Proceedings of

EL SIN XVI

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2011
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Proceedings of the 16th Annual Conference of the EDUCATION, LEARNING, STYLES, INDIVIDUAL DIFFERENCES NETWORK

Developing Learning Within and Across Disciplines: Evidence from Research and Practice

University of Antwerp
DEVELOPING LEARNING WITHIN AND ACROSS DISCIPLINES: EVIDENCE FROM RESEARCH AND PRACTICE

Proceedings of the 16th Annual ELSIN Conference

University of Antwerp, Antwerp, Belgium
29 June – 1 July 2011

The 16th ELSIN conference is organised jointly by the ELSIN executive and the University of Antwerp (The Institute of Education and Information Sciences and Linguapolis, the Institute for Language and Communication).

The major theme of this year’s conference is ‘Developing Learning within and across Disciplines: Evidence from Research and Practice’

ELSIN - THE EDUCATION, LEARNING, STYLES, INDIVIDUAL DIFFERENCES NETWORK

ELSIN is an international interdisciplinary association of academics, researchers, trainers and practitioners in the fields of education, psychology, business, computer science, information systems, management, medicine, and other related fields who are interested in the theory and application of cognitive style, learning styles and strategies, in addition to other individual learning differences to enhance the quality of learning environments.

The Education, Learning, Styles, Individual differences Network, formerly known as the European Learning Styles Information Network (1996-2010), has adjusted its focus from one that was exclusively centred on the consideration of cognitive and learning styles in learning and teaching, to one that seeks to consider a broader definition of styles to encompass all aspects of an individual’s learning profile in relation to both individual and contextual factors across educational and workplace settings. In so doing, we hope to be able to move styles research forward by considering more integrated models of learning that locate styles research within the broader field of individual learning differences. The change in emphasis also reflects, more accurately, the global reach of ELSIN.

The principal aims of ELSIN are to

1. further opportunities for research and development in cognitive/learning styles and other related fields, considering a more holistic definition of a learning profile to include both individual and contextual factors across educational and workplace settings impacting on learning. For example, personality constructs, conceptions and beliefs about learning and teaching, motivational factors, affect, self-regulation; as well as the nature of learning environments and individual learners’ navigation of these belong to the focus of attention.

2. promote collaboration with practitioners in various contexts, encouraging multi-disciplinary and cross-cultural studies.

3. enable the creation and dissemination of knowledge about cognitive/learning styles and other individual learning differences.

4. promote international collaboration in research and development.

5. organise an international conference on an annual basis.

6. facilitate other events and co-operate with organisations that will realise the aims of ELSIN (e.g., symposia, journals, scientific networks).
COMMITTEES

Local organizing committee

David Gijbels (University of Antwerp, Belgium)
Vincent Donche (University of Antwerp, Belgium)
Peter Van Petegem (University of Antwerp, Belgium)
Eva Cools (Vlerick Leuven Gent Management School, Belgium)
Filip Dochy (K.U.Leuven, Belgium)
Katrien Struyven (Vrije Universiteit Brussel, Belgium)
Gert Vanthournout (University of Antwerp, Belgium)
Liesje Coertjens (University of Antwerp, Belgium)
Ann Aerts (University of Antwerp, Linguapolis, Belgium)

ELSIN executive committee

Carol Evans (University of Exeter, United Kingdom)
Steve Armstrong (Hull University Business School, United Kingdom)
Eva Cools (Vlerick Leuven Gent Management School, Belgium)
Helena Pedrosa-de-Jesus (University of Aveiro, Portugal)
Zarina Charlesworth (Haute Ecole d’Ingénierie et de Gestion du Canton de Vaud, Switzerland)
Martin Graff (University of Glamorgan, United Kingdom)
Tony Redmond (Trinity College Dublin, Ireland)

Abstract reviewers

Carol Evans (University of Exeter, United Kingdom)
Steve Armstrong (Hull University Business School, United Kingdom)
Eva Cools (Vlerick Leuven Gent Management School, Belgium)
Helena Pedrosa-de-Jesus (University of Aveiro, Portugal)
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Martin Graff (University of Glamorgan, United Kingdom)
Tony Redmond (Trinity College Dublin, Ireland)
Lorenzo Vigentini (University of Glasgow)
Ian Kinchin (King’s College London, United Kingdom)
Âge Diseth (University of Bergen, Norway)
Patricia Albergaria Almeida (University of Aveiro, Portugal)
Gloria Banner (University of Birmingham, United Kingdom)
David Gijbels (University of Antwerp, Belgium)
Vincent Donche (University of Antwerp, Belgium)
Gert Vanthournout (University of Antwerp, Belgium)
Liesje Coertjens (University of Antwerp, Belgium)

We kindly thank all reviewers for their hard work and for the endless energy they have put in the objective evaluation of all abstracts.

CONFERENCE VENUE: THE UNIVERSITY OF ANTWERP AT A GLANCE

The University of Antwerp is characterised by its high standards in education, internationally competitive research and entrepreneurial approach. It was founded in 2003 after the merger of the three universities previously known as RUCA, UFSIA, and UIA. The university’s roots go back to 1852. The University of Antwerp has approximately 13,000 students, which makes it the third largest university in Flanders. Over 1,000 of these students - exchange students not included - are from foreign countries, with a majority of EU countries. In order to face the challenges posed by the internationalisation of European education and research, the University is part of the Antwerp University Association (AUHA).

The University of Antwerp has faculties in Applied Economics, Arts and Philosophy, Law, Medicine, Pharmaceutical - Veterinary and Biomedical Sciences, Political and Social Sciences, and Sciences. Doctoral programmes are available in most faculties.

The 4 campuses are situated in the historic city centre and in the green belt to the south of the city.
CONFERENCE THEME

In recent years, scholars and researchers have devoted considerable attention to research on the development of learning within educational and business settings, as well as to the ways in which this learning can be invoked. The various disciplines have much to learn from each other with regard to this topic. The major theme of the conference is ‘Developing Learning within and across Disciplines: Evidence from Research and Practice’. ELSIN 2011 particularly welcomes submissions on one of the following key issues:

1. development of learning throughout education and professional careers
2. implications of style for teaching and management
3. research on workplace learning
4. individual differences in learning and how to take them into account
5. differentiation and style coaching
6. good practices: putting research into practice
7. methodological issues
8. test development and psychometrics

CONFERENCE FORMATS

The following formats are hosted at the ELSIN conference

Keynote presentations

The organising committee is delighted to welcome three internationally renowned keynote speakers:

Mien Segers, Professor of Corporate Learning at Maastricht University in the Netherlands
Sari Lindblöm-Yläne, Professor of Higher Education at Helsinki University, Director of the Centre for Research and Development of Higher Education at Helsinki University in Finland
Maria Kozhevnikov, Professor of Radiology at the Harvard Medical School, Associate in Neuroscience at Massachusetts General Hospital

Symposia

Format

Each symposium contains three presentations addressing a specific topic. A symposium aims to be an active discussion forum on a relevant issue within the domain of learning and individual differences in education or business.

Points of attention

In addition to the points of attention for each of the constituting papers, the introduction to the symposium should underline:

1. the cohesion between papers
2. the complementarity in information and presentations
3. the innovative nature of the research presented for the styles-field relevance of the symposium and future directions of research in the styles-field

Paper presentations

Format

Paper presentation sessions allow attendees to present their work in the area of learning and individual differences in the domain of education or business. As far as possible, individual papers are grouped into thematic sessions three papers each. Presenters have 20 minutes of presentation time, followed by 10 minutes of discussion.
Points of attention

Contributors have to pay special attention to:

1. sound theoretical background
2. clear research aims
3. relevance of contribution for research and practice in styles field
4. sufficient details on methodology where relevant to the nature of paper
5. transparent description of results where relevant to the nature of paper
6. conclusion and critical discussion

Posters

Format

In contrast to traditional ‘poster presentation’ formats, the ‘talk and tell’ format requires contributors to present a brief (5 minutes) outline of their posters at the start of the session. Afterwards, attendees have the opportunity to take an in-depth look at the posters, ask questions and engage the presenters in discussion. The posters are grouped thematically into two sessions: ‘Implementation of Change’ and ‘Measurement’

PhD students are invited to present the outline of their entire PhD projects through poster presentations. The outline has to contain the following information: theoretical framework, general research questions, proposed methodology and relevance of the research for theory or practice.

Points of attention

In their posters, contributors have to pay special attention to:

1. sound theoretical background
2. clear research aims
3. sufficient details on methodology
4. clear structure and visual attractiveness

If applicable, attention also has to be devoted to:

1. transparent description of results
2. critical discussion of results and conclusion
3. relevance for research and practice in the styles field

Good practices

Format

Good practice sessions or demonstrations provide the opportunity for practitioners to present an ‘intervention or practice’ related to learning and individual differences, along with a critical discussion of its impact. Contributions from both education and business are welcome. Presentations are grouped thematically into two sessions: ‘Professional Learning in Teacher Education’ and ‘Stimulating Learning Competences’. Presenters have 20 minutes of presentation time, followed by 10 minutes of discussion.

Points of attention

Contributors have to pay special attention to:

1. description of the context in which the good practice or demonstration is set
2. theoretical foundation of the practice or demonstration
3. clear description of the intervention
4. discussion of evaluation and impact
5. lessons learned and suggestions for the future.
PhD activities

The ELSIN 2011 conference pays special attention to PhD students by organising workshops and two thematically grouped poster sessions.

The workshops are predominantly methodological in nature, covering both qualitative and quantitative research methods. A workshop on publishing is to be hosted as well.

**Workshop Multilevel Modelling in SPSS** (Sven De Maeyer & Huub van den Berghe)

Researchers often face situations where data are gathered on different observational units. A classic example of educational research involves the investigation of the impact of school characteristics on the performance of the students with students nested within schools. Another example often encountered in educational research includes studies with the same subjects measured on multiple occasions (e.g. pre-test/post-test designs, or longitudinal designs). Typically, observations are nested within subjects. Multilevel analysis, or more generally, mixed modelling, provides a solution to the problems with this kind of (nested) data.

This workshop will show you how to perform basic multilevel analyses. We will start from a very basic multilevel model and elaborate this model to accommodate research designs with a pre-test post-test design. For this workshop we will use the SPSS software package. We combine theory and hands-on exercises in such a manner that theoretical explanations can be applied directly to a realistic research situation.

**Workshop Nvivo** (Liesje Coertjens & Vincent Donche)

Nvivo is a user-friendly software package, allowing the systematic content analysis of qualitative data (e.g., interview or focus group records, observation notes). Particularly with respect to analyses on larger qualitative datasets and/or when multiple researchers are working collaboratively on a qualitative research project, Nvivo can prove its benefits.

In this workshop you will be introduced to the program in a hands-on fashion. After the workshop, you will be able to upload data in Nvivo and code them in a deductive or inductive way. Apart from this, you will get an idea of the simple and more advanced analysis strategies offered.

**Workshop Publishing in Scholarly journals** (David Gijbels & Piet Van den Bossche)

Publishing in scholarly journals is a crucial part of being a researcher, but it is often easier said than done. This workshop offers advice and tricks for getting your research published. It deals with the following questions: How does a journal work? What instructions do reviewers get when they review articles? How does an editor look at articles? What should you take into account when submitting an article? How can you increase your chances of getting an article accepted? The workshop will complement the presentation of guidelines and examples with exercises and discussions.

**PUBLICATION**

Authors have the opportunity to submit their paper for a Special Edition of the International Journal of Inclusive Education.

*Volume 14, Edition 2, 2012*

**Focus:** An Inclusive Approach to Cognitive and Learning Styles within educational settings

**Editors:**

Dr. Carol Evans, Associate Professor, Head of Teacher Education, Graduate School of Education; President of The European Learning, Styles, Individual differences Network; Visiting Fellow of the Institute of Education, London.

Dr. Lynne Rogers, Director of Post Compulsory PGCE, Institute of Education Chair of the Psychology of Education Section of the British Psychological Society. Director of the London Centre for Excellence in Teacher Training (LONCETT)

Dr. Vincent Donche, Assistant Professor, Institute of Education and Information Sciences, University of Antwerp, Belgium.

Mr. Gert Vanthournout, doctoral research fellow, Institute of Education and Information Sciences, University of Antwerp, Belgium

**Background to special edition**

The aim will be to consider how research on cognitive and learning styles is being translated into higher education and school-based settings and offer suggestions for improvement of practice based on latest research findings (Zhang & Sternberg (eds.) 2009; Rayner & Cools (eds.) 2010 and Zhang, Sternberg & Rayner (in preparation).

Within this special issue we will be particularly focusing on how the interpretation and application of styles work can be
Proceedings ELSIN 2011 (overview)

both inclusive and exclusive. There has been much debate in recent years concerning the 'limited' and often inappropriate application of styles work to practice (Coffield, Moseley, Hall, & Ecclestone, 2004a, 2004b; Evans & Sadler- Smith, 2006; Evans & Graff, 2008; Cools, Evans & Redmond, 2009), the predictive validity of some learning style models, as well as the misuse of styles work in school settings (Sharp et al, 2008).

We will argue that an awareness of how students process information (i.e., their cognitive and learning styles) can potentially inform pedagogy to enhance student and tutor understandings (Evans, Cools & Charlesworth, 2010). In addition, when adequately measured, these characteristics can have an explanatory value regarding to issues of exclusion such as lower academic achievement and drop-out (Vermunt, 2005; Donche & Van Petegem, 2010). However, the potential of cognitive and learning styles research to contribute to this agenda has to date not been fully realised (DEMOS, 2005; Evans and Waring 2009; Zhang & Sternberg, 2009). A key consideration within this special edition will be to consider how to enhance understandings of effective practice within the styles field.

Examples of specific papers (theoretical/empirical):

1. A review of how schools/HEIs are using styles research in practice; what are teacher/lecturer understandings?
2. The predictive nature of styles. How learning style research can be helpful for identifying students at risk for exclusion or successful progress in education.
3. Research identifying learning style characteristics that are predictive for negative study outcomes.
4. Papers describing/identifying risk profiles among students/pupils.
5. Papers describing conditions or results of interventions that could be helpful to diminish the risk for exclusion in education.
6. Papers outlining how a personal learning styles pedagogy can be used to help teachers to consider their approaches to learning and teaching.
7. Papers considering the limitations of the ‘matching hypothesis’ and those that consider learner self – regulatory strategies to enable cognitive flexibility.
8. Papers considering how key style ideas can be translated effectively into practice.

Please follow the guidelines that can also be found on the website when submitting a proposal:

Author guidelines

1. To be related to the areas identified above
2. Articles should be a maximum of 7,000 words including refs and figs/tables
3. Abstract should be no more than 200 words in length
4. Six relevant keywords have to be selected
5. Articles should be original and written in a clear, straightforward style, stating objectives clearly and defining terms. Arguments should be substantiated with well-reasoned supporting evidence
6. Tables and Figures must be typed out on separate sheets with approximate positions indicated in the text

Word templates are available – see main site:
http://www.tandf.co.uk/journals/journal.asp?issn=1360-3116&linktype=44

Process and timelines

Initial papers should be submitted directly to c.a.evans@exeter.ac.uk by 31 July 2011 for consideration. Papers will be sent to the editorial team and each paper will be anonymised and independently reviewed by members of the editorial review team. All those who have submitted papers will be notified in September 2011 of the editorial decision. Authors of the selected papers will receive comprehensive feedback to further enhance their papers and to ensure that the papers conform to the journal requirements (quality and rigour) and meet presentation requirements. Final papers should be submitted by 15 December 2011. The editorial team of Research Papers in Education reserve the right to request further modifications should they be considered necessary. Papers will be submitted to the journal January 2012 following further minor amends ready to meet the publication date for Volume 14, edition 2 2012

ELSIN 2012

The 2012 ELSIN Conference will be held from Tuesday 26 June to Thursday 28 June 2012.

The venue will be the University of Glamorgan, Wales, United Kingdom.

www.elsin-2112.org
## CONFERENCE PROGRAMME

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| 10.00h–11.00h | **Keynote 1**: Mien Segers  
*Understanding Professionals’ Learning Approaches*                                    |
| 11.00h–11.30h | Coffee break                                                                                                                          |
| 11.30h–13.00h | **Good practice session 1**: Professional Learning in Teacher Education  
**Paper Session 1A**: Visualisation & Measurement of Learning  
**Paper session 1B**: Learning Styles  
**Paper session 1C**: Teaching Concept |
| 13.00h–14.00h | Lunch                                                                                                                                  |
| 14.00h–15.45h | **Good practice session 2**: Stimulating Learning Competence  
**Poster session 1A**: Measurement  
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| 15.45h–16.15h | Coffee break                                                                                                                          |
| 16.15h–17.45h | **Symposium 1**: Understanding the Learning Process  
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**Paper session 2B**: Inventory Research  
**Paper session 2C**: E-learning |
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<td>Approaches to Learning – Contextual or Stable in Nature?</td>
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*Convener: Vincent Donche*  
**Paper session 5A:** Individual Differences  
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| 11.00h - 12.00h| **Keynote 3:** Maria Kozhevnikov  
*Cognitive Style in the Context of Contemporary Psychology and Neuroscience.* |
| 12.00h - 13.00h| Lunch                                                               |
| 13.00h - 14.30h| **Paper session 6A:** Group Learning  
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| 14.30h - 15.00h| Official closing of ELSIN 2011 and presentation of ELSIN 2012       |
| 15.00h - 15.30h| Farewell Drink                                                      |
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By Maria Kozhevnikov

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Convener: David Gijbels

Discussant: Sari Lindblom-Ylänne

1. The Application of Styles Research within Educational Practice
   By Carol Evans and Michael Waring

2. The Learning Process of Management Students Unraveled: a Longitudinal Study on the Link between Individual Learner Characteristics, Context Factors and Learning Outcomes in Management Education
   By Eva Cools, Kim Bellens and Karlien Vanderheyden

3. The Effects of Learning Environments on Students’ Approaches to Learning. Can Students’ Perceptions Offer an Explanation?
   By Marlies Baeten, Filip Dochy and Katrien Struyven

Symposium 2: Relationships, Reflection, and Resources: Navigating the Student Experience

Convener: Jennifer Blake

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2. “… the cognitive needs look after themselves…”
   By Jamie Thompson

3. Inertia and the Learning Journey: How Positioning of Resources Affects the Student Experience
   By Jennifer Blake, Valerie Wass and Louise Walmsley

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Convener: Vincent Donche

Discussant: John Richardson

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2. Changes in BSc Business Administration & Psychology Students’ Learning Styles over One, Two and Three Years of Study: A Longitudinal Study
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By Wilfried Admiraal, Jantina Huizenga, Miriam Reitenbach, Sacha Rosenthal, Monique Volman and Geert Ten Dam

Cognitive Styles and Enquiry-Based Science Education
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The Role of Personal Goals in (Dis)Engagement in Adult Literacy Classes
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By Kim Bellens and Eva Cools

To Be Conformative or not – A Question of Style or Education? A Comparative Study of Teacher Students in Sweden and Community Education Students in Scotland.
By Lena Boström and Annette Coburn

Character, Communication, and the Classroom with Learning Styles
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To group or Not to Group: a Response to Individual Differences in Learning Seen Through the Eyes of the Students
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Understanding Professionals’ Learning Approaches

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Abstract

Learning approaches are a well-studied domain in educational research. Most of the studies are conducted in school settings (e.g., Nijhuis, Segers, & Gijselaers, 2007). A vast amount of this research has evidenced the influence of individual as well as contextual variables in the adoption of specific learning approaches. However, while the need for learning in organizational contexts is broadly recognized (Gijselaers, Arts, Boshuizen, & Segers, 2006), comparably little is known about how professionals approach their learning in the workplace and which factors lead to individual differences in learning approaches (Bernsen, Segers, & Tillema, 2009). The presentation will focus on recent studies addressing the influence of professionals’ learning approaches on their performance. Moreover, evidence will be shown on factors influencing the learning approaches employed in the workplace.

Keywords: Learning approaches, Learning in the workplace

References


Abstract

The presentation focuses on research on approaches to learning of university students. There is a rich body of research on students’ approaches to learning in which different methodological approaches have been applied to explore the nature of and the variation in approaches to learning. In my presentation I will explore the effects of the applied research method on the achieved results, in particular from the point of view of the contextuality versus stability of the approaches to learning.

The data were collected by using both student interviews and a questionnaire, more precisely the Experiences of Teaching and Learning Questionnaire (ETLQ). The data were analysed both qualitatively and quantitatively by using a follow-up design in which students filled in the questionnaire twice, before and after a course.

The results showed that when exploring the approaches to learning by applying factor analyses and ANOVAs or t-tests, no major changes in students’ approaches to learning we found. However, more detailed analyses of students’ questionnaire answers at the individual level showed great variation both at the factor level and at the item level. While some students scored significantly higher on one approach to learning, other students scored significantly lower on the same approach after the course. In addition, a small group of students showed no variation in their scores on this approach to learning. These changes to two different directions seemed to overrule each other. Student interviews shed more light on the reasons why the students changed their approaches to learning or why they did not change them during the specific course.

There is contrasting evidence of the nature of students’ approaches to learning. Some argue that they are stable in nature and others consider the approaches to learning as dynamic and contextually varying. These different views could be explained by the different methodological designs of the studies. The majority of studies investigating approaches to learning have applied questionnaires and carried out statistical analyses, mainly factor analysis and comparisons of either factor scores or scale means. It can be concluded that this kind of a research approach is not enough to explore the variation or the development of the approaches to learning during university studies. The unit of analysis should be an individual student and the possible changes in his or her answers at the two points of data collection process.

Keywords: Student learning, approaches to learning, research methods
Cognitive Style in the Context of Contemporary Psychology and Neuroscience

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Abstract

The intent of this presentation is to review research on cognitive style from different traditions in order to revaluate previous and existing theoretical conceptions of cognitive style, and redefine cognitive style in accordance with current cognitive science and neuroscience theories. Despite being extremely popular throughout the 50s-70s, research on cognitive style has lost much of its appeal and has been seriously questioned in recent decades. The main reasons for this decline of interest in cognitive style seem to be the lack of a coherent organizing framework, and the lack of understanding of how cognitive style maps onto other psychological concepts and theories. According to its definition, cognitive style should refer to the way individuals process information; however, since the vast majority of cognitive style studies were conducted before the rise of cognitive science, the concept of cognitive style has not been integrated with contemporary cognitive science theories, and the relationship between cognitive style’s and cognitive psychology’s approaches to individual differences in cognition has not been established.

To examine the ways how cognitive style could be incorporated into current cognitive science theories of individual differences, I will review research findings on individual differences in cognition and cognitive styles from three different research perspectives: 1) cognitive style, 2) cognitive psychology and neuroscience, and 3) transcultural psychology and neuroscience. First, I will review conventional research on cognitive style that introduces the concept of cognitive style as patterns of adaptation or specific modes of adjustment to the external world. Second, I will review cognitive style research in applied fields demonstrating that, although cognitive style develops on the basis of innate abilities, it is modified further as a result of changing environmental demands and life experiences, and must thus be thought of not only in terms of innate predispositions, but as a flexible construct, in terms of socio-cultural interactions regulating an individual’s behavior. Third, I will summarize the latest trends in cognitive style research that have attempted to integrate the variety of cognitive style dimensions into unifying hierarchical models, and relate these models to information processing theories. Finally, I will review recent findings in transcultural psychology and neuroscience that have documented the existence of culturally sensitive individual differences in cognition and suggested a close relationship between social-cultural environment and specific neural and cognitive patterns of information processing. Based on my review, I will suggest a dissociation between 1) stationary individual differences that are determined primarily by genetic factors and exhibit only limited sensitivity to ontogenetic (environmental and socio-cultural) factors; and 2) flexible individual differences or cognitive styles, whose formation, although affected by genetic factors, is largely influenced by environmental and socio-cultural factors during ontogenetic development. According to the above approach, I will redefine the concept of cognitive style as ontogenetically flexible individual differences representing an individual’s adaptation of innate predisposition to external physical and socio-cultural environments and expressing themselves as environmentally and culturally sensitive neural and/or cognitive patterns of information processing.

Keywords: cognitive style, information processing, neural mechanisms, socio-cultural environment, innate predispositions

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ELSIN XVI

SYMPOSIAS
The Application of Styles Research within Educational Practice

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Michael WARING (University of Loughborough, United Kingdom)

Abstract

To explore how styles research is being used within educational practice in schools and higher education institutions (HEIs) through a systematic analysis of research findings (1999-2010), to inform priorities and future directions for styles research. Styles research is used as an umbrella term to include cognitive styles, learning styles, approaches to learning, intellectual styles and orientations.

The systematic review involved an automated advanced search of The Education Resources Information Center (ERIC) database and six special editions of journals focusing on styles research to identify potentially relevant studies for use in the review. From an initial identification of 486 potential papers, 134 were finally selected using increasingly refined inclusion criteria. Two authors independently reviewed the data with any discrepancies between the independently generated lists of included journal articles being collaboratively revisited by the two reviewers and a consensus decision arrived at. A thematic analysis (Braun & Clarke, 2006) of the data was then carried out independently by each of the two researchers to identify key themes occurring within the papers focusing on the applications of styles to educational instruction and assessment.

The thematic analysis identified five main themes:

1) the impact of new interventions on students’ approaches to learning and management of such learning transitions;
2) issues related to style flexibility;
3) relationships between the learning styles of students and teaching styles of teachers;
4) using styles as a framework to enhance pedagogy;
5) e-learning environments and styles.

The implications of the findings for future practice and research will be discussed. A number of areas will be highlighted for group discussion. Specifically, these will consider the relative lack of use of research on the role of cognitive styles in learning, compared to other style dimensions such as approaches to learning within educational environments. We need to consider which cognitive styles do matter and how they are related to each other and to other styles and individual difference constructs. In addition, and as discussed by Ritter (2007), we will also ask the question as to whether we should be using styles instruments with students at all? Are there general principles that we should be applying to our design and delivery of curricular for all learners, regardless of their styles profiles (Evans and Waring 2009; Yates 2000)? In developing this line of argument, we ask how we move beyond the reductionist notion of the matching hypothesis (Pashler et al. 2009). Furthermore, we will also consider the relative lack of consideration of styles research findings in relation to the design and operationalisation of assessment and feedback. Lastly, we will consider, the implications of styles findings in relation to the design of e-learning environments. What general principles can be applied to the design and management of e-learning that are relevant to enhancing access and learning for all and which cognitive styles appear to be most implicated in relation to the design and use of e-learning (Rittschof, 2010; Handal and Herrington, 2004)?

Keywords: cognitive styles, learning styles, approaches to learning, intellectual styles and orientations.

References


The Learning Process of Management Students Unraveled: A Study on the Link between Individual Learner Characteristics, Context and Process Factors, and Learning Outcomes in Management Education

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Abstract

Although ample research has been conducted to unravel the learning process of students and to determine the influencing factors of students’ learning outcomes, research that takes into account the joint effect of multiple factors is scarce. Moreover, many studies focus on stable individual differences to explain learning outcomes and are therefore conducted in a cross-sectional way, hereby neglecting the context in which learning takes place and the individual strategies developed during the learning process. Following these knowledge gaps, the general purpose of our research was to provide a comprehensive insight about the impact of individual learner characteristics, process factors, and contextual elements on learning outcomes. The underlying conceptual model of our research assumes that the learning process (i.e., students’ approaches to studying) will mediate the relation between individual characteristics (i.e., cognitive styles) and learning outcomes (i.e., academic achievement, course evaluation), and that the learning context (i.e., didactical methods used) additionally serves as a moderator on the relation between process characteristics and learning outcomes. Preliminary findings, using a sample of 159 students, demonstrate that both student characteristics (cognitive styles and approaches to studying) and the learning context influence learning outcomes. It seems like students with particular styles and approaches benefit more from specific didactical methods than others, which needs to be investigated further when we finalised the data collection of this study. We are convinced that this research can contribute to the design of effective personalised learning environments and in this sense provide specific knowledge to assure the learning of all students.

Keywords: Individual differences; learning process strategies; context factors; learning outcomes; assurance of learning

1. Introduction

The recent shift in educational priorities from ‘teaching’ to ‘learning’ (Whetten, Johnson, & Sorenson, 2009) led to increased pressure on the shoulders of teachers in management education, as this requires many teachers to rethink their teaching approach. The emphasis on ‘learning’ indeed implies a shift in two ways: (1) from a focus on what the teacher does to what students do during the course; and (2) from a focus on the performance of the teacher (faculty evaluation) to students’ performance (student learning) (Barr & Tagg, 2005; Mundhenk, 2004; Whetten et al., 2009). Consequently, the assumptions of a ‘one size fits all’ curriculum are increasingly questioned (Kolb, Boyatzis, & Mainemelis, 2001) and business educators face the challenge of preparing a diverse population of students to meet the demands of a rapidly changing business environment (Backhaus, 2011; Boyatzis & Mainemelis, 2011). In fact, business schools are often criticised for failing to adequately prepare students, and in times of economic difficulty, are even blamed for sending ill-prepared students into the business world (Bennis & O’Toole, 2005). Hence, business schools are experiencing increased pressure from students, organisations, governments, and accreditation commissions to clearly demonstrate and even proof ‘assurance of learning’ (AoL), which implies showing that their students are achieving the learning goals that form the basis of the curriculum. As Rubin and Martell (2009, p. 366) stated it: “the movement toward increased accountability in management education for what is being taught and learned is ubiquitous”. However, how to directly measure the extent to which the learning

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objectives set forth have been accomplished and hence provide ‘hard evidence’ for assurance of learning is still a challenge in most business schools (Martell, 2007; Pringle & Michel, 2007).

In addition, as the diversity of students in MBA classes and management programmes increases (Friga, Bettis, & Sullivan, 2003), one consequence is that business educators can expect the diversity of their approaches to learning to increase. Therefore, to create an environment that enhances sustained learning of all students, business schools must engage a wider variety of teaching methods and pedagogy than the typical curriculum contains (Kolb & Kolb, 2005; Vermunt, 2011). Yet, a commonly used practice is to design curricula and deliver courses with a ‘one size fits all’ assumption (Evans & Cools, 2011), and as such neglect individual learner differences. Although ample research has been conducted to unravel the learning process of students and to determine the influencing factors of students’ learning outcomes (Tzu-Chien & Graf, 2009), research that takes into account the joint effect of multiple factors is scarce (Gully & Chen, 2010). This is surprising, as learning outcomes are influenced by a multitude of variables (Dobson, 2009; Duff, 2003; Nofte & Robins, 2007). Moreover, many studies focus on stable individual differences to explain learning outcomes (e.g., Armstrong, 2000; Au, 1997) and are therefore conducted in a cross-sectional way (Vanthournout, Donche, Gijbels, & Van Petegem, 2009, 2011), hereby neglecting the context in which learning takes place (Chamorro-Premuzic & Furnham, 2008; Diseth, 2003) and the individual strategies developed during the learning process (Riding, 2000), which is rather unexpected in the light of the intrinsic developmental process that characterises learning. Sadler-Smith (2006, p. 4) explicitly defined learning as “a longer-term change in the knowledge possessed by and individual, their type and level of skill, or their assumptions, attitudes or values, which may lead to them having increased potential to grow, develop and perform in more satisfying and effective ways”. Hence, the general purpose of this study is to provide a comprehensive insight about the impact of individual learner characteristics and contextual factors on learning outcomes to stimulate the design of effective personalised learning environments and in this sense provide specific knowledge to assure the learning of all students.

Following from the above mentioned gaps, we developed an initial conceptual framework for this study on the basis of an extensive literature review of the field of education research in general and the field of cognitive and learning style research in particular (e.g., Gully & Chen, 2010; Sadler-Smith, 2006; Whetten et al., 2009). The conceptual model of our research assumes that the learning process will mediate the relation between individual characteristics and learning outcomes, and that the learning context additionally serves as a moderator on the relation between process characteristics and learning outcomes. We hypothesise: (1) that students’ individual characteristics (in this study: cognitive styles) have a direct impact on the learning process (in this study: approaches to studying); (2) and an indirect impact on the learning outcomes (in this study: academic achievement, course experience) through the learning process, (3) that the learning process will influence the learning outcomes of the students, and (4) that the learning context (in this study: didactical methods used) will moderate the relation between process and outcome variables (see Figure 1).

### Figure 1: Conceptual framework

<table>
<thead>
<tr>
<th>Individual characteristics</th>
<th>Learning process</th>
<th>Learning outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive styles</td>
<td>Approaches to studying</td>
<td>Academic achievement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Course experience</td>
</tr>
</tbody>
</table>

#### 2. Method

Data are collected by means of a self-reporting questionnaire from postgraduate and MBA students of a Belgian business school (still ongoing), using two measurement moments: one at the beginning and one at the end of the academic year 2010-2011. This design allows us to measure the effects of the received education on student learning outcomes. It was clearly explained to the students that the surveys were for
research purposes only and that their participation was voluntary. In return, participants received an individualised feedback report with the general results of the study and their personal scores.

### 2.1 Sample

The sample for the first data wave contained 312 students (mean age = 27, SD = 4.67, ranging from 21 to 48 years; 67% men and 33% women; 62% national and 38% international students; 16% with a major in accounting and finance, 34% in management, 14% in marketing, and 36% in general business).

In total, 159 students also completed the second questionnaire (mean age = 26, SD = 3.68, ranging from 21 to 41 years; 70% men and 30% women; 62% national and 38% international students; 28% with a major in accounting and finance, 34% in management, 17% in marketing, and 21% in general business).

### 2.2 Concepts and measures

**Individual learner characteristic: cognitive styles.** Cognitive styles can be defined as partly fixed, relatively stable and possibly innate individual preferences in information processing that are linked to a person’s cognitive system (Peterson, Rayner, & Armstrong, 2009). Following recent evolutions in the style field, we preferred a multidimensional rather than a unidimensional perspective (Kozhevnikov, 2007; Sadler-Smith, 2009). Cools and Van den Broeck (2007; 2008a; 2008b; Cools, Van den Broeck, & Bouckenooghe, 2009) recently developed and validated a multidimensional cognitive style model based on three cognitive styles. Their 18-item Cognitive Style Indicator (CoSI; Cools & Van den Broeck, 2007) was used to measure cognitive styles in this study, distinguishing between a knowing style (i.e., a preference for a logical, rational, informed way of information processing; 4 items; \( \alpha = .66 \); e.g., ‘I like to analyse problems’), a planning style (i.e., a preference for a structured, organised, efficient way of information processing; 7 items; \( \alpha = .79 \); e.g., ‘I prefer clear structures to do my job’), and a creating style (i.e., a preference for a creative, intuitive, unconventional way of information processing; 7 items; \( \alpha = .75 \); e.g., ‘I like to extend the boundaries’). The response format was a five-point likert scale from 1 (totally disagree) to 5 (totally agree).

**Learning process: approaches to studying.** An approach to studying is generally defined as “the manner in which studying is grasped” (Ashworth & Greasley, 2009, p. 561), pointing to students’ mental orientation to studying. Most authors investigating students’ approaches to studying have build further on the work of Marton and Saljö (1997), distinguishing between a deep and a surface approach (Furnham, Christopher, Garwood, & Martin, 2008). Students adopting a deep approach aim to understand the subject and are intrinsically interested in, and derive enjoyment from, studying. Surface learners perceive the task of learning as an external imposition and they are externally motivated, thereby depending largely on rote learning and memorisation. Some researchers (e.g., Entwistle & Ramsden, 1983; Marton & Saljö, 1997) mentioned the need to add a third approach, namely a strategic approach. A strategic approach entails well-organised and conscientious study methods linked to achievement motivation, and the determination to do really well in the courses taken. Following this more recent theorising on approaches to studying, we chose this three-dimensional conceptualisation within our research. We used the 52-item Approaches and Study Skills Inventory for Students (ASSIST; Tait, Entwistle, & McCune, 1998) to measure approaches to studying, which makes a distinction between a surface (16 items; \( \alpha = .78 \); e.g., ‘I’m not really sure what’s important in lectures so I try to get down all I can’), a deep (16 items; \( \alpha = .78 \); e.g., ‘When I read an article or book, I try to find out for myself exactly what the ather means’), and a strategic (20 items; \( \alpha = .77 \); e.g., ‘I organise my study time carefully to make the best use of it’) approach to studying. The response format was a five-point likert scale from 1 (disagree) to 5 (agree).

**Learning context: didactical methods used.** To measure the didactical methods used, we searched for an existing validated scale that would be appropriate for use within the Belgian business school. As no adequate measure seemed to exist, we started from the didactical preference questionnaires of Sadler-Smith (1997, 1999) and Chuang (2004) to compile our own list of didactical methods. Based on additional feedback from five professors of the business school, some further adaptations were made to the instrument. Preliminary analyses (item analysis, exploratory factor analysis) reduced the initial 33-item questionnaire to 14 items. This final instrument was used to measure the learning context, distinguishing between three groups of didactical methods: active methods (i.e., methods that instruction that lay the responsibility of learning with the learners; 5 items; \( \alpha = .76 \); e.g., Participating in field trips), individual methods (i.e., methods that focus on learning by yourself; 4 items; \( \alpha = .72 \); e.g., Writing individual papers), and group methods (i.e., methods that stimulate learning in group; 4 items; \( \alpha = .67 \); e.g., Participating in group work). The response format was a five-point likert scale from 1 (didactic not used at all) to 5 (didactic used very much).
Learning outcome: academic performance. To measure students’ academic achievement we used the final score of the students on the Management and Organisation’ course, in which they participated during this study. This is a provisional measure in expectation of their final end of year grade, which will be a weighted aggregation of their scores on all courses.

Learning outcome: course experience. As we do not only want to look at cognitive learning outcomes, we also added a more affective measure in this study. We used the 25-item Course Experience Questionnaire (CEQ) of Ramsden (1991) to assess students’ perceptions of their learning environment. An example item of this scale is ‘Overall, I was satisfied with the quality of this study’ (α = .85). The response format was a 5-point likert scale from 1 (totally disagree) to 5 (totally agree).

2.3 Analyses

Techniques of moderated-mediation were used to analyse the data (Preacher, Rucker, & Hayes, 2007). This technique allows us on the one hand to analyse the mediating effect of approaches to studying on the relation of cognitive styles with learning outcomes, and on the other hand to shed light on the possible additionally moderating effect of the didactics used by the teacher on the effect of approaches to studying on learning outcomes, both cognitive and affective ones. We used an SPSS macro designed by Preacher and his colleagues (2007) to conduct the analyses, which makes it possible to calculate conditional indirect effects, as it is plausible that the strength of the hypothesised indirect (mediation) effect is conditional on the value of the moderator.

3. Preliminary results and discussion

As we are currently still in the data collection phase (i.e., second data collection wave and final academic performance scores), it is not yet possible to elaborate on the full findings of our study. Detailed results will be presented during the paper presentation at the conference. However, some preliminary analyses of the data already revealed some interesting findings, both for the cognitive and the affective learning outcome.

3.1 Cognitive learning outcome

For this preliminary paper, we only selected part of the sample in the analyses that focus on the cognitive outcomes (n = 87), this is the students for which we already had a temporary academic performance score at this stage. This section will give an overview of the significant results found, first looking at simple mediation effects and then at moderated mediation effects. Detailed tables of these results will be provided at the conference.

3.1.1. Mediation effects

When looking at the possible mediation effect of approaches to studying on the relationship between cognitive styles and cognitive learning outcomes, we can conclude that approaches to studying are a significant partial mediator, as many partial relationships show significant paths. Focusing, for example, on one particular finding\(^1\): the mediating effect of a deep approach on the relationship between a knowing style and the cognitive learning outcome. The total relationship between the knowing style and the cognitive outcome is significant (p < .05). Furthermore, the relationship between a deep approach and the cognitive outcome is significant as well (p < .05), as is the relationship between a knowing style and a deep approach (p < .001). When controlling for a deep approach, the direct effect of the knowing style on cognitive outcome is not significant. As the value of \(B\) is not equal to zero, we conclude that the relationship is only partially mediated.

3.1.2. Moderated mediation effects

Knowing. When looking at students with a knowing style, the following moderating effects could be detected (using the recommendations of Hayes (2009) for interpretation). First of all, the frequent use of active, group as well as individual didactics by teachers (Mean and +1 SD) strengthens the positive effect of a deep approach on learning outcomes. For the use of active methods, \(p = .03\) for the mean score on active didactics and \(p < .001\) for +1 SD above the mean score on active didactics. For the use of group methods, \(p\) is

\(^1\) The other results of the mediation effects will be presented in a detailed overview during the conference.
respectively .07 and < .001 and for the individual didactics, \( p \) is respectively .03 and .02. This means that for students with a knowing style using a deep approach, the teaching style (be it with the use of active, individual or group didactics) will positively influence students’ learning outcomes. Hence, students with a knowing style and a deep approach seem to have a double advantage: one for the positive effect of a deep approach and one for the additional positive effect of the interaction with the teacher. Secondly, in relation to the strategic approach to studying, teachers seem to strengthen the positive effect of this strategic approach on learning outcomes when making use of individual didactics (Mean and +1 SD) (Mean: \( p = .03; +1 \text{ SD: } p = .02 \)).

**Planning.** Students with a planning style are also influenced by the didactics used by teachers. First of all, the use of active didactics moderated the relationship between a strategic approach and learning outcomes, such that when making moderate use of active didactics, the positive effect of a strategic approach on learning outcomes is significant (Mean: \( p = .02; +1 \text{ SD: } p = .06 \)). When making frequent use of individual didactics (Mean and +1 SD), a significant effect of strategic approach on learning outcomes can be detected (Mean: \( p = .01; +1 \text{ SD: } p = .01 \)). The same results are found for making use of group didactics (Mean: \( p = .02; +1 \text{ SD: } p = .04 \)). Again, it seems that in the interaction of students, in this case with a planning style and a strategic approach to studying, with whatever didactics used by the teacher (active, individual or group didactics), the teaching style will positively influence students’ learning outcomes. Hence, students with a planning style and a strategic approach also seem to profit from this double advantage: one for the positive effect of a strategic approach and one for the additional positive effect of the interaction with the teacher.

**Creating.** For students with a creating cognitive style, we found three significant moderating effects of used didactics on the relationship between approaches to studying and learning outcomes. First of all, the use of active didactics moderates the relationship between a deep approach and learning outcomes, in the sense that higher scores (Mean and +1 SD) on the use of active didactics show a significant positive effect of a deep approach on learning outcomes (Mean: \( p = .01; +1 \text{ SD: } p < .001 \)). Secondly, also individual didactics moderate the effect of a deep approach on students’ learning outcomes. The frequent use of individual didactics (Mean and +1 SD) significantly strengthens the positive effect of using a deep approach (Mean: \( p = .01; +1 \text{ SD: } p = .02 \)). A last significant moderating effect was found for the use of group didactics, which positively influenced the relationship between a deep approach and students’ learning outcomes, when the scores on group didactics was high (Mean: \( p = .01; +1 \text{ SD: } p < .001 \)). Hence, overall the same conclusion seems to apply here as for students with a knowing style, as also for students with a creating style and a deep approach, the teaching style will positively influence students’ learning outcomes.

We did not find any significant results in our preliminary analyses for students that develop a surface approach during the learning process. A possible explanation is that for these students, the used didactics of the teacher neither positively nor negatively affect their learning outcomes.

### 3.2 Affective outcome: course evaluation

#### 3.2.1 Mediation effects

Equal to the results of the mediating effect of approaches to studying in the relationship between cognitive styles and cognitive learning outcomes, the results show that the relationship between cognitive styles and course evaluation is partly mediated by approaches to studying. The total effect of cognitive styles on course experience never revealed any significant effects. When looking at the partial relationships, significant results are obtained. For example, the relationship between a strategic approach and course experience is significant (\( p = .04 \)) as well as the relationship between a planning style and a strategic approach (\( p < .00 \)). The direct relationship between a planning style and course experience is not significant with a \( B \)-value close to zero (\( B = .03 \)), indicating a partial mediation of a strategic approach on the relationship between a planning style and course experience. The same results\(^\text{2}\) are obtained for the other values of cognitive style and approaches to studying, which led us to the conclusion that approaches to studying partially mediate the relationship between cognitive styles and course experience.

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\(^\text{2}\) The other results of the mediation effects will be presented in a detailed overview during the conference. Given the word limits of this paper, we prefer to give more dedication to the moderated mediation results.
3.2.2 Moderated mediation effects

Tables 1, 2 and 3 show the significant results of the moderated mediation analyses of cognitive style, approaches to studying, and used didactics on course evaluation.

First of all, results (see Table 1) indicate that the cross-product term between a surface approach and the use of individual didactics is significant ($B = .19; t = 1.94, p = .05$) when students have a planning style. Hence, these results show that the use of individual didactics interact with a surface approach in influencing the course evaluation of students. To explore this in more depth, it is interesting to have a look at the conditional indirect effect of the use of individual didactics. Therefore, we examined the conditional indirect effect of a surface approach on learning outcomes at three values of the use of individual didactics: the mean (2.36), one standard deviation above the mean (3.15) and one standard deviation below the mean (1.57). Normal-theory tests indicate one of the three conditional indirect effects (based on moderator values at -1 SD) was negative and significantly different from zero. Bootstrap CIs corroborated these results. This means that for students with a planning cognitive style, there is a negative effect of a surface approach on course evaluation when teachers make less use of individual didactics.

<table>
<thead>
<tr>
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<th>B</th>
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<th>Boot SE</th>
<th>Boot z</th>
<th>Boot p</th>
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</tr>
<tr>
<td>M (2.36)</td>
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<td>+ 1 SD (.79)</td>
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<td>4.56</td>
<td>.05</td>
<td>.05</td>
<td>.91</td>
<td>.36</td>
</tr>
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</table>

Note. N = 155. Unstandardized regression coefficients are reported. Bootstrap sample size = 5,000.

A second model (see Table 2) shows a significant interaction between a strategic approach and the use of individual didactics on the course evaluation of students with a knowing cognitive style. Although the
overall interaction term was not significant, significance tests were conducted on the hypothesis that the conditional indirect effect equals zero at specific values (M, ±1 SD) of the moderator, as suggested by Hayes (2009). The use of individual didactics moderates the effect of a strategic approach on course evaluation at the mean and at high levels (+1 SD) of a strategic approach, but not when the use of individual didactics were low (-1 SD; see Table 2). Hence, for students with a knowing cognitive style, the use of individual didactics by the teacher will strengthen the positive effect of developing a strategic approach during the learning process on the course evaluation of students.

A third significant moderator effect (Table 3) can be seen with students with a knowing style, where the use of group didactics moderates the effect of the use of a strategic approach on the course evaluation of students. Equal to the results presented in Table 2, the overall interaction term is not significant, however the conditional indirect effects showed some significant results. As can be seen in Table 3, when the use of group didactics is low (-1 SD), the effect of a strategic approach on students’ course evaluation is significant. More specifically, students with a knowing style will benefit from developing a strategic approach during the learning process, when teachers make less use of group didactics. When teachers make more use of group didactics, the beneficial effect of a strategic approach on course evaluation is no longer significant.

### Table 2: Regression Results for Moderated Mediation

<table>
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<td>Course evaluation</td>
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</tr>
<tr>
<td>Boot indirect effect</td>
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</table>
| Conditional indirect effect at didactics = M ± 1SD
| -1 SD (-.79)                     | .04  | .04 | 1.19 | .24  |
| M (2.36)                         | .07  | .03 | 2.19 | .03  |
| +1 SD (.79)                      | .10  | .05 | 2.11 | .04  |
| Individual didactics             |      |     |      |      |
| Boot indirect effect             |      |     |      |      |
| Conditional indirect at range of values of N-exp
| 1.00                             | .02  | .05 | .49  | .63  |
| 1.38                             | .04  | .04 | .91  | .36  |
| 1.75                             | .05  | .03 | 1.47 | .14  |
| 2.13                             | .06  | .03 | 2.00 | .05  |
| 2.50                             | .07  | .03 | 2.24 | .02  |
| 2.88                             | .09  | .04 | 2.20 | .03  |
| 3.25                             | .10  | .05 | 2.07 | .04  |
| 3.63                             | .11  | .06 | 1.92 | .05  |
| 4.00                             | .13  | .07 | 1.8  | .07  |
| 4.38                             | .14  | .08 | 1.71 | .09  |
| 4.75                             | .15  | .09 | 1.63 | .10  |

*Note.* N = 155. Unstandardized regression coefficients are reported. Bootstrap sample size = 5,000.

*aRange of values represent an abbreviated version of the output provided by the macro.*
Table 3: Regression Results for Moderated Mediation

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<td>.72</td>
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<th>Boot SE</th>
<th>Boot z</th>
<th>Boot p</th>
</tr>
</thead>
<tbody>
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<td><strong>Conditional indirect at range of values of N-exp</strong></td>
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<tr>
<td>2.40</td>
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*Note.* $N = 155$. Unstandardized regression coefficients are reported. Bootstrap sample size = 5,000.

*a*Range of values represent an abbreviated version of the output provided by the macro.

4. Conclusion

This study aims to shed light on the influencing factors of students’ learning outcomes in an integrative way and in this sense fits within ongoing debates about the design of effective learning environment for all students (Boyatzis & Mainemelis, 2011; Whetten et al., 2009). We hope to contribute to education research by investigating the combined impact of a multitude of influencing factors and to educational practice by providing relevant insights to stimulate the design of student-centred learning environments in management education and in this sense add to the assurance of learning for all. Preliminary findings already demonstrate that both student characteristics and the learning context influence learning outcomes. It seems like students
with particular styles and approaches benefit more from specific didactical methods, which needs to be investigated further when we have the full data.

5. References


**Acknowledgement**

We are grateful to the Vlerick Academic Research Fund, partially subsidised by the Flemish government, for their financial support to execute this research project.
The Effects of Learning Environments on Students’ Approaches to Learning: Can Students’ Perceptions Offer an Explanation?

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Filip DOCHY(Katholieke Universiteit Leuven, Belgium)
Katrien STRUYVEN (Vrije Universiteit Brussel, Belgium)

Abstract

Objectives of the study: Deep approaches to learning, which aim at understanding, are highly valued in higher education. Previous research has tried to enhance the adoption of deep approaches by implementing student-centred instruction, such as case-based learning (CBL). However, the results of these studies were not univocal (Baeten et al., 2010). Until now, the reasons for this were unclear. One possible explanation is that not the isolated use of student-centred instruction encourages a deep approach, but instead the combination with lectures (Sivan et al., 2000). This explanation will be investigated in the current study. Yet, it has to be recognised that it is not necessarily the learning environment in itself that influences learning, but rather the way students perceive it (Entwistle, 1991). Therefore, also students’ perceptions will be taken into account.

Research questions: What is the influence of the learning environment (lectures, CBL or a combination of both) on students’ approaches to learning? And, can the effects of the learning environment on students’ approaches to learning be explained by students’ perceptions of the learning environment?

Method: A quasi-experimental pre-test/post-test design took place with 1099 first-year student teachers during a compulsory course on child development. Research conditions were: 1) a lecture-based learning environment (LLLL), 2) a CBL environment (CCCC), 3) a mixed learning environment in which lectures and CBL were used alternately (LCLC), and 4) a mixed learning environment in which lectures gradually made way for CBL (LLCC). At the start and end of the course students’ approaches were measured by means of the Approaches to Learning and Studying Inventory (Entwistle et al., 2002). Students’ perceptions were measured at the end of the course through focus group interviews.

Summary of results: Results of AN(C)OVA showed that the gradually implemented CBL setting was most beneficial. Students in this learning environment scored the highest on deep approach (LLCC>CCCC, LLLL), monitoring studying (LLCC>CCCC, LCLC) and organised studying (LLCC>LLLL, CCCCLCLC) and the lowest on surface approach (LLCC<LLLL, CCCCLCLC). Through the focus group interviews five themes arose, which might explain students’ approaches in the different settings, i.e. independent study through cases, teacher input, variation, workload and group problems.

Conclusions: This study contributes to theory development about CBL by showing the surplus value of implementing CBL gradually for students’ approaches to learning. Moreover, by referring to students’ perceptions, this study helps educators in optimising their student-centred practices, e.g. by taking into account structured teacher input, appropriate workload and variation.

Keywords: student-centred learning, lectures, case-based learning, approaches to learning, perceptions

1. Introduction

A deep approach to learning is highly valued in higher education. Previous research has tried to enhance the adoption of this deep approach by implementing student-centred learning environments. However, the results of these studies were not univocal (Baeten et al., 2010). Until now, the reasons for this were unclear. One possible explanation is that not the isolated use of student-centred instruction encourages a deep approach, but instead the combination with lectures (Sivan et al., 2000). This explanation will be investigated in the current study.

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1.1. Approaches to learning

In general, three approaches to learning can be distinguished, i.e. a deep, surface and strategic approach. A deep approach is associated with an intention to understand and to distil meaning from the content to be learned. To reach this goal, students use deep learning strategies, e.g. relating ideas to previous knowledge, looking for patterns, checking evidence and critically examining arguments. Oppositely, the intention behind a surface approach is bound to coping with course requirements. The course is treated as unrelated bits of knowledge (Entwistle, 1997) and learning strategies are limited to selective memorisation. Whereas the first two approaches describe ways in which students handle a learning task (deep versus surface), the strategic approach indicates how students organise their learning (e.g. when, where, how long they learn) (Biggs et al., 2001). The intention of a strategic student is to achieve the highest possible grades. This student is putting consistent effort into studying. He tries to find the right conditions and materials for studying and manages time and effort effectively (Entwistle, 1997).

1.2. Approaches to learning in student-centred learning environments

To reach the highly valued deep approach to learning, student-centred learning environments inspired by the constructivist learning theory have been implemented. Student-centred approaches to teaching and learning are described by Cannon and Newble (2000: 16–17) as “ways of thinking about teaching and learning that emphasise student responsibility and activity in learning”. Several teaching methods have been developed that suit this definition, e.g. problem-based and case-based learning. These teaching methods are often presented as the opposite of traditional lectures where the teacher provides information to students (Prince, 2004). While student-centred teaching can take many different forms in practice, one recurring aim of these teaching methods is fostering deep learning and understanding (Hannafin et al., 1997). Recently, Baeten et al. (2010) conducted a literature review about the effects of student-centred learning environments on approaches to learning. However, this review revealed no univocal results. While some studies emphasised the surplus value of student-centred instruction for fostering deep approaches (e.g. Sivan et al., 2000; Wilson and Fowler, 2005), other studies found the opposite, i.e. students using more surface approaches in student-centred learning environments (e.g. Gijbels et al., 2008; Struyven et al., 2006).

To explain these mixed findings, Baeten et al. (2010) listed up several encouraging and discouraging factors, among which structure. A lack of structure might explain why students’ deep approaches did not increase in student-centred learning environments. To counterbalance this problem, it has been suggested to combine student-centred instruction with lectures in order to provide structuring support (Struyven et al., 2006). In fact, lectures serve goals as structuring information, giving overview and illustrating relationships between subjects (Dochy et al., 2005), which offer support in highly cognitive demanding settings where students have to discover course contents themselves (Perkins, 1999). According to Albanese and Mitchell (1993) students have to become familiar with the discipline, basic concepts and outline of the course through the structured input from the teacher before starting to work autonomously. So, their basic science framework needs to be developed first. During the initial transition from a traditional approach (e.g. a lecture-based setting) to a new student-centred approach, students regularly encounter difficulties, discomfort and resistance (Choi et al., 2009). They experience a feeling of uncertainty about their roles and responsibilities. However, when students have adjusted their learning and roles to the new approach, this initial dissatisfaction will decrease (Choi et al., 2009). Therefore, Lake (2001) proposes an incremental introduction of active learning methods to improve students’ perceptions of it.

The incorporation of lectures in a student-centred learning environment could explain why Sivan et al. (2000) found a positive influence of a student-centred learning environment on the deep approach, while other researchers did not (e.g. Gijbels et al., 2008; Struyven et al., 2006). Yet, it has to be recognised that it is not necessarily the learning environment in itself that influences students’ learning, but rather the way students perceive it (Entwistle, 1991).

1.3. Objectives of the study

The main objective of the current study is to investigate the explanation that not the sole use of student-centred instruction or lectures encourages a deep approach, but instead the combination of both. Moreover, we want to investigate how these different learning environments affect the other approaches to learning. The student-centred teaching method central to our study is case-based learning (CBL). CBL is “a method of acquiring knowledge through students’ active participation in analysing and discussing real-world
scenarios presented by a case” (Chen et al., 2008: 331). As such, it allows students to connect theories and concepts to real-life situations represented in cases (Kurz et al., 2005). The research questions are:

– What is the influence of the learning environment (lectures, CBL or a combination of both) on students’ approaches to learning?

- Can the effects of the learning environment on students’ approaches to learning be explained by students’ perceptions of the learning environment?

We hypothesise that students in learning environments that combine both lectures and CBL will use deeper and less surface approaches to learning than students in learning environments in which one sole teaching method (either lectures or CBL) is used.

2. Method

2.1. Participants

Twenty-six teachers from eleven institutions for teacher education participated with their student groups, which resulted in a sample of 1099 first-year students. The object of study was a compulsory course on child development.

2.2. Research design

The design of the research was quasi-experimental since the research was implemented in authentic class settings. Each teacher and his/her student group were assigned to one research condition:

1) A lecture-based learning environment (LLLL; N=251), which comprised lectures and teacher–student interaction. The teacher transmitted knowledge to the students by means of PowerPoint presentations and visual aids (i.e. pictures and videos).

2) A CBL environment (CCCC; N=307), in which students discovered the course content themselves by selecting and applying those contents necessary to solve authentic cases. Students had to read the cases at home and in class questions about the cases were solved in small student groups. In solving these cases, the teacher’s role consisted of scaffolding and supervising. The answers to the cases were corrected by students themselves with the help of correction keys.

3) An alternated learning environment in which lectures and CBL were used by turns (LCLC; N=281). Both occurred approximately in equal amounts. Students first received a lecture about each developmental phase and afterwards a case study, so that the goals of lectures and CBL could constantly support each other.

4) A gradually implemented CBL environment (LLCC; N=260). The first chapters in the course book were provided by means of lectures, the next chapters were provided by means of a combination of lectures and case studies, and the final chapters were provided by means of case studies.

To guarantee a standardised treatment, several measures were taken. First of all, standardised learning materials were developed, i.e. the same course book, PowerPoint presentations, case studies and correction keys. These materials were submitted to the participating teachers for preview. Their feedback was used in revising the materials. Moreover, we organised a meeting with each teacher before the start of the research to ensure similar experimental protocols. Furthermore, each teacher was videotaped twice during the course with the aim of stimulating them to use the prescribed teaching methods as intended.

2.3. Instruments

Approaches to learning were measured by means of the Approaches to Learning and Studying Inventory (ALSI) (Entwistle et al., 2002). The ALSI contains 36 items scored on a 5-point Likert scale. Five scales can be distinguished: deep approach, surface approach, monitoring studying, organised studying, and effort management. The scale monitoring studying relates to the deep approach and describes metacognitive aspects of learning and studying. The scales organised studying (including time management) and effort management (including concentration) refer to the strategic approach. The questionnaire was administered twice, hereby following the procedure of Sivan et al. (2000): at the beginning of the first lesson general approaches to learning were measured, and at the end of the final lesson approaches to learning for the
course in question, i.e. child development, were measured. Cronbach’s alpha for pre- and post-test data were acceptable, respectively 0.75/0.76 for deep approach, 0.72/0.75 for surface approach, 0.65/0.65 for monitoring studying, 0.79/0.74 for organised studying and 0.75/0.76 for effort management.

Students’ perceptions of the learning environment were measured through focus group interviews, administered at the end of the course. Questions related to advantages and disadvantages of the learning environment and needs for change. Twenty-six focus group interviews were conducted with subgroups of students from each teacher, ranging from two to ten students. Interviews were transcribed and analysed qualitatively in order to identify factors that might explain differences in approaches to learning between the four learning environments.

3. Results

3.1. What is the influence of the learning environment (lectures, CBL or a combination of both) on students’ approaches to learning?

This question was answered by means of analyses of variance (ANOVA). However, regarding deep approach, monitoring studying, organised studying and effort management, initial differences were found between the research conditions. In order to examine the effect of the research condition on these four variables, analyses of covariance (ANCOVA) instead of ANOVA were conducted, which controlled for initial differences in these approaches.

Results of the full ANCOVA model (Table 1) showed a significantly higher deep approach in LLCC compared to CCCC and LLLL. Concerning the surface approach, ANOVA showed a significantly lower score in LLCC compared to all other settings. As a consequence, our hypothesis was confirmed partially. Students in LLCC used deeper and less surface approaches, compared to LLLL and CCCC. Students in LCLC on the other hand did not differ significantly from students in LLLL and CCCC on their deep and surface approach.

With regard to monitoring studying, results of the full ANCOVA model showed that students scored significantly higher in LLCC compared to CCCC and LCLC. As to organised studying, significantly higher scores were found in LLCC compared to the other three settings. Regarding effort management, ANCOVA could not be conducted since the assumption of homogeneity of regression slopes was not met. Based on these findings, LLCC was the most beneficial learning environment in terms of students’ approaches to learning.

<table>
<thead>
<tr>
<th>Scale</th>
<th>F</th>
<th>Df</th>
<th>P</th>
<th>Partial $\eta^2$</th>
<th>Comparison$^a$</th>
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<tr>
<td>Deep approach</td>
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<tr>
<td>Condition</td>
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<td>3,1094</td>
<td>.007*</td>
<td>.01</td>
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<td>1,1094</td>
<td>.000**</td>
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<td>Surface approach</td>
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<tr>
<td>Condition</td>
<td>8.98</td>
<td>3,1095</td>
<td>.000**</td>
<td>.02</td>
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<tr>
<td>Condition</td>
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<td>Organised studying pre</td>
<td>383.01</td>
<td>1,1094</td>
<td>.000**</td>
<td>.26</td>
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$^a$p<.01, **p<.001
$^b$Post hoc Bonferroni comparisons (p<.05)
3.2. Can the effects of the learning environment on students’ approaches to learning be explained by students’ perceptions of the learning environment?

Through focus group interviews, five themes arose which might explain students’ approaches in the different settings, i.e. independent study through cases, teacher input, variation, workload, and group problems.

**Independent study through cases.** In solving authentic cases, students recognised benefits for optimising deep approaches to learning. CBL stimulated their thinking and focused on understanding and application rather than on knowing the course contents. By looking up information themselves, students felt actively involved. They recognised learning benefits compared to a lecture, in which they only heard the course contents from the teacher. For several students, the independent study did not result in in-depth thinking. These students invested little energy and worked rather superficially. A reason for that was that the assignments were not graded. As a consequence, motivation for students to do their utmost decreased. Because of the incomplete content coverage in CBL and their superficial way of working, these students did not perceive learning gains and saw the course merely as home study.

In LLLL, on the other hand, some students perceived the exclusive use of lectures as passive. They did not feel involved, and as a consequence, they had difficulties to concentrate. Moreover, they neglected studying throughout the year, because they did not have tasks that obliged them to read the course book. Conversely, other students in LLLL indicated to be actively involved with the course contents, since they could write information down and highlight main points in their course book while the teacher was explaining.

**Teacher input.** Students who received lectures (LLL, LCL, LLCC) were in general pleased with it, whereas students who did not receive lectures (CCCC) expressed a need for teacher input. Perceived advantages of lectures were the PowerPoint presentations which provided overview and structure. This helped students to follow the course and to learn it afterwards. Moreover, during lectures, teachers emphasised the most important information and provided additional explanation, which clarified the course contents.

For students in CCCC, it was harder to distinguish between important and non-important information and to understand everything because explanation of the teacher was lacking. Moreover, it was difficult for them to see relationships between the contents. Instead, they regarded cases as fragmented parts of information. As an alternative, students in CCCC suggested to combine lectures and CBL so that they would have some basic knowledge before starting to work autonomously. In this way, they supposed that the solving process would be a lot easier. This combination of first lectures and afterwards CBL was also considered as the most favourable in LCLC and LLCC.

**Variation.** While LCLC and LLCC were the settings in which there was objectively the most variation, supporters and opponents of variation were found in each of the four settings. In LCLC and LLCC, the variation between lectures, visual aids and CBL was recognised. However, for some students this variation was not satisfying. In LCLC, students considered it to be always the same, repetitive pattern: lectures and CBL. In LLCC, students perceived an overweight of cases. In all the settings using CBL (CCCC, LCLC and LLCC), students were enthusiastic about this teaching method in the beginning. However, after a while, it became boring for them. Students perceived it to be always the same activity, i.e. looking up information and looking for relationships.

**Workload.** An excessive workload was experienced in the settings were students received cases about each developmental phase, i.e. CCCC and LCLC. The experienced workload was related to the amount of work and information students had to deal with, but also to the time they had to accomplish it. According to students, CBL took a lot of time because each case contained a lot of information. Finding the right answers and writing them down, especially if students did not have had an introduction before, and correcting the solutions afterwards was considered time-consuming. Because of the workload, CBL was more and more perceived as a burden. Students had less courage to solve it. Because of the large amount of cases and the experienced time pressure, students spend less time to discuss cases in-depth. In LCLC, students also experienced time pressure during the lectures. A lot of information was provided in a short time span so that course contents were not examined into depth. In LLCC, students’ perceptions of a high workload were less frequently reported and less pronounced. In LLLL, finally, workload was not really an issue.

**Group problems.** By working in groups, students said they could help each other and got to know each other’s perspectives. However, all kinds of problems may arise during group work, which might have hindered the adoption of deep approaches, for instance students who were ill-prepared, unmotivated, absent
or who did not contribute to the group work. These student behaviors reduced other students’ motivation. Besides, a lack of focus might have obstructed students from working thoroughly during class hours. Also the group composition was reported to cause problems. Students with more prior knowledge worked too fast so that other group members did not have the opportunity to look up information themselves. Finally, the fact that the teacher composed the groups hindered students in discussing topics in-depth, because they did not know their group members well.

4. Conclusions and discussion

The aim of this study was to investigate whether settings that combine both student-centred instruction and lectures could enhance students’ approaches to learning compared to settings in which either student-centred instruction or lectures were used. Results showed that implementing CBL—which is an example of student-centred instruction—gradually was most beneficial for students’ approaches to learning. In comparison to the other learning environments, students in the gradually implemented CBL setting scored the highest on deep approach, monitoring and organised studying, and the lowest on surface approach.

Contrary to our expectations, only the gradually implemented CBL setting and not the alternated setting outperformed both the lecture-based and CBL setting on deep approach. This might be explained by perceived workload. Students in both the CBL and the alternated setting might have experienced a higher workload since they received cases about each developmental phase. According to previous research (Bruning et al., 2008), CBL is often associated with a perceived high workload. This may be due to the fact that richly described cases may result in cognitive overload, if the student must acquire too much information at one time (Van den Berg and Visscher-Voerman, 2000). The higher amount of cases in the alternated and CBL setting compared to the gradually implemented CBL setting might have increased the perceived workload, which, consequently, might have hindered students in reaching a deep approach. In fact, many researchers have shown that an excessive perceived workload is negatively associated with a deep approach (e.g. Crawford et al., 1998). In the gradually implemented CBL setting, students’ perceptions of a high workload were less frequently reported and less pronounced, while in the lecture-based setting workload was not really an issue. Other reasons such as passive attitude and lack of involvement might have explained the lower score for deep approach in the lecture-based setting.

Another factor that might explain the less beneficial students’ approaches in the alternated setting compared to the gradually implemented CBL setting is the fact that students perceived the combination of lectures and CBL in the alternated setting as little varied. It was always the same combination. In the gradually implemented CBL setting, there was objectively more variation: first only lectures, than a combination of lectures and CBL and in the end only CBL. Possibly, students in this setting had a clear goal in mind towards which they had to work, i.e. solving cases without structured input of the teacher. Nonetheless, receiving lectures before CBL was considered most favourable in all three settings using CBL in order for students to have overview, see relationships and understand everything, which are all important for reaching a deep approach or discourage a surface approach (Entwistle, 1997). Moreover, in the gradually implemented CBL setting, a combination of a less pronounced high workload and a structured input of the teacher might have helped students in monitoring study effectiveness, monitoring understanding and monitoring generic skills (Struyven et al., 2006).

Students in the CBL and alternated setting might have experienced problems with study organisation due to their more negative perceptions of the learning environment, e.g. a perceived high workload, lack of variation, and group problems, but also due to the intensive efforts and the high level of concentration that is required at the end of the course when examinations are in the near future (Struyven et al., 2006). The latter argument might also count for students in the lecture-based setting. During the course, these students were not obliged to study the course contents in order to solve cases. At the end of the course, however, they might have been confronted with lots of learning materials that still had to be studied. As a consequence, they might have experienced problems with study organisation at that moment. Student in LLCC, on the other hand, might have felt more at ease because their learning environment worked towards a clear goal of solving cases without teacher input, after a period of structured teacher input and CBL. As a result, they scored higher on organised studying.

In all settings using CBL, students’ enthusiasm about CBL decreased in general throughout the semester, because it was always the same activity of looking up information and looking for relationships. In the gradually implemented CBL setting, students experienced not as many cases as in the alternated or CBL
setting, so maybe their level of motivation, which was found to be related to approaches to learning (Entwistle et al., 2002), might not have decreased as much. Students who still perceived CBL as positive at the end of the semester referred to the surplus value of CBL for understanding, thinking and applying. Perhaps only those students benefitted from CBL in terms of their deep approaches.

Finally, some limitations are recognised in the current study. A first limitation is inherent to the quasi-experimental design. Since the research took place in authentic class settings, many attempts were made to standardise the learning environments (see 2.2.). Nevertheless, differences (e.g. moment of teaching, infrastructure, teachers’ narrative skills) were inevitable since different teachers and student groups were involved. A second limitation refers to the fact that students’ deep approaches, monitoring studying, organised studying and effort management were not equal in the four conditions at the start of the quasi-experiment. By including the pre-test scores as covariates, the analyses controlled for initial differences. However, initial differences could have made that groups did not have the same opportunity of increasing or decreasing their approach. A third limitation concerns the focus on one CBL format. Our standardised CBL format might have restricted advantages of CBL since the case solving process was rather structured; solving separate questions with the help of the course book. As a consequence, a CBL format where students have more freedom in determining the problem solving route could possibly have the power to increase students’ deep approaches, monitoring studying, organised studying and effort management over time.

Despite these limitations, the current study shows that the gradually implemented CBL setting, in which lectures gradually made way for CBL, is most beneficial in terms of students’ approaches to learning. Important factors in this setting are the gradual implementation, the structured input of the teacher, an appropriate workload and variation. These factors might help educators in optimising their student-centred practices.

5. References


Embedding Reflective Thinking on Approaches to Learning – Moving from Pilot Study to Developing Institutional Good Practice

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Abstract

Aim
Asking undergraduates to reflect on their approaches to learning involves the individuals in effort and activity they may well consider to be an unwanted addition to their normal studies: unless the activity has clear links in their minds with their chosen subject. The same reaction is sometimes found in teaching academics, as supporting a reflective strand requires additional effort which they may be happy to give as long as it relates to their research, or is a one off pilot. There are therefore issues that very quickly arise when attempting, as this study does, to embed metacognitive thinking about approaches to learning and style into the everyday good practice of teaching staff in universities and in the routine thinking of students.

Methodology
This paper describes the progress of a study facilitating the embedding of one framework for developing an individual's approaches to learning into the everyday good practice of university teaching staff and the everyday learning experience of undergraduates. It is an interim report that sets out the five strands of this activity: introduction to the model for staff; first steps at putting into practice; collection of examples of activity; building a community of practice; assessing the effectiveness of interventions. It also describes some of the issues and challenges that arise when moving from pilot study to developing good practice within a large organisation. The basis of the initial stages is a consultative and collaborative approach to develop effective materials for informing colleagues and developing their understanding of the model whilst laying the foundations for a community of practice and empowering individuals to develop activities for embedding these ideas into their teaching and to share these along with commentary on the success of these interventions – not just within the group but also for their contemporaries to access.

Finding
It has previously been demonstrated that the Effective Lifelong Learning Inventory, ELLI, can be an effective tool for teachers and learners, providing a framework to think and talk with students about learning and about how to grow as learners within both their formal education and informal learning. However, this is a reasonably complex model with seven dimensions of learning, and it has been developed primarily for the school context. Whilst the model has been shown to be of value within universities, the higher education context offers several challenges to the approach and these are explored. The issues relating to colleagues being persuaded to embed these ideas into their everyday practice will be discussed along with the measures required for institutional support, including the demonstration of positive outcomes to interventions.

Relevance
This paper is relevant to anyone considering ways in which their understandings and experience of metacognitive thinking about approaches to learning and style may benefit the student body, the teaching of their colleagues and their institution

Keywords: lifelong-learning, open distance learning, personal development, higher education, ELLI

1. Introduction
It is, of course, vitally important to research the validity and effectiveness of theories and the tools that we and others develop. As we find models that offer benefits to individuals in their learning then, as practitioners, we find ourselves compelled to find ways to embed these ideas into our normal activities. Through the academic communities we belong to ideas are shared and tested further. Understandings grow and individual practices develop and become increasingly refined. We may influence the practice of others as they measure and make judgements on our work. Ideally, those of us who work in the same institution

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should also be sharing in the same way as we belong to the same institutional academic community. However, this is not necessarily the case and it should not be surprising when the internal community within our own institution works less effectively than those of the international academic communities of which ELSIN is one. However, this may present us with a problem. Do we rest content that we have continued to develop our practice as well as we can, or do we try to affect those of others perhaps even those of our institution?

Following two studies, the first of which was presented to ELSIN in 2009 (Edwards & Hush, 2009) and the second in 2010 (Edwards, 2010a) and the shared findings from others on the use of the Effective Lifelong Learning Inventory (ELLI), I set out to share these ideas further. In particular I wanted to find a way to share these ideas with others within my institution and to increase the number of students to be given the opportunity to engage with the framework of ideas at the heart of the tool. This paper is a report on the way this has been approached and the results to date.

2. Background

The ELLI tool was developed at Bristol and brought together a range of ideas associated with approaches to learning, or individual learning dispositions stemming from work in the early part of the last decade (Carr & Claxton, 2002). Some see these as relating to learning styles others feel they are something different to styles. Learning power has been described by one of the tool’s originators as:

‘…a form of consciousness characterized by particular dispositions, values and attitudes, with a lateral and a temporal connectivity’ (Deakin Crick, 2007) p.138.

However, the tool is in practice at times used as an alternative to speaking about other models of learning styles and therefore has relevance to the area of styles research. The first project we undertook included a strand intended to explore whether ELLI was a suitable replacement for the Honey and Mumford learning styles questionnaire and model that had been selected several years earlier by the team developing a technology module (Edwards & Hush, 2009). ELLI has been extensively trialled with age groups ranging from primary school children (Deakin Crick et al., 2004) to adult learners at university (Small & Deakin Crick, 2008). The Honey and Mumford questionnaire is directed at general traits in behaviour and Effective Lifelong Learning Inventory is one of the tools that begins with behaviour but invites reflection on an individual’s approaches to learning. Both questionnaires are intended to be the starting point in a process of discussion and change and not be used for assessment or selection. Following this study the module team retained the Honey and Mumford approach because it was relatively straightforward and quick to use in comparison with ELLI and because a change would have therefore required very significant reworking of the module.

A recent publication clearly sets out the intentions to initiate a focus on ways to identify a good style theory and developing approaches to encourage greater examination, comparison and development of theories (Rayner & Cools, 2011). This should gradually bring greater coherence to the field and help us establish better ways of comparing models and theories.

Sir Ken Robinson argues persuasively in his lecture to the Royal Society for the encouragement of Arts, Manufactures and Commerce (RSA) on the need for a paradigm shift in the way we approach education (Robinson, 2008). He argues humanity has entered a period of such rapid and fundamental change and is impacting on its home planet in significant ways that we cannot afford to not re-imagine our education systems. It is clear that he and others have made a case for this for over a decade and whilst the rhetoric of governments may suggest this is important the reality of change in education is far short of the transformation they have called for. I do not argue the work I and others do on theories, ideas and practices relating to style will directly lead to such a change, or that there is universal agreement this change is necessary. I consider we are contributing to an improved understanding of individuals as learners, including themselves, and this will enable an increasing number to benefit from an improved education however radical the system is allowed to become.

3. Method

The model of use for the ELLI inventory requires a trained mentor to facilitate an individual learner’s reflection on the results of their answers to the online inventory. Therefore, if the integrity of the approach is
to be maintained whilst offering the framework to an increasing number of individuals, an increase in the number of available mentors must also be made. The obvious group to approach within the institution are the lecturers. The people who have the greatest interest and engagement with a student’s learning process. A possible second group to consider is the student body itself. There can be advantages in this –buddying is becoming more widely considered as a way, when carefully managed, to structure improved support for students whilst keeping costs in check. As part of the buddying approach it would therefore also make sense to include some structured reflection on approaches to learning. For this study I took the approach to encourage a number of lecturers to engage with the model and to use this experience and their feedback to improve the approach. I produced a document intended to introduce members of the University community to the model. This was a 22 page document with background, a description of the model and the chart that it produces (Edwards, 2010b). It also included sections illustrating how the seven dimensions of learning power might relate to different people and on typical interventions that might be suitable within a university context and the learner’s environment. The document takes the ideas described by Tim Small (Small, 2006) with some adaption for the higher education and adult context and is available at http://www.open.ac.uk/personalpages/c.h.edwards/conferences/elli-inOU-intro-draft-may2010-first-version.pdf.

The approach consisted of two options. Firstly, there was the option to read and comment on this document using the lecturer’s own knowledge and experience. Secondly, there was the option to use the ideas within the document to develop an activity within a tutorial session, either face-to-face or virtual and to describe and report on this. There were small amounts of funding available as recognition this was additional to their workload.

Responses from option 1 will be used to improve the orientation document by making it clearer and better organised and directed to those who will use it. Those colleagues who have opted for the second option, to develop an activity, will report what they have done and how it went. With their agreement we can build a repository of activities to use with different groups in different subjects at different levels.

The intention is also that we begin to build a community of colleagues who are developing and working with the instrument. Together, these activities constitute a phase 1. Practice is beginning to be shared and developed amongst a group of staff. The next phase is to develop, if necessary, these activities to allow their success/effectiveness to be measured. We have previously reported (Edwards & Hush, 2009) that using ELLI with undergraduates in higher education (HE) is seen by them as offering something of value. Also, that the staff involved with its delivery give very positive feedback of their experience. What we need to demonstrate for the wider institution to take a stronger interest is a measurable benefit that will justify the use of resources – largely staff time – in administering and supporting the tool.

The university is a distance learning organisation that uses a supported open learning method. Face-to-face tutorials take place on most modules and usually last two hours. Online synchronous and asynchronous tutorials also take place in an increasing number of modules using forums and conferencing software.

3. Results

Thirty one lecturers committed to provide extended comments on the introduction document and reports were received from all. Comments ranged from the typographical through those to do with the structure and layout and on to those questioning the ideas behind the document. All were engaged by the ideas in the paper and it is clear from responses that individuals valued the space to consider their own approaches to learning and how the seven dimensions related to themselves. Of course, not everyone felt the ELLI approach was the best. No specific preferred alternatives were named although one commented they prefer ‘more practical’ ways – referring to their psychology background. Some had not thought about their own learning and one noted this whilst commenting they frequently encouraged their dyslexic students to do so.

Some concern was expressed over the ‘complex’ and ‘cumbersome’ nature of the model and it was noted that for those students already struggling with the volume, variety and unfamiliarity of university study this might be too much to expect them to deal with. Similar remarks were made for those on introductory routes into HE. These are part of our institution’s widening participation programme, and comprise relatively short but moderately paced modules with strong tutor support. This complexity would also mean that not all members of any group would choose to commit to the process – unless it was integrated into the module. An alternative approach was offered where the lecturer would be aware of ELLI and use their own understanding to shape their work with their students. They would effectively be responsible for the mediation of the model and its communication to individuals and the group. Within this same group of
comments were those who felt there is already sufficient focus on the student’s own learning built in to their module. Others commented that the paper was dense as a reflection of this complexity. On the other hand, one person who was grappling with the dimensions and what they mean and how they should be viewed felt the paper was too brief.

The mode of support is also identified as an issue. Face-to-face support is assumed within the approach to ELLI. However, there is an increasing pressure to move HE study, at least for some student groups and for some institutions, including my own, to increased online meeting and reduced face-to-face delivery. This provides many challenges to both those teaching and learning. It also requires the model of support for ELLI to be developed. Linked with this a concern was expressed that there was a risk students might not be supported in their reflection by someone with appropriate experience. The suggestion was not that harm would be done, but that the effectiveness of engaging with the tool would be reduced. Another highlighted the risk of students using the model (not the inventory as this is only accessible by arrangement) themselves without support and gaining little or nothing from it. The benefit of this support was expressed well by one lecturer who had made an honest attempt at placing himself on the dimensions of learning and said that the exercise ‘stimulated a lot of internal debate’ that lead to the ‘desire to want to express these thoughts to another individual’.

One respondent suggested that the tool be used if and when students felt they had reached a plateau in their learning in the years following their first year. Others suggested that it was ideal for students as they begin their study.

Subject specific relevance was indicated in relation to the tool sparking a discussion amongst students about how skills and other aspects of sport are learned, and this open discussion would be valuable ahead of personal reflection. With regards to the creativity dimension in particular one commented that different disciplines might like to add their own examples to support this dimension. Another commented that the approach gives a different articulation of exactly what they do to encourage collective composition and improvisation with those attending their music workshops.

Of the fifteen people who committed to develop an activity I have so far received eight outline activities which vary in content and format:

1. Use the seven dimensions of learning power to augment a ‘free write’ exercise which is a stream of consciousness activity that some manage but other students struggle with because they are not familiar with working in this way, or find it difficult to do.

2. Provide students with an outline learning profile as they begin a first year undergraduate environment module. This would take the form of each student receiving a pack of materials based on appendices A, C and D from the draft introduction paper. After an introduction from the tutor the students would consider their learning in the first sections of the module and use this reflection to show where they think they sit on the printed blank profile chart. The tutor would collate these and use the draft document to provide suitable, selected feedback. The intention is to discuss the profiles as a group in a subsequent tutorial and to reflect again on their learning at a later point in the module. The group electronic forum would be a place to allow the discussion to continue.

3. For a first year undergraduate module called ‘Learning through enquiry in primary schools’ the last half hour of the first tutorial – two and a half hours long – will be used to introduce the ELLI dimensions of learning using copies of the appendices as above. The students will be encouraged and supported in using this through their study of the module and their tutor intends to use the four formal assessments as benchmarks.

4. Group 1, a first year undergraduate group studying the Arts. The tutor would send students the rough and ready tool to have an attempt at completing before the tutorial prior to their second formal assessment. This is timely, as this second assessment includes questions that ask students to rewrite part of their first assessment taking into full account of the tutor’s feedback. Students would pair off and discuss each other’s profiles in so far as they are willing. The tutor would bring the students together for a group discussion, and would have the profiles of several fictitious students available for the group to discuss. The tutor has some themes in mind: What they learn from their profile; How they can build on their strengths; How they can tackle the areas where they are not so strong; How the different areas of the profile might link with one another. There would be opportunities at later tutorials to have another attempt at profile charts and discussion.
Group 2, a second year undergraduate Arts group. Here the tutor would send the rough and ready profile for the students to attempt to complete and bring to the first tutorial. Towards the end of this first tutorial they would discuss their profiles and continue in the same way as the group above.

Group 3, a second year undergraduate Arts group studying a different module. This module is unusual as there are no face-to-face tutorials. The tutor would post the rough and ready profile on the module forum and ask students to have a go at completing it during the first week. The students would then be asked if they had any questions or comments and given a couple of days to respond before the tutor posts two or three fictitious profiles and asks for comments before pulling things together using the same list of themes as before. There would be a later request to have a second attempt at the chart with opportunities to discuss.

Group 4, a first year undergraduate group following an introductory route. This module uses regular one-to-one telephone tutorials. The tutor would introduce the idea of the seven dimensions of learning at the end of the first and offer to send a blank chart and details for the student to attempt to complete and give a couple of weeks for them to do this. The tutor would dedicate an additional telephone tutorial to a conversation about the student’s experience of making their profile and discussing the things that it raised for them. They would return to the profile and evaluate where they are now at the end of the module.

5. The tutor would introduce ELLI in the second half of the third tutorial with their group – a first year undergraduate arts group. They would illustrate each of the dimensions with aspects from the module, or invite students to think how they can demonstrate a dimension through the way in which they study the module. The group would then break into twos and threes to discuss these ideas.

6. The tutor would introduce ELLI to the group studying an introductory module that has been working on study skills. The students would be able to discuss the ideas in groups. A second session would be a one-to-one session held some time later where there would be the opportunity to have a more personalised focus to the conversation.

7. The group is a first year undergraduate group and the tutor proposes beginning a discussion about what learning is and the idea of learning power. They would then consider the seven dimensions move to a point where the students would have a go at rating themselves and therefore producing their own profile. They would then be able to discuss these and then consider developing student owned strategies for change.

8. The tutor plans to provide background information to their group of students on an introductory module and invites expressions of interest. About half the group would be expected to have an interest in learning more about Effective Lifelong Learning Inventory. Those that do would be sent a moderated form of the dimensions guidance that they could work on during a tutorial with support from the tutor. They would revisit this towards the end of the module.

Whilst I am waiting for the final reports it seems that the tutor linked to the activities set out in (4.) above has had no response to those studying only accessing things through the online environment. However, the response at a face-to-face tutorial was ‘better than I expected’ with the students finding it of benefit and continuing to refer to it on occasion following.

3. Discussion

Why do we want to encourage students to reflect on their learning? It leads directly from our experience as teachers and researchers. It is also strongly encouraged as the third response to the perceived problems in the field of style research described in Rosenfeld and Rosenfeld, (2011). An individual’s responses to their reflection help themselves, each other and they improve the teacher’s understandings of the ways in which their students learn. However, this is not usually enough for an institution to choose to encourage its staff to adopt a change in approach with its corresponding investment of effort and therefore valuable and increasingly scarce resource into it. The current financial pressures on very many institutions are great enough (at least in the UK) to mean that they are looking to significantly reduce staff numbers, making resources for a development like this less available, but some would argue this makes the need greater. Rosenfeld and Rosenfeld speak of the importance and value of encouraging and using the second-person perspective that focuses on a learner’s proactive reflection on their own learning into work on style. In their
chapter they recognise that some already do this and in addition to their list I would add another example, from my own institution, where a model of learning style developed from the European Language Portfolio is used in order to aid self-reflection and the development of the autonomous learner (Perez Cavana, 2010). A further example is the work using ELLI including the Dispositions to Stay project in the UK (Thompson, 2010) and is expected to be further reported at ELSIN 2011. Ultimately therefore, some hard figures on improved performance, retention and satisfaction would be sought before any decision at an institutional level is likely. This does not contradict Rosenfeld and Rosenfeld’s call for a new paradigm in order to improve the overall health and visibility of research into style but suggests something that might be necessary for a larger number of individual learners to benefit from such research.

I am also interested in people’s response to the fact that there are seven (two pole) dimensions of learning power. Undoubtedly this is a higher number than many people are used to dealing with from their general experience. Initially I tended to be apologetic over this comparatively large number and do appreciate that it leads to the requirement of greater initial effort and more complex graphics. Within the apology I would explain that because the model has been developed empirically this is what factor analysis revealed as the dimensions. Having however worked with this in HE for some time now it seems that for university students, particularly mature ones, and their teachers one dimension is almost invariably high – that of change orientation, sometimes referred to as changing and learning. It is also one that people within this group easily relate to. Most of the effort of reflection therefore is naturally focussed on the other six dimensions which makes things a little more straightforward. This also raises the possibility that for most people the changing and learning dimension might be used as an indicator to show their level of self-confidence. Someone with strongly developed dimensions will have a near circular profile chart but for some this circle can be smaller in radius than for others, and this can be to do with self-confidence. Sometimes an individual will repeat the online inventory at a subsequent date without having made any deliberate interventions and find their profile chart has remained the same shape but is fuller, larger radius. An improvement in their self confidence or in their familiarity with the model may be two of the possible reasons for this.

Something that may also impact on the way we view, or on the relative importance and focus we give to these dimensions stems from the initial findings of the Dispositions to Stay project. Here, the project team reported finding initial correlation with three of the dimensions to students’ success in their first year at university – change orientation, critical curiosity and strategic awareness (Thompson, 2010). Therefore, it may be more effective to introduce individuals to the model in a phased process. Initially introducing them to these three dimensions and facilitating their reflection on these with support to help them define appropriate interventions if they identify this as desirable. Sometimes it is enough to provide the opportunity and framework for supported self-reflection that enables an individual to make more sense of how they approach their study and to make changes. The inclusion of change orientation in this list of three is not at odds with the earlier comment about this dimension nearly always being high in undergraduates, and raises questions about the motivations of any with a weak (or no) belief that HE study will change the way they think, and about the advice and guidance they received in reaching their decision to go to university.

The concern of ensuring a suitably experienced and expert individual provides the support for reflection is noted, and is indeed one of the concerns of the Bristol team as well as of mine. It is important therefore to be clear about the level of familiarity and expertise that is necessary to provide a particular level of support, and this is an area that would benefit from greater focus.

4. Conclusion

Although this research has yet to be concluded, this combination of approaches are providing an encouraging response from those lecturers who directly contact students within my own institution. It is important to stress that I have not made any judgements of the value of the ELLI approach in comparison to any other model. I have used this because it is the one with which I am most familiar and it consistently provides reported benefits to those who engage with it. The comparative complexity of a model that has seven, two pole dimensions does present the issue over the level of familiarisation required before one can fully engage in conversations about profiles. When exploring the use of the tool beyond research activity another issue has to do with the effort and expense required in order to provide staff with the appropriate training to act as mentors. Whilst I am sure this investment does bring benefits to individuals, both students and their teachers, I am not yet able to make a case that at an institutional level this investment will provide tangible returns. The benefits include an extensively trialled framework to promote thinking, self-reflection and discussion.
about approaches to learning that are not fixed. This in turn supports transition into HE and from the Disposition to Stay study referred to earlier may provide an indication on how to succeed in at least the first year of university study.

Results so far suggest there may be value in a phased approach to introducing the ELLI model for undergraduate students both in terms of gradual familiarisation with the framework and in terms of the effort and cost required in providing support. This ramped approach would reduce the effort required by students when they already have much to do, and might lead to an increased proportion of students choosing to engage and potentially gain something of value to them in their study. A phased approach could either attempt to use a more simplified framework at the outset, or focus initially on say the three dimensions that have been highlighted as potentially strong indicators of early success: change orientation, critical curiosity and strategic awareness. At a later point, and this may be a different point for different students, there could be an option to explore the full depth of the model or the other dimensions. This in turn could lead to students having the option to take the full online inventory supported by an expert mentor. It is clear that conversation with others is an important aspect of this model.

Whilst buddy ing was not explored within this study, some of the activity proposals begin to show how this might potentially be taken forward: by pairing where the focus would be on one profile and then the other, or by dividing into groups of three where the third person is an observer. This could take place in face-to-face tutorials, in online forums or telephone and videoconferencing where the tutor could be on hand to provide support.

5. References


Abstract:

Students expect their experience of Higher Education (HE) to deliver personal development facilitated by informal, supportive relationships with staff and peers. Relationships that do not support change impact negatively on success and retention. Good relationships enable students to understand themselves as learners. Peers and mentors are important in facilitating change. How can we encourage supportive relationships and develop students’ confidence/self awareness?

Profile data from the Effective Lifelong Learning Inventory (ELLI) (Deakin Crick et al 2004) was collected from HE students from various institutions/disciplines. Profiles were analysed in relation to retention and success. Qualitative data was drawn from interviews/focus groups with staff and students regarding: experience of ELLI, ELLI dimensions, expectations of HE and its impact. Students who left before completion, who considered leaving but stayed and successful, employed graduates were interviewed about what influenced their progress. Analysis (Thompson, 2010) showed interesting but weak correlations between learning dimensions and retention/success. However a theme of ‘relationships’ emerged. The data was revisited and new interviews and focus groups illuminate this theme. This data was used to support development of best practice with practical resources.

Significant small correlations were found between Critical Curiosity/meaning making and academic success. No significant correlation was found with retention. Good correlations were found between academic success/students’ reason for attending university. Students whose principal motivation is subject interest are more likely to succeed echoing the significance of Critical Curiosity and illuminating a distinction between learners in compulsory settings versus optional settings. Staff and students report ELLI as successful for student engagement and perceive benefit when integrated into the programme where good support and explanation were available. Interim findings were reported (Harding et al 2010).

Another theme, quality of peer and staff relationships experienced by students in relation to their development as learners suggests;

- Students expect change and development
- Relationships not supporting change negatively impact retention and success
- Good relationships enable students to understand themselves as learners
- Peers and mentors are important in facilitating change

The final phase will illuminate these themes with further qualitative data and develop and evaluate resources for developing positive relationships and student self-awareness and confidence. Work continues on a practice-guide for building relationships between staff and students and a manifesto for producing self-aware, critical learners.

The validation of codified knowledge by HE is no longer the predominant need of the global economy or community. Improving value in HE requires delivering personal and professional transition and development. Magolda (1999) describes this transitional as Self Authorship; the learner addresses knowledge (how do I know?), identity (who am I?) and relationships (with others/knowledge/ the world).

John Cowan recently wrote ‘.. if I look after the affective needs of my students then the cognitive needs look after themselves’. New relationships begin with explaining need and developing the resources required but also require leadership and an agenda to overhaul learning experiences in HE. This project begins to address these issues.

Keywords: Student experience, best practice, learning, self reflection, resources

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Inertia and the Learning Journey: Choice, Resources, and the Student Experience

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Abstract

Aim: Students’ ability to make informed choices can be influenced by those resources which are available to them (Schwartz, 2005). The interaction between student and university is enriched by deeper comprehension of choice processes and how resources can be positioned effectively (Foskett and Hemsley-Brown, 2001). Three contrasting degree programmes at the University of Manchester participated in HEARing Student Voices through focus groups and individual interviews and have begun action research concerning: resources available to inform students’ choices, feedback as resources for learning, support students need to understand their university experience (Ertl et al., 2008, Johnston and Watson, 2009) (Hattie and Timperley, 2007). We aim to understand how best to create resources that answers the needs of students and staff, can be flexible enough to be useful for a variety of learning styles and will help trace learning development throughout the student’s time at university. Methodology: Themes were formulated after analysis of data from focus groups and interviews (Blake, 2010). Three sets of focus groups were run: specific degree only, mixed-degree, and specific degree only staff; themes were then drawn using grounded theory (Kitzinger, 1995). From the three distinct themes emerging from the initial qualitative study, specific interventions were developed and will be tested using action research methodology. Results: Findings suggest resources must be mapped and reliable, feedback focus on improvement and students given structured and purposeful support as they develop as learners. The themes found in the study fit into the idea of fixed versus group mindset in learning and suggest different ways to approach this issue (Dweck, 2007). They suggest an optimal place for resources and support to sit is within learning environments of the individual degree programmes. Resources could benefit from being designed with time and place for reflection as a purposeful addition, especially as students and staff both express a need for opportunities to go “beyond the mark” in discussions and planning. Relevance: The student experience is a complex issue, but a key part of that experience is their ability to use and understand resources available to them, the place and purpose of the feedback received,(Hattie and Timperley, 2007) and their ability to understand where they are in terms of personal development and placement in their programme of study (Harvey, 2006). This study indicates a clear and structured programme must be in place which allows students to understand the value of the resources available and enable them to discern what resources are most appropriate for a task. It also touches on the differences found in contrasting curricula and learning environments and how this impacted perceived support. Feedback must be part of a pedagogical plan that allows students to move forward from the mark rather than react to it, able to power the journey through the degree (Elliott and Dweck, 1988). Finally, there must be places in the programme for reflection and assimilation, somewhere for students to pull together what they are learning about their subjects and themselves.

Keywords: Student experience, best practice, resources, self-reflection, learning

1. Introduction

As students make their way through university degree programmes, they are faced with a myriad of choices. Interaction between student and university can be enriched by a deeper comprehension of choice processes and how resources and support can be positioned most effectively (Foskett and Hemsley-Brown, 2001).
Although it has been recognized that students face increasing pressure to exhibit reflective thinking skills, thoughtful decision-making and habits of life-long learners (Gosling, 2003), comparatively little research has been done exploring resources that students use to “navigate” the curriculum and make choices. Although a number of studies have looked into motivation behind the choices students make (Young, 2000, Breen, 1999) relatively few have delved into the process that informs the choices.

It was evident in at least one study that students were taking the path of least resistance in decision-making, and there was little forward-planning (Cochrane and Straker, 2005). This lack of method has further implications because, although “motivation is a hypothetical construct inferred from and indirectly based on an individual’s behaviour” (Curasi & Burkhalter, 2009, p. 4), and students in different disciplines may describe different motivations for their choices (Breen and Lindsay, 2002), understanding the processes used in making informed choices could be of benefit to all disciplines. Universities must understand which resources are most useful for students to reach and aid students most efficiently and to avoid the “paralysis [that] is a consequence of having too many choices.” (Schwartz, 2005). In their literature review of the student experience, Ertl et al. (2008) find that there is a “need to go beyond ‘information transmission’ where students are in passive mode, to involve students actively.” (p. 9). Looking at what resources students use will help maximize the dialogue between staff and students and, hopefully, help feedback and other assessment feel like less of a bureaucratic process and more a part of student learning (Ertl et al., 2008). With this in mind, this study aims to investigate how students navigate choices in disparate degree programmes and how they, and the staff at the university, use and interact with the resources provided for them.

2. Methodology

Much of the methodology of the study was discussed in a previous paper (Blake et al., 2010). The study focused on three contrasting curricula within the University of Manchester with structures which potentially impact differently on student choice: (a) Pharmacy: a highly structured programme with a definite career outcome; (b) BA/BSc Geography: a large honours degree programme with a medium level of structure around a mix of core and optional units with no definite career outcome; and (c) BA English, a relatively unstructured honours degree programme with a wide choice of units and no compulsory final year units other than a dissertation.

Recruitment of student volunteers for the focus groups and individual interviews was done through email recruitment and general information sessions. This method was problematic as the response rate was not high, and it is possible that the participants were self-selecting from strongly motivated students; therefore, an effort was made to discover whether the experiences described by the participants were “typical” experiences in the degree programme. Where response rates for the focus groups were especially low, further individual interviews were scheduled in an effort to get a better picture of the degree programme. The decision to add interviews in addition to the focus group was taken in order to triangulate the data that had previously been gathered and to ensure saturation of themes. It was felt that the in-depth nature of the interviews might allow for deeper understanding of the context of the data.

After the recruitment process, the first focus groups of students were formed in curricula groups. A summary of participant numbers is included as Table 1. There was a disparity between disciplines in recruitment with lower participation from English Literature. It is possible that the difficulty in recruitment stems partly from the amorphous and relatively unstructured nature of the English degree programme. As there are no required units or entire-year meetings recruitment information sessions were done by visiting individual units so the whole year group may not have been aware of the opportunity. For the second set of focus groups new participants were recruited and mixed focus groups covering the three disciplines were set up with the hypothesis that giving the participants an opportunity to compare experiences would allow for more general discussion on resources necessary for all students, instead of discipline specific issues. It was hoped that the discussion between disciplines would highlight any differences in the definitions of informed choice and feedback and elicit further community definitions and realities. Enough students were recruited to run two mixed discipline focus groups. Again, it was most difficult to recruit from the English degree programme, and it was decided that additional individual interviews would be sought to attempt to balance the data.
Finally, academic staff in the selected degree programmes were recruited for discipline-specific staff-only focus groups. These groups were comprised of lecturers, research staff, and a small number of post-doctoral academics. These focus groups met only once and additional questions were added in order to elicit staff perception of student opinion. Recruitment and availability varied, but we were able to recruit at least six staff members for each focus group.

3. Data Analysis and Themes

These themes were formulated after analysis of the data gathered in the focus groups and interviews. The data was analyzed with an emphasis on grounded theory and placed in a social-constructivist context. Many of the themes echo the fixed and growth theories of intelligence discussed by Carol Dweck and others. These theories project models that describe a difference between entity and incremental theories (which describe the beliefs that intelligence/skills are either an “entity” and unable to be changed or able to be “incrementally” improved with work and practice) and the more recent iterations of these theories that emphasize the growth (incremental) or fixed (entity) “mindset” (Dweck, 2000, Dweck, 2007). Many of the issues discussed by students and staff centre around the fact that the resources that are provided (or the way they are used) promote a fixed mindset with a focus on the marks (implying that there is a fixed and unchangeable description of a skill or effort, instead of encouraging growth). This continues on with the issues of self-awareness as the fixed mindset brings with it an increased inclination to compartmentalize and avoid self-reflection (as there is no assumption of growth). It even impacts choice because, to those with a fixed mindset, choices are often fraught with possibilities of failure (or admittance of issues), and those with a fixed mindset will often ignore choices that would create the possibility of failure (Dweck, 2007). Mindset is not a constant personality trait; rather, it is dependent on the surrounding circumstances and can be heavily influenced by the situation and resources surrounding it. Dweck and others have demonstrated that it is possible to point people at a particular mindset with as little as a journal article (Blackwell et al., 2007). This instability in the mindset echoes what we have found in the study; students will often decide that no
improvements can be made if the resources to do so are inaccessible or unclear—whether or not this is actually the case.

3.1 No Map and a Broken Compass: Students’ ability to use resources to navigate university

Although much attention has been paid to the path students may take as they transition to university education, once students set foot on this path, many of the support systems in place for the transition fall away under the assumption that the moment they were necessary has passed (Harvey, 2006). As this study progressed, a pattern emerged where it appeared that, though students do not want a proscribed map of their university experience, they do need a way to figure out where they are and where they want to go in respect to their programmes, their modules, and their place in the larger university. When asked to list resources available to them for choice, most of the resources they named fit into four “compass points” that operate inside their particular learning environments: the staff/student relationship, student maturity/confidence, personal experiences/social networks, and communication/reading between the lines (figure1). Although students listed a number of resources when asked, there was little reporting of consistent use of any resources outside of personal experience/social networks. It should be emphasized that students reported attempting to use other resources, but, for a variety of reasons, were unable to use them effectively:

“My [second year academic advisor]...he didn’t know anything about me..so it was just a waste of time” (Mixed focus group, Geography, ln 153)

Students are relying on non-university and casual resources, not necessarily because that resource is best for making an informed decision, but because it is more consistently available. This leads to a lack of knowledge about the goals and options available and interferes with students feeling a part of a degree programme. A sense of isolation and lack of understanding of a wider picture, both individual and academic, was an ongoing theme throughout the study, with one student stating:

“No one’s ever said, ‘Look, here’s the underlying structure of what we want to give you, this is why we’re doing all of this...’ that’s never happened” (English Focus Group 1, ln 32)

This lack of orientation, both institutionally and in the student response to their courses, makes further choices both anxiety-producing and more difficult. Some difficulty can be linked to the idea of a paradox of choice (as defined by Schwartz). With so many resources to choose from, choosing which resources to use to answer the question becomes a quandary separate from the informed choice itself. If one resource, for example academic advisors, fails even a few times, it is unlikely to be taken up again, whether or not it would be the best resource for a future choice. With the myriad of university-created resources useful only inconsistently, students face choices that require an ability to assign values to and make judgments on the utility of everything provided without a compass to indicate which would be the best way to go.

“I think sometimes you’re um...maybe bombarded with too much information.” (Mixed Focus Group 1, Geography, ln 29)

In this case, the avalanche of available information, and the lack of any reliable points on the compass outside the student’s own experiences, leaves them adrift. Without a map to help them navigate the resources and criteria to create a hierarchy to understand both the choice they are making and the resources they might use, students’ abilities to make informed choices suffer. The overabundance of resources further exacerbates the students’ lack of orientation within the university itself, with frequent references to not knowing where to go for help or struggling to find an appropriate place to put resources in context:

“Other than [friends], I think I’d be struggling, really, to work out what’s good and what’s not.” (Rebecca, English Interview, ln 60)

“You’ve got to email about ten different people to get something.” (Mixed Focus Group 2, Pharmacy, ln 28)

The students’ struggles to find appropriate ways to navigate university resources (and reliance on a different point of their compass, the more casual personal experience/social networks), has wider implications, as the fact that students are unable to use (or are discounting) the other resources they listed as possibilities on their
compass indicates that their resources, and thus their choices, are being limited in possibly subtle ways. As students are not able for whatever reason to really utilize university resources effectively, they have to spend time searching for what they need to learn instead of learning from it.

There is a real struggle to create a hierarchy of resources, and the proliferation of information can often be detrimental to a student’s understanding of a choice and its ramifications. This disorientation follows through to feedback and the student experience. In a similar way to not understanding how to orient themselves to make a choice, students indicate that they often do not understand how feedback, in whatever form, indicates their “location” on a continuum of learning. Because students have no idea where they are, they struggle to understand both where they need to end up as a final goal and the route required. Effectively, this places them in a fixed growth mindset, where any feedback is a judgment on a past project and gives no indication of possibilities for growth. This, in turn, discourages students’ engagement with the resource. Because success or failure is a judgment on a fixed (or entity) intelligence, any chance of failure must either be assiduously avoided (to the point that remedial help will be refused as it will merely highlight the lack) or dismissed in some other way in order to be dealt with by the learner (Dweck, 2007).

In comparison, the growth mindset, which is linked with the increment theory of intelligence, focuses on improvement through practice and effort. This mindset would be encouraged with feedback that clearly directs students to a next step and implies a road for improvement. With the growth mindset, each experience is treated as a step in a larger journey (to some extent) and there is a conviction that there can always be improvement with enough effort. This issue leads us to our second set of themes to come out of the research: feedback as part of the impetus for learning and growth. If the map and compass are the path of the student journey, feedback is one of the ways that journey is powered.

3.2 Feedback: a fuel for the engine of the learning environment

Feedback is often treated as a perpetual motion machine and handed back with the assumption that it will automatically influence future work. However, though both students and staff could identify various forms of feedback:

“…constructive criticism on what… on something that you’ve produced…” (Amy, Geography Interview, ln 76)

“…a piece of paper giving you a mark and a few comments.” (Dani, English Interview, ln 157)

“I always think of exams and it’s like an evaluation of your performance in exams.” (Geography, Focus Group, ln 152)

it was significantly more difficult for students to identify times when feedback had been used to improve and change habits or work (and thus trigger a growth mindset). Attempting to move feedback beyond the mark is not new to research in higher education, with Hattie and Timperley stating that it must answer three major questions: “Where am I going? (What are the goals?), How am I going? (What progress is being made toward the goal?), and Where to next? (What activities need to be undertaken to make better progress?)” (Hattie and Timperley, 2007p.86) However, although this model may be an eventual goal for feedback, the reality is feedback, far from acting as its own impetus, often acts as a wrapping up of a task. To be most effective, feedback must instead be a part of the learning environment itself, and it must be clearly delineated as part of a process that ensures its integration into the learning process as a whole.

Although students in all three disciplines defined feedback in similar ways, the level of comfort with feedback and the reported efficacy of feedback changed depending on how clearly it was integrated into a wider learning cycle. When feedback is typically dependent on a written criticism, with no clear next step, it stalls.

"Yeah it would be nice if someone could remember my essay when I go and talk to them about it. I don't blame them personally because I know they're underpaid... Too many essays to mark. It's the system that needs to be sorted, so they can actually say, 'Oh yeah I do remember your essay, let me talk to you about it.'" (English, Focus Group, ln 250)
“One of the things about feedback on particular... modules is I’m never totally certain our students see... our modules as having connection to other... modules that they do. So they get a mark on that, that’s their mark on that, and they go on to the next thing and they write their essay, and there... there’s no... real... sense of development. I very rarely get students say “Oh, we... I was reading this for x and it informs here...”” (English, Staff, Focus Group, ln 290)

The feedback exists only as a discrete element of one module; it cannot power a student beyond where they currently are in their learning. Defining feedback around the mark forces it to face backwards to the work that has already completed instead of towards future work. Here again is the prevalence of the fixed mindset with the emphasis on marks as the “important” part of feedback. In this case the mark (or judgment) becomes the focus and labels the paper/task as success or failure. There is no assumption of growth, nor any focus on the possibility of change.

“Yeah... thing is, I... Like, that module I got feedback from. But we don’t have the module again – can’t really use it.” (Hiba, Pharmacy Interview, ln 219)

“I think you have to justify your mark – that’s the first... I mean my written feedback is... the first thing is to justify the mark.” (Geography, Staff, Focus Group, ln 168)

The ability of the students to grow as learners is impeded by the difficulty in using the feedback received as a tool for change. There is no answer to the question of “what to do next?”. This difficulty can be smoothed with a solid system where feedback is not received as a justification for the mark, but where it is assumed that the feedback will be revisited and used in some fashion.

“...there’s no point in receiving feedback if it doesn’t include, if it doesn’t help you to do it better the next time. So if it doesn’t help you to better yourself then it’s not really feedback.” (Geography, Focus Group, ln 162)

As the students become confident that the feedback will provide direction and a clear process, it stops being a justification and becomes an instrument for change. The assumption that the feedback’s purpose is to set forth specific next steps, to be used as a “how to” for the next pieces of work, changes the way it interacts with the learning process. Instead of representing a fixed point, it operates as a cog in a complicated machine, pushing the student to the next step in the learning process. This is not a new pedagogical concept, and incorporating feedback as an instructional tool makes “the process itself takes on the forms of new instruction, rather than informing the student solely about correctness” (Kulhavy, 1977p.212). It is important to note that, though written feedback can be modified in such a way as to provide these next steps, the most valuable resource, as reported by the students, was the opportunity and expectation of one-on-one conversation with staff. These conversations seemed most effective when at least some of them were purposefully scheduled and integrated into a wider learning plan. As students and staff learned to value the conversations, an open door policy becomes even more powerful and more casual contact between staff and students can lead to stronger relationships. It is in this relationship that another element of the student experience appears: the student’s own growth and development as a learner.

3.3 The Self-Portrait: students' understanding of themselves

A final part of the students’ journeys is their sense of self, their ability to navigate the path they have chosen, and their understanding of the resources and choices available to them. This sense of self, the awareness of strengths and weaknesses, is much like an artist’s self-portrait. Often painted using a mirror, the portrait becomes a reversed representation of reality. Students, like those artists, seeking to understand who they may be as learners, may not create an accurate picture if working alone. The first issue with the students’ self-portraits is the sense of isolation many of them feel in their degree programmes, an issue that touches staff as well:

“Yeah, we don’t really get... It would be possible to do the whole... go through the whole semester, and no one would have a clue whether you were doing well, or anything. You could go through the whole semester and not... know anything at the end of it.” (Mixed Focus Group 1, Pharmacy. Ln 400)
“You can just feel completely anonymous.” (English, Focus Group, ln 154)

“There are so many of them... and it’s so anonymous, that I think it does create anxiety, and I think it creates... a... sort of short temper. And we, on the other hand, don’t get to know them very well either, and I think that doesn’t help. So, exactly, having a space, and having a kind of identity to the department.” (English, Staff Focus Group, ln 399)

This sense of anonymity and isolation pushes the students away from the resources provided by the university and, in the end, limits their ability to make informed choices, reflect on what they learn, and understand their strengths and weaknesses. If a student feels merely one of many, lost in the crowd, they are unlikely to reach out to the resources available in their programme and often feel there must be some sort of pressing problem or specific issue that would permit them to use academic resources.

“It feels like you need to go with something to discuss.” (English, Focus Group, ln 147)

“You don’t want to be bugging [the staff] too much.” (Mixed Focus Group 2, Pharmacy, ln 70)

However, although they feel anonymous and hesitant, students excuse academic advisors and other staff as being too busy to be able to know students individually.

“I know it’s much too big [for someone to know each student]; there are too many people at university.” (English, Focus Group, ln 156)

This assumption, that it is normal to feel disconnected and divorced from the degree programme, powers a cycle where students view the staff as a resource they are not really meant to use, or one they should only use in extremis. This further highlights the connections to the fixed mindset as that brings with it a higher inclination to avoid self-reflection or seek help (as there is thought to be no chance for growth). With this mindset, there is little reward for understanding where improvements might be made, as there is an assumption that those improvements would have little effect (or possibly detrimental ones) on results. It would seem futile to attempt what can possibly lead to failure. This can be mitigated by a clear and structured system where students feel they are expected to use resources available, where those resources are deliberately set-up to be easily accessed and where access is an integral part of the pedagogy of the degree. In this case, the resources become a support instead of an opportunity for failure.

"oh yeah so, at the moment I do feel that I can sort of make a choice about where I want to go in life, as well as post graduate study as well at the moment because there are so many different people you can talk to because you've got all different information coming in and then obviously it's up to yourself to make the choice " (Geography, Focus Group, ln 18)

Although the resources must be integrated into the system, the students were adamant that they be allowed to find a balance between structured requirements and personal responsibility. This is the thin line that the pedagogical structure must tread, one that allows for personal choice and responsibility but continues to assist students with gaining an understanding of what is available and establishing a system of values that they can learn to apply beyond their degree programme.

“But, I think, like, the more you put in yourself, the more you get out of it.” (Mixed Focus Group 1, Geography, ln 412)

“It’s striking a balance between sort of still doing our own things rather than spoon feeding.” (Pharmacy, Focus Group 1, ln 166)

This fine balance between responsibility and requirement, between choosing the path through the degree and being shown which paths are possible, should inform any development plan. While they may have the map the resources provide, and the push from the feedback, it is this final cog, the sense of where they are in the programme and where they could go next, that has the potential to powerfully impact the student experience. Once students are aware of where they can go, what they can use to get there, and how to plan the rest of the journey, they are able to make informed decisions about where to go next.
“But I think…we have a lot…the resources we have are quite good. It’s just knowing what we actually need to find. So again it falls back onto the weaknesses and strengths in your own resources, so once you know what your weaknesses are you have pretty much most of the resources to go yourself and dig in.” (Geography, Focus Group, In 100)

4. Limitations/Strengths

Because this study focuses on focus groups and individual interviews, it has necessarily been limited in numbers of participants. The recruitment process required students and staff to volunteer to participate, leading to the possibility that those taking part in the study may not represent the views of their degree programmes. Finally, though efforts have been made to run focus groups at Northumbria and Keele University, the data drawn currently focuses on University of Manchester staff and students.

An unexpected strength of this study came from the commitment of participating students and staff. There was a high level of engagement evident in the discussions on feedback and resources and both students and staff expressed satisfaction at being given a chance to discuss wider university issues and contribute to a greater understanding of the student experience.

5. Conclusion

The student experience is a complex and interwoven issue, but a key part of that experience is their ability to use and understand the resources available to them, the place and purpose of the feedback they receive, and their ability to understand where they are in terms of personal development and placement in their programme of study. The interconnectedness of these issues places them alongside the entity and increment theories of intelligence. A clear and structured programme must be in place that allows students to understand the value of the resources available to them and to enable them to discern what resources are most appropriate for the tasks at hand. Although there are a myriad of resources available, the focus must instead be on making resources consistently accessible and clearly useful. Resources which are inaccessible are rapidly dismissed, whether or not they are most appropriate for the task at hand.

There is a definite level of anxiety around one resource in particular, feedback. Feedback must be part of a pedagogical plan that allows students to move forward from the mark rather than react to it, able to power the journey through the degree. This is different than using feedback to explain or justify a mark and represents a necessary change of focus from what happened in the past to what must change for the future. Finally, there must be a place in the programme for reflection and assimilation, a specific place for the students to put together what they are learning about their subjects and themselves. The opportunity to assimilate and discuss what has been learned, and to plan a path forward, can help ensure that chances, and resources, are not being neglected because of a lack of understanding and that growth and a growth mindset are an integral part of the university experience. No matter the size, focus, or goals of the programme, the students should feel an integral and valuable part of it, known, appreciated, and able to contribute.

6. References


The Development of Learning Strategies in Higher Education: A Multi-Level Study

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Abstract

During the last twenty years, there has been an increasing interest in the development of learning strategies in higher education (Baeten, Kyndt, Struyven, & Dochy, 2010). Results show that learning strategies are susceptible to change and that students predominantly evolve towards a deeper and more self-regulated way of learning. However, some learning strategies, such as stepwise processing and external regulation, have proven to be resilient to change (Vanthournout, Donche, Gijbels, & Van Petegem, 2010).

A common criticism on most of the research is the short duration and the limited number of data-gathering moments (Vanthournout, Donche, Gijbels, & Van Petegem, 2009). The present study therefore aims at investigating the developments in learning strategies across a period of two years, using 4 data-gathering moments. The study poses the following research questions:

RQ1: How do learning strategies evolve throughout the first two years of higher education?

RQ2: Can these evolutions best be labelled as random, linear or curvilinear?

RQ3: To what degree are these evolutions individually different?

Students were questioned on their learning strategies using the K-ILS (Donche & Van Petegem, 2008) at four measurement times throughout the first two years of higher education (N1=571; N2= 332; N3=179; N4=185 ). To answer the research questions a multi-level analysis was conducted. Multiple observations of learning strategies were nested within persons. Data-gathering moments (RQ1-RQ3) was incorporated in the model as predictor. Differences in log-likelihood were use to estimate whether more complex models fitted the data better.

A homogeneous linear growth was observed for relating and structuring. No systematic changes were found for critical processing and analyzing. For memorising a quadratic evolution described the data best. The use of memorising as a strategy decreased throughout the first year, remained stable during the summer holidays but increased slightly in the second year. The model in which individual differences where incorporated, proved marginally significantly better. A linear growth was found for self-regulation. When individual differences were taken into account, the model marginally significantly improved. Students significantly decreased in their reliance on external regulation. This evolution was found to be linear. The model in which individual differences was incorporated was found to be significantly better. Generally scores on external regulation, were ‘fanning out’. Finally, scores in lack of regulation decrease linearly. The model with individual differences was found to be marginally significantly better.

This study investigates evolutions in learning strategies across multiple data-gathering moments and across a longer period of time. It demonstrates the complexity of these evolutions and thereby adds to a more thorough understanding of learning in higher education.

Keywords: Learning strategies, longitudinal, higher education

References


Changes in BSc Business Administration & Psychology Students’ Learning Styles over One, Two and Three Years of Study: a Longitudinal Study

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Abstract

Longitudinal studies on changes in the learning styles of university students are scarce, and knowledge on the possible socialisation effects of studying a particular discipline on the styles of students is limited. This study aims to add to the existing knowledge within Sternberg’s theory of mental self-government (Sternberg, 1997) by studying the changes in learning styles of three year groups of students admitted to the same study programme, across one, two and three years of study respectively. The learning styles of three year groups of BSc Business Administration & Psychology students were measured using the Danish Self-Assessment Learning Styles Inventory (Nielsen, 2005a; Nielsen & Kreiner, 2005; Nielsen et al., 2007) at two time points; upon admittance in 2007, 2008 or 2009 (t1) and again in 2010, that is one, two or three years into the study programme (t2). At t1, 372 students, or 95% of admitted students, completed the D-SA-LSI. At t2, the test completion rates were 31% (after one year), 43% (after two years) and 42% (after three years) of the students tested at t1. In order to determine the generalisability of the findings, the learning style scores at t1 for the participants in the present longitudinal study and the non-participants were compared employing Student’s independent samples t-test, followed by the Benjamini-Hochberg (1995) procedure to control for false detection rate due to multiple testing. The hypotheses of change were tested employing the paired sample t-test. To ascertain whether the changes in learning style scores for the three year groups were of equal size, tests of hypotheses of equality were conducted, and when appropriate common estimates of change were calculated.

Three learning styles had changed significantly for all three year groups: the Judicial learning style decreased significantly for the group tested after one year of study, while it increased significantly and equally for the groups tested after two and three years of study. The Hierarchic learning style decreased significantly for all three year groups, with the biggest and equal decrease for the groups tested after one and two years of study. The Oligarchic learning style decreased significantly for all three year groups, with the biggest and equal decrease for the groups tested after one and three years of study. Two learning styles had changed significantly only for a single year group of students: the Legislative learning style increased significantly only for the group tested after three years of study. The Global learning style decreased significantly only for the group tested after one year of study. The findings have specific value for the involved university, but also hold value for other universities with similar study programmes. The findings might be utilised on a general level in the design and execution of courses, and for evaluating if changes in the students’ learning styles correspond with the objectives of such programmes. In particular, the changes found in the Judicial and the Global learning styles provide useful knowledge, since the decreases across the first year of study replicates Nielsen’s (2005b) results for year groups of Sociology and Educational Psychology students.

Key words: MSG learning styles, change, higher education

1. Introduction

Longitudinal studies on changes in the learning styles of university students are scarce, and accordingly knowledge on the possible socialisation effects of studying a particular discipline on the styles of students is limited (Nielsen, 2005b, 2009). International research has been concentrated within Vermunt’s theory of learning styles (1992, 1998), and as such this research is to some extent comparable. Vermetten, Vermunt and Lodewijks (1999) found an increase in university students’ use of strategies indicative of a meaning-directed learning style, from the end of the first to the end of the third term, but found no changes in the students’ use of strategies representing a reproduction-directed learning style. Schatteman et al (1997) found changes in learning styles from the start of the first academic year to the end of the first semester for both an
experimental group and a control group of students of various majors: however, the changes for the two groups differed. Busato et al (1998) found no changes in the learning styles of Dutch university students from their first to their second year of study, but a significant increase in the meaning-directed learning style from the second to the third year of study. Recent work by another Dutch research group reports similar findings: Donche and Van Petegem (2009) found that the learning patterns of pre-service teacher students over the course of a three-year teacher education programme are subject to changes, and some learning styles more than others. Specifically, the meaning-directed learning style increased over the three years, and the un-directed learning style decreased. Delvaux, Donche and Van Petegem (2010) reported changes in all four Vermunt learning styles with family science students across their first year of study.

There are only few longitudinal studies on learning styles of higher education students within other theoretical learning style frameworks. Within Kolb’s (1984) theory of experiential learning, Pinto, Geiger and Boyle (1994) found some changes in the learning styles of business students from their first semester to their fifth. Rakozy & Money (1995) found no changes in the learning styles of nursing students from the first to the second and third years of study. Salter, Evans and Forney (2006) found some changes in the learning styles of graduate administration students from the start of their first year of study to the end of their second year of study. Developing a new framework, Dippelhofer-Stiem (1989) found that Austrian, German and Dutch university students showed significant linear increases on a research-oriented learning style through the first, fifth and ninth term. Yugoslavian university students, however, showed no changes, and already at the first semester they showed the level of research-oriented learning style reached at the ninth semester by the three other groups of students. Within Sternberg’s (1997) theory of mental self-government, Nielsen (2005b) found changes in the learning styles of university students dependent on study discipline and the initial level of the learning styles from the start of the study programmes to one year later1 - this is the only previous longitudinal study within the Danish university context. The present study aims to add to the existing knowledge on changes in students’ learning styles within Sternberg’s theory of mental self-government (Sternberg, 1988, 1997) by studying the changes in learning styles of three year groups of students admitted to the same study programme, across one, two and three years of study respectively.

2. Methods

2.1. Participants and Instruments

The learning styles of three year groups of BSc Business Administration & Psychology students (BSc BA. Psych.) were measured using the Danish Self-Assessment Learning Styles Inventory (D-SA-LSI, Nielsen, 2005a, 2005b; Nielsen & Kreiner, 2005; Nielsen et al., 2007) at two time points: upon admittance in 2007, 2008 or 2009 (t1) and again in 2010 (t2), that is one, two or three years into the study programme. At t1, 372 students completed the D-SA-LSI. At t2, the test completion rates were 31% (after one year), 43% (after two years) and 42% (after three years) of the students tested at t1. The resulting t1-sample comprises 95% of the admitted students, and the t2-sample comprises 38% of the t1-sample (Table 1).

Both the t1-sample and the t2-sample were homogeneous with regard to gender and age within and between the three year groups. In the t1-sample, 63% of the participants were female, while the age range was 18-45 years with a mean age of 21.6 years.

At t1, the D-SA-LSI (Nielsen, 2005a, 2005b; Nielsen & Kreiner, 2005; Nielsen et al., 2007) was administered in a paper-pencil version to the 2007 and 2008 year groups and in a computer-based version to the 2009 year group, using otherwise identical procedures. At t2, the D-SA-LSI was administered in a computer-based version to all three year groups simultaneously, using identical procedures. The two versions of the D-SA-LSI are psychometrically comparable.

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1 Due to an equation error Tables 5 and 6 are not correct. Nielsen, Karpatschof & Kreiner (2007) gives the correct equation.
Table 1: The sample broken down on year groups

<table>
<thead>
<tr>
<th>Participants</th>
<th>Year groups</th>
<th>All students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted students</td>
<td>2007 127</td>
<td>2008 131</td>
</tr>
<tr>
<td>Students tested with D-SA-LSI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at t1 in 2007, 2008 and 2009</td>
<td>(98%) 124</td>
<td>(100%) 131</td>
</tr>
<tr>
<td>(% of admitted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t1-sample: students agreeing to test used for research</td>
<td>117 (92%)</td>
<td>127 (97%)</td>
</tr>
<tr>
<td>(% of admitted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(% of tested at t1)</td>
<td>(94%) 117</td>
<td>(97%) 127</td>
</tr>
<tr>
<td>t2-sample: students tested with D-SA-LSI at t2 in 2010</td>
<td>49 (39%)</td>
<td>54 (41%)</td>
</tr>
<tr>
<td>(% of admitted)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(% of t1-sample)</td>
<td>(42%) 49</td>
<td>(43%) 54</td>
</tr>
</tbody>
</table>

Both the t1-sample and the t2-sample were homogeneous with regard to gender and age within and between the three year groups. In the t1-sample, 63% of the participants were female, while the age range was 18-45 years with a mean age of 21.6 years.

At t1, the D-SA-LSI (Nielsen, 2005a, 2005b; Nielsen & Kreiner, 2005; Nielsen et al., 2007) was administered in a paper-pencil version to the 2007 and 2008 year groups and in a computer-based version to the 2009 year group, using otherwise identical procedures. At t2, the D-SA-LSI was administered in a computer-based version to all three year groups simultaneously, using identical procedures. The two versions of the D-SA-LSI are psychometrically comparable.

The D-SA-LSI is a Danish adaptation of Sternberg’s (1997) Thinking Styles Inventory (TSI) measuring learning styles within the theory of mental self-governance. The D-SA-LSI is a self-report inventory and consists of 98 statements, with seven statements for each learning styles scales. The statements are rated according to how well they describe participants in learning situations in the context of their university study, using a polytomous answering scale with 1 corresponding to “not at all” and seven corresponding to “extremely well”. Item analysis by graphical loglinear Rasch models (Kreiner & Christensen, 2002) showed all 14 scales to be functioning adequately, with seven scales fitting the Rasch model and seven scales fitting the graphical loglinear Rasch model, and with reliabilities for the single scales ranging from .55 to .91 (Nielsen & Kreiner, 2005). The reliabilities of the Danish language version of the D-SA-LSI are comparable to the reliabilities for a Norwegian language version (Nielsen & Ytterstad, unpublished work), the reliabilities for a Chinese short version of the TSI (Zhang, 2002a, 2002b), and the reliabilities for an earlier version of the TSI (Sternberg, 1994).

2.2. Analysis

Though participation rates in the three year groups of students were very high at t1; 92% in the 2007 year group, 97% in the 2008 year group, and 95% in the 2009 year group, the participation rates (% of participants at t1) at t2 were relatively low; 42% in the 2007 group (after 3 years of study), 43% in the 2008 year group (after two year of study), and 31% in the 2009 year group (after one year of study). Accordingly, to determine the generalisability of findings, the learning style scores at t1 of the participants in the present longitudinal study and the non-participants were compared employing Student’s independent samples t-test. The comparisons were conducted for the total sample as well as stratified by year group, gender and age. This conventional analysis was followed by the Benjamini-Hochberg procedure (Benjamini & Hochberg, 1995) to control for false detection rate due to multiple testing.
The hypotheses of change (from t1 to t2) were tested employing the paired sample t-test. Additionally, for the purpose of ascertaining whether the mean changes in learning style scores for the three year groups were equal or different, tests of hypotheses of equality were conducted when a significant mean change was found for at least one year group. In cases where the hypothesis of equality of the mean changes was accepted, a common estimate was calculated and tested for significance using a z-test.

3. Results

3.1. Descriptives

Means and standard deviations of the 14 learning styles scales at t1 and t2 for the three year groups of participants are presented in Tables 2, 3 and 4.

Table 2: 2009 year group: means and standard deviations of the learning styles at t1 and t2 (N = 40)

<table>
<thead>
<tr>
<th>Learning styles</th>
<th>t1 (year of admittance)</th>
<th>t2 (one year into study)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Legislative</td>
<td>33.57</td>
<td>5.71</td>
</tr>
<tr>
<td>Executive</td>
<td>36.58</td>
<td>6.91</td>
</tr>
<tr>
<td>Judicial</td>
<td>32.73</td>
<td>5.32</td>
</tr>
<tr>
<td>Monarchic</td>
<td>24.68</td>
<td>5.14</td>
</tr>
<tr>
<td>Hierarchic</td>
<td>35.53</td>
<td>5.11</td>
</tr>
<tr>
<td>Oligarchic</td>
<td>21.03</td>
<td>5.11</td>
</tr>
<tr>
<td>Anarchic</td>
<td>31.58</td>
<td>5.17</td>
</tr>
<tr>
<td>Democratic</td>
<td>33.55</td>
<td>7.05</td>
</tr>
<tr>
<td>Global</td>
<td>29.70</td>
<td>5.11</td>
</tr>
<tr>
<td>Local</td>
<td>28.54</td>
<td>4.95</td>
</tr>
<tr>
<td>Internal</td>
<td>28.36</td>
<td>8.20</td>
</tr>
<tr>
<td>External</td>
<td>36.49</td>
<td>7.05</td>
</tr>
<tr>
<td>Progressive</td>
<td>35.62</td>
<td>7.62</td>
</tr>
<tr>
<td>Conservative</td>
<td>30.05</td>
<td>7.50</td>
</tr>
</tbody>
</table>

Table 3: 2008 year group: means and standard deviations of the learning styles at t1 and t2 (N = 54)

<table>
<thead>
<tr>
<th>Learning styles</th>
<th>t1 (year of admittance)</th>
<th>t2 (two years into study)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Legislative</td>
<td>34.54</td>
<td>5.46</td>
</tr>
<tr>
<td>Executive</td>
<td>35.17</td>
<td>7.51</td>
</tr>
<tr>
<td>Judicial</td>
<td>31.20</td>
<td>6.04</td>
</tr>
<tr>
<td>Monarchic</td>
<td>24.39</td>
<td>5.45</td>
</tr>
<tr>
<td>Hierarchic</td>
<td>35.70</td>
<td>6.40</td>
</tr>
<tr>
<td>Oligarchic</td>
<td>19.75</td>
<td>5.30</td>
</tr>
<tr>
<td>Anarchic</td>
<td>31.70</td>
<td>6.75</td>
</tr>
<tr>
<td>Democratic</td>
<td>31.74</td>
<td>5.96</td>
</tr>
<tr>
<td>Global</td>
<td>30.17</td>
<td>6.45</td>
</tr>
<tr>
<td>Local</td>
<td>26.30</td>
<td>4.76</td>
</tr>
<tr>
<td>Internal</td>
<td>26.51</td>
<td>6.68</td>
</tr>
<tr>
<td>External</td>
<td>37.02</td>
<td>5.83</td>
</tr>
<tr>
<td>Progressive</td>
<td>36.54</td>
<td>7.51</td>
</tr>
<tr>
<td>Conservative</td>
<td>26.71</td>
<td>6.88</td>
</tr>
</tbody>
</table>
Table 4: 2007 year group: means and standard deviations of the learning styles at t1 and t2 (N = 47)

<table>
<thead>
<tr>
<th>Learning styles</th>
<th>t1 (year of admittance)</th>
<th>t2 (three years into study)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Legislative</td>
<td>33.49</td>
<td>6.41</td>
</tr>
<tr>
<td>Executive</td>
<td>34.34</td>
<td>6.48</td>
</tr>
<tr>
<td>Judicial</td>
<td>31.98</td>
<td>5.95</td>
</tr>
<tr>
<td>Monarchic</td>
<td>23.24</td>
<td>6.43</td>
</tr>
<tr>
<td>Hierarchic</td>
<td>34.73</td>
<td>5.84</td>
</tr>
<tr>
<td>Oligarchic</td>
<td>20.56</td>
<td>4.90</td>
</tr>
<tr>
<td>Anarchic</td>
<td>31.96</td>
<td>5.68</td>
</tr>
<tr>
<td>Democratic</td>
<td>33.40</td>
<td>6.76</td>
</tr>
<tr>
<td>Global</td>
<td>30.00</td>
<td>7.39</td>
</tr>
<tr>
<td>Local</td>
<td>24.77</td>
<td>6.49</td>
</tr>
<tr>
<td>Internal</td>
<td>26.18</td>
<td>7.10</td>
</tr>
<tr>
<td>External</td>
<td>37.52</td>
<td>5.83</td>
</tr>
<tr>
<td>Progressive</td>
<td>35.64</td>
<td>7.52</td>
</tr>
<tr>
<td>Conservative</td>
<td>25.66</td>
<td>7.58</td>
</tr>
</tbody>
</table>

3.2. Changes in learning styles

Using conventional test procedures, no significant changes were found in the Executive, Monarchic, Anarchic, Democratic, Local, Internal, External, Progressive or Conservative learning style scores after one, two or three years of study, while significant changes in the scores on five learning style scores from t1 to t2 were found for the three year groups (Table 5).

After three years of study, there was a significant increase in the Legislative learning style scores (mean diff 1.96, p < .05). No significant changes were found in the Legislative learning style scores after one or two years of study (2009 and 2008 year groups).

Significant changes in the Judicial learning style scores were found for all the year groups. After one year of study, there was a significant decrease in the Judicial learning style score (mean diff -2.40, p < .05). After two and three years of study, there were significant increases in the Judicial learning style scores (mean diff 2.24, p < .05 and mean diff 2.72, p < .01).

Significant decreases in the Hierarchic learning style scores were found for all year groups. After one year of study, the decrease in the Hierarchic learning style scores was 5.80 points (p < .01), after two years of study 6.20 points (p < .01), and after three years of study 4.84 points (p < .01).

Significant decreases in the Oligarchic learning style scores were found for all year groups. After one year of study, the decrease in the Oligarchic learning style scores was 2.78 points (p < .01), after two years of study 1.77 points (p < .05), and after three years of study 3.38 points (p < .01).

After one year of study, there was a significant decrease in the Global learning style scores (mean diff -2.83, p < .01). No significant changes were found in the Global learning style scores after two or three years of study.

Table 5: Results of paired samples t-test from admittance (t1) to one, two and three years of study (t2) (N = 141)

<table>
<thead>
<tr>
<th>Year group</th>
<th>Mean changes in learning style scores from t1 to t2 (std. error)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leg</td>
</tr>
<tr>
<td>2009 (after one year of study)</td>
<td>.48 (.69)</td>
</tr>
<tr>
<td>2008 (after two years of study)</td>
<td>-.33 (.74)</td>
</tr>
<tr>
<td>2007 (after three years of study)</td>
<td>1.96* (.85)</td>
</tr>
</tbody>
</table>

Note. * and ** indicate significant difference in mean learning styles scores from t1 to t2 for the year groups ( * p < .05; ** p < .01) with conventional test procedures.
3.3. Commonality of changes for the three year groups

Testing hypotheses of equality of the mean changes in the Legislative, Judicial, Hierarchic, Oligarchic and Global learning styles across the three year groups adjusted the findings in Table 5, as common estimates for two year groups of students were more appropriate in some cases (Table 6).

Three learning styles had changed significantly for all three year groups, though in different ways: the Judicial learning style decreased significantly for the group tested after one year of study (mean diff -2.40, p < .05), while it increased significantly and equally for the groups tested after two and three years of study (common mean diff 2.46, p < .01). The Hierarchic learning style decreased significantly for all three year groups with the biggest and equal decrease for the groups tested after one and two years of study (common mean diff -5.99, p < .01), while a significantly smaller decrease was found for the groups tested after three years of study (mean diff -4.84, p < .01). The Oligarchic learning style decreased significantly for all three year groups, with the biggest and equal decrease for the groups tested after one and two years of study (common mean diff -2.94, p < .01), while a significantly smaller decrease was found for the group tested after two years of study (mean diff -1.77, p < .05).

Table 6: Common and year group specific changes in five learning styles from admittance (t1) to one, two and three years of study (t2) (N = 141)

<table>
<thead>
<tr>
<th>Year group</th>
<th>Leg</th>
<th>Jud</th>
<th>Hier</th>
<th>Olig</th>
<th>Glob</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 (after one year of study)</td>
<td></td>
<td></td>
<td>-2.40*</td>
<td>-2.94**</td>
<td>-2.83**</td>
</tr>
<tr>
<td>2008 (after two years of study)</td>
<td>-.32</td>
<td>-5.99**</td>
<td>-1.77*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007 (after three years of study)</td>
<td>1.96*</td>
<td>2.46**</td>
<td>-4.84**</td>
<td>a</td>
<td>1.47</td>
</tr>
</tbody>
</table>

Note. * and ** indicate significant difference in mean learning styles scores from t1 to t2 for single year groups or combined year groups ( * p < .05; ** p < .01)

Note. a. The estimate for the 2007 year group is the common estimate given for the 2009 year group.

Two learning styles had changed significantly only for a single year group of students: the Legislative learning style increased significantly only for the group tested after three years of study (mean diff 1.96, p < .05). The Global learning style decreased significantly only for the group tested after one year of study (mean diff -2.83, p < .01).

3.4. Generalisability of findings

Conventional comparisons of the learning style scores at t1 of the participants in the present longitudinal study and the non-participants found no significant differences in any learning style scores for the total sample. Subsequent stratification by year group, gender and age revealed significant differences between longitudinal participants’ and non-participants’ scores on four learning styles: longitudinal participants aged 18-20 years scored significantly higher on the Executive learning style (mean diff 2.57, p<.05) at t1 than did the non-participants in the same age strata. Longitudinal participants aged 23 years and older scored significantly higher on the Anarchic learning style (mean diff 3.01, p<.05) at t1 than did the non-participants in the same age strata. Longitudinal participants in the 2009 year group scored significantly higher on the Local learning style (mean diff 3.05, p<.01) at t1 than did the non-participants in the same year group. And last, male longitudinal participants scored significantly higher on the Internal learning style (mean diff 4.10, p<.01) at t1 than did the male non-participants. However, when correcting for false detection rate due to multiple testing using the Benjamini-Hochberg procedure (Benjamini & Hochberg, 1995), all p-values were accepted, and the four suggestions of differences in the learning style scores at t1 of the longitudinal participants and non-participants were rejected. This, combined with the fact that 95% of the admitted students were tested at t1, suggests that results concerning changes in the learning styles of the longitudinal participants from t1 to t2 are indeed generalisable to the entire three years of students admitted to the study programme.
4. Discussion and relevance of findings

The findings have, of course, specific value for the involved university and study programme, but also hold value for other universities with similar programmes by providing insight into the changes in the students’ learning styles through the three years of a BSc programme. Such knowledge might be utilised on a general level in the design and execution of courses, and for evaluating if changes in the students’ learning styles correspond with the objectives of such programmes.

In the present study, a significant decrease of -2.40 points in the Judicial learning style was found across the first year of study of BSc BA. Psych. This is comparable to Nielsen’s (2005b) finding of a significant decrease of -2.93 points in the Judicial learning styles across the first year of study both for a year group of MSc Educational Psychology students (MSc Ed. Psych.) and a year group of BSc Sociology students (BSc Soc.). In both studies, the findings were unexpected, since all three study programmes involved are explicitly concerned with developing students’ analytical critical thinking. Nielsen (2005b) suggested that the common decrease in the Judicial learning style for MSc Ed. Psych. and BSc Soc. students might in fact be an effect of the general “first year in university” experience. The present study strengthens the notion that there might be a discipline-independent effect of the first year in university on the students’ preferred ways of thinking when learning. And even more so because the present study also shows that this effect is only present across the first year. When change is measured across the first two or three years of study, there is in fact instead an increase in the Judicial learning style. Might it be, as tentatively suggested by Nielsen (2005b), that Danish students enter university with a mindset reflecting a relatively un-qualified, un-conditional mode of judging (a sort of naïve Judicial learning style) resulting from the Danish primary and secondary school system. Then through the first year of university experience, this is slowly transformed into a more qualified, argued mode of thinking (a more sophisticated Judicial learning style), and that this transformation can be seen as first a decrease (first year) and then an increase (second and third year) in the Judicial learning style of the students. This study does not settle this question, but it points toward an obvious course for future research.

In the present study, a significant decrease of -2.83 points was found in the Global learning style across the first year of study of BSc BA. Psych. students. This is comparable to Nielsen’s (2005b) finding of a significant decrease of 3.05 points in the Global learning styles across the first year of study for a year group of MSc Ed. Psych. students, while no such change was found for a year group of BSc Soc. students. One possible explanation might have to do with the fact that both groups of students, who decreased in the Global learning style across the first year of study, were studying disciplines focused primarily on the individual and detailed level (i.e. psychology). While the group of students, who did not change on the Global learning style, were in fact studying a discipline primarily focused on the societal and more abstract level (i.e. sociology). The suggestion is here that these findings might reflect what could be termed discipline-specific socialisation of learning styles.

The present finding of a significant increase of 1.96 points in the Legislative learning style across three years of study, but no significant or substantial changes in this style across one or two years of study, combined with Nielsen (2005b) also finding no changes in this style across the first year of study for both a year group of MSc Ed. Psych. students and a year group of BSc Sociology students, suggests that increasing the natural preferences for the more cognitively complex ways of thinking with a low degree of structuring and conformity and a high degree of autonomy as expressed by the Legislative, Judicial and Global learning styles (termed type I styles by Zhang & Sternberg, 2005), which is often the overall purpose of university programmes, might time-wise be a relatively long process, which might only result after several years of university studies. However, both the Hierarchic (also a type I style) and the Oligarchic (a type III style, which is also cognitively complex) learning styles are found to decrease significantly and substantially across shorter time frames (i.e. across one, two and three years of study). In conclusion, more longitudinal studies are needed to support or repudiate the suggestion that certain types of learning styles might only change over relatively long periods of time.

Due to space restrictions, the results of the present study have only been discussed in relation to longitudinal findings on changes in Danish university students’ learning styles within Sternberg’s (1997) theory of mental self-government. A broadening of the discussion to include findings on changes in university students’ approaches to learning/studying or learning, thinking or cognitive styles within a wider range of theoretical frameworks, and organising such a discussion within Zhang and Sternberg’s (2005) threefold model of intellectual styles, might reveal the presence of general and/or discipline-specific patterns in the changes in university students’ styles of high practical educational value. Such a review, as well as additional research
on changes in the styles of university students, is needed in order to establish further any possible general or discipline-specific patterns in the changes in university students’ learning styles

5. References


Nielsen, T. (2005b). Learning styles of Danish university students – Do they differ according to subject of study at the start of the first academic year? – Is there a subject specific socialization effect of one year of higher education? Development of and Research by means of The Danish Learning Styles Inventory (D-LSI) based on Sternberg’s theory of mental self-government. PhD thesis, the Department of Educational Psychology, the Danish University of Education.


The Evolution in Learning Patterns during Higher Education: A Multi-Indicator Latent Growth Model

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Abstract

The variability or stability of students’ way of learning during higher education is increasingly studied (Phan, 2008). In addition, recent research increasingly allows for more measurement waves and longer time intervals (e.g., Zeegers, 2001). Next to this, the methodological field on how to analyze change has evolved as well. By combining for example multi-level analysis and structural equation modeling, latent growth (LG) analysis has been developed (Muthén & Muthén, 2010). Yet, analysis on how students’ learning evolves during higher education has continued to rely primarily on traditional statistical methods such as repeated-measures ANOVA. The present research therefore attempts to complement the scarce longitudinal research on the evolution of learning patterns, while demonstrating the multi-indicator latent growth analysis. The following research questions are central in this study:

How do students’ processing and regulation strategies evolve during the three years of higher education?

Do students vary in this evolution?

How well does the growth model predict the evolution in learning strategy scales?

One cohort of students entering a University College was followed up during the three years of higher education. 245 students participated at three measurement waves by filling out the Inventory of Learning Strategies – Short Version (ILS-SV; Donche & Van Petegem, 2008). This questionnaire maps four processing strategies (memorizing, analysing, critical processing and relating & structuring) and three regulation strategies (external regulation, self-regulation and lack of regulation), using a five-point likert scale. To assess possible changes in learning strategy scales, a multi-indicator latent growth model was calculated using Mplus 5 (Muthén & Muthén, 2010).

Results indicate a linear increase in deep processing and self-regulated learning, to the detriment of externally regulated, unregulated learning and memorizing. Only the degree of analysing remains stable over time. In sum, students do seem to evolve towards high-quality learning over the course of higher education. Yet, at the same time, the data point out the relativity of these general trends. For all scales, at least two of the errors variances of the latent factors resulted significant. The latent growth trajectory in itself thus seems insufficient to predict the varying levels of the factors.

Examining the differences between students, for all scales, students were found to vary in their initial level, while the variance in slopes never reached significance. It appears that the research context of the University College seems to have a similar effect on all students.

Results confirm prior research findings only partially. An increase in meaning directed learning and a decreasing reliance on unregulated learning is in line with the findings of former ILS-studies (for a review, see Vanthournout et al., 2010). The high resilience to changes in stepwise processing and external regulation was however not replicated: only the analysing scale resulted constant over time, while a decrease was noted in the memorizing and external regulation scale.

Results suggest that future research could probe into the predictors for variation in the degree of processing and regulation at the start of higher education. Second, the significant residual variances in the factors call for predictors, aside of the growth trajectory. Third, to better trace the data curve (Wu, et al., 2010) and to detect
opportunities for stimulating learning strategy development, future research should preferably include more than three measure moments across time (Bijleveld, van der Kamp, & Mooijaart, 1998).

**Keywords:** Learning patterns, latent growth model, evolution

**References**


ELSIN XVI

PAPER PRESENTATIONS
Abstract

In the Netherlands, the difference between senior general secondary and pre-university education is a major issue in political debates. Educationalists claim that most curriculum programmes, pedagogy and educational materials for secondary education use pre-university as a norm; senior general secondary education is understood as simply a lower level of pre-university education. In this study, differences in learning styles of students from both school levels were examined as well as the moderating role of learning styles in school motivation and performance. Subjects were a convenient sample of 204 students from a secondary school in a medium-sized city in the western part the Netherlands. Students’ learning style was measured by the Learning Style Inventory; school motivation and performance were both also measured by self-report items. Students of senior general secondary education differ from student of pre-university education in school motivation and performance, showing less motivation and lower performances for the former group of students. No differences in learning style were found. However, differences between students from senior general secondary education and pre-university education in both school motivation and school performance were explained in different way by learning style. Interpretations of a different learning environment in both school levels are discussed.

Keywords: Secondary education, learning style, motivation, performance

In the Netherlands, the difference between senior general secondary and pre-university education is a major issue in political debates. Educationalists claim that most curriculum programmes, pedagogy and educational materials for secondary education use pre-university as a norm. Senior general secondary education is understood as simply a lower level of pre-university education. However, students of both main streams of education may not only differ in ability, but also in school motivation and learning style. This would imply that senior general secondary education asks for a different curriculum, pedagogy and materials, instead of just pre-university education at a lower level.

In this study, students from senior general secondary education and pre-university education were compared with respect to learning style, school motivation and performance and the way their learning styles explained differences in motivation and performance.

1. Dutch secondary education

Dutch mainstream education is summarised in Figure 1.

The Dutch education system is structured in a way that the final degree can be reached by several different study routes. This means that students always have the possibility to switch from one level to another. There are around 700 secondary schools in the Netherlands, both publicly and privately run. Secondary education starts after completion of primary education, usually at age 12 and generally continues to the age of 18. Full-time education is compulsory up to and including the child's sixteenth year. When children are in their final year of primary school, parents must select secondary schools. They are assisted by the head teacher who uses the students’ achievement records, and in many cases, results from national tests designed to help guide secondary school choice. There are three school levels determined by the outcome:

- pre-vocational secondary education is a preparation to a practical internship followed by work or a preparation to vocational education. This generally takes 4 years, depending on the subjects chosen.
- senior general secondary education takes 5 years and prepares for universities of applied sciences.
- pre-university education takes 6 years and is the admission level for research universities.

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Progression depends on student achievement, and students may be required to repeat a year. Secondary students who fail a year twice must transfer to a less demanding type of education.
In secondary education two major educational innovations have been implemented. In 1999, all schools for pre-university education and senior general secondary education introduced set subject combinations and the “study house” construction, which commences in the fourth course year and requires students to acquire skills and knowledge in a much more independent capacity. In 1999, pre-vocational education and junior general secondary education schools introduced the new pre-vocational secondary education.

One of the more persistent problem of Dutch senior general secondary education include underachievement as well as learning, behavioral, and emotional difficulties that eventually lead to school dropout for many students. Dropping out of school is theorised to be a gradual process of student disengagement and alienation, marked by a chronic cycle of tardiness, absenteeism, failing classes, suspensions, and transitions between schools (Bridgeland, Dilulio, & Burke Morison, 2006; Finn, 1989). Although there is some empirical evidence showing that the problem of underachievement, failing classes and dropout is relative more persistent in senior general secondary education, compared to pre-university education (cfr. Van Langen & Vierke, 2008, 2010), it is still unclear what the underlying causes are. Expert studies and field consultations (see for example: De Boer, Goris, & Noordink, 2003; Kerkstra, 2006; Vermaas & Van der Linden, 2007) confirm these problems with teachers comparing students from senior general secondary education with the norm (i.e., pre-university education), concluding these students do not reach the standard. Teachers and school principals also hypothesise about the causes. Students from senior general secondary education are said to be motivated by classes in which they can apply what they learn and link it to other practical experiences, whereas teachers focus on deep cognitive processing. Moreover, students are said to have difficulties with self-regulation (planning, monitoring, and reflection) and need more external regulation of their learning process. However, teachers also recognise a large variety in learning styles, school motivation, and performance, which makes it difficult for teacher to adjust their teaching.

In sum, students’ learning styles seem to be a crucial element in explaining differences in school motivation and performance between students from senior general secondary education and pre-university education.

2. Learning style

There is a strong intuitive appeal related to the idea that teachers and course designers should pay closer attention to students’ learning styles – by diagnosing them, by encouraging students to reflect on them and by designing teaching and learning interventions around them. Teachers notice that students vary enormously in the speed and the manner with which they pick up new information, and the confidence with which they process and use this. Students will become more motivated to learn by knowing more about their own strengths and weaknesses as learners. In turn, if teachers can respond to students’ strengths and weaknesses, then retention and achievement rates in educational programmes are likely to rise. For empirical evidence of various models of learning styles of their impact on student learning, we refer to the literature study of Coffield, Moseley, Hall, and Ecclestone (2004).

The framework of Vermunt for classifying learning styles defines learning style as “a coherent whole of learning activities that students usually employ, their learning orientation and their mental model of learning” (Vermunt, 1996 p. 29). This definition strongly emphasises metacognitive knowledge and self-regulation. It deals not only with cognitive processing, but also with motivation, effort and feelings. Based on this framework, the Inventory of Learning Styles (ILS) was developed, originally for higher education, with good reliabilities, face validity and construct validity and used as research instrument in various countries (Ajisuksmo & Vermunt, 1999; Boyle, Duffy, & Dunleavy, 2003; Eaves, 2009; Lonka & Lindblom-Ylänne, 1996; Marambe, 2007; Schatteman, Carette, Couder, & Eisendrath, 1997; Vermunt, 1996, 1998; Vermunt & Vermetten, 2004).

In several studies, the ILS was used in secondary education (Boekaerts, Otten, & Simons, 1997; Slaats, Lodewijks, & Van der Sanden, 1999; Roosendaal & Vermunt, 1996). Recently, Picarelli, Slaats, Bouhuijs, and Vermunt (2006) presented the ILS that was adapted for secondary education. The authors rephrased the items in order match the context of secondary education and shortened the questionnaire to 100 items. They found a slightly different factor construction, compared to the original ILS, and low to moderate reliabilities. Generally, the original ILS is understood to be a reliable and valid instrument to measure students’ learning styles (Vermunt & Vermetten, 2004). In this study, students from senior general secondary education and pre-university education were compared with respect to learning styles (as measured by the ILS), school
motivation and school performance and the way their learning style explained differences in motivation and performance. More specific, we want:

- to test the differences between students of senior general secondary education and pre-university with respect to learning style, school motivation and school performance, and
- to relate at both school levels students’ learning style with their school motivation and school performance.

3. Method

3.1 Participants

Subjects were a convenient sample of 204 students from a secondary school in medium-sized city in the western part the Netherlands (110 students senior general secondary education (SGSE) and 94 student pre-university education (PE)). Their mean age was between 15 and 16 years (range 14 to 19) and 53% were female. Students were clustered into one of the subject domains (Social sciences and Economics: 52%; Science and Health: 15%; Science and Engineering: 21%, and Social sciences and Arts: 12%).

3.2 Data collection

Students’ learning style was measured by the Learning Style Inventory of Vermunt (ILS; Vermunt, 1996). ILS is a reliable and valid instrument to measure students’ learning style (Vermunt & Vermetten, 2004). School motivation and performance were both also measured by self-report items. All items were combined into one survey that was administered online.

3.3 Measures

Information from the survey is summarised in Table 1 with descriptive statistics for students from SGSE and PE.

Inventory of Learning Styles (ILS).

Items of the original Inventory of Learning Styles (ILS) were slightly rephrased to be used in secondary education. We did not use ILS for secondary education (cfr. Picarelli et al., 2006) as the information on its reliability and (construct) validity is ambiguous and the content of the questionnaire is quite different from the original ILS. The ILS is a 120-item self-rating instrument, using 5-point Likert scales (the higher the score, the more applicable). These items cover four learning components: Cognitive processing (what students do while learning), Regulation of learning (how students plan and monitor learning), Mental models of learning (how students see learning), and Learning orientations (why students learn; Vermunt & Vermetten, 2004). In Table 1, the components and their subscales are shown, along with item consistencies.

The component Cognitive processing includes five subscales. Relating and structuring (relating and structuring elements of the subject matter to each other and to prior knowledge) and Critical processing (forming one’s own view) both refer to deep processing. Memorising and rehearsing (learning facts by heart) and Analysing (studying elements in detail and one by one) both refer to stepwise cognitive processing. Concrete processing includes the application of subject matter and linking it to experiences.

The component Regulation of learning also includes five subscales. Self-regulation refers to the self-regulation of processes and outcomes (planning, monitoring, testing and reflecting) and of content (consultation of additional sources). External regulation refers to the regulation of both the learning process and outcomes by teachers, text books and tests. Due to low reliabilities, we combined the original two subscales of process and outcomes into one, External regulation. Lack of regulation describes difficulties in the regulation of the learning process.

The Mental models of learning are measured by five subscales: Intake of knowledge (learning viewed as taking in knowledge), Construction of knowledge (learning viewed as constructing one’s own knowledge and insights), Use of knowledge (learning viewed as acquiring knowledge that can be applied), Stimulating education (teachers should stimulate students to learn), and Cooperative learning (valuing learning with fellow students).
Table 1: Dependent and independent variables for students from senior general secondary education (SFSE) and pre-university education (PE)

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>SGSE</th>
<th>PE</th>
</tr>
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<tbody>
<tr>
<td></td>
<td><em>N = 110</em></td>
<td><em>N = 94</em></td>
</tr>
<tr>
<td></td>
<td><em>M (SD)</em></td>
<td><em>M (SD)</em></td>
</tr>
<tr>
<td>School motivation (4 items, Cronbach’s α = 0.78)</td>
<td>3.05 (0.75)</td>
<td>3.35 (0.69)</td>
</tr>
<tr>
<td>School performances (2 items, Pearson’s correlation r = 0.79)</td>
<td>3.02 (0.65)</td>
<td>3.54 (0.85)</td>
</tr>
</tbody>
</table>

**Learning styles: cognitive processing**

<table>
<thead>
<tr>
<th></th>
<th>SGSE</th>
<th>PE</th>
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<tbody>
<tr>
<td></td>
<td><em>M (SD)</em></td>
<td><em>M (SD)</em></td>
</tr>
<tr>
<td>Deep: relating &amp; structuring (7 items, Cronbach’s α = 0.79)</td>
<td>2.86 (0.87)</td>
<td>2.88 (0.78)</td>
</tr>
<tr>
<td>Deep: critical processing (4 items, Cronbach’s α = 0.71)</td>
<td>2.54 (0.81)</td>
<td>2.49 (0.85)</td>
</tr>
<tr>
<td>Stepwise: memorising &amp; rehearsing (5 items, Cronbach’s α = 0.75)</td>
<td>3.08 (0.78)</td>
<td>2.92 (0.79)</td>
</tr>
<tr>
<td>Stepwise: analysing (6 items, Cronbach’s α = 0.73)</td>
<td>2.75 (0.73)</td>
<td>2.72 (0.65)</td>
</tr>
<tr>
<td>Concrete processing (5 items, Cronbach’s α = 0.74)</td>
<td>2.60 (0.70)</td>
<td>2.52 (0.83)</td>
</tr>
</tbody>
</table>

**Learning styles: regulation of learning**

<table>
<thead>
<tr>
<th></th>
<th>SGSE</th>
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<tbody>
<tr>
<td></td>
<td><em>M (SD)</em></td>
<td><em>M (SD)</em></td>
</tr>
<tr>
<td>Self-regulation-process (7 items, Cronbach’s α = 0.79)</td>
<td>2.64 (0.76)</td>
<td>2.69 (0.75)</td>
</tr>
<tr>
<td>Self-regulation-content (4 items, Cronbach’s α = 0.66)</td>
<td>2.14 (0.78)</td>
<td>2.16 (0.72)</td>
</tr>
<tr>
<td>External regulation (10 items, Cronbach’s α = 0.70)</td>
<td>3.12 (0.58)</td>
<td>3.19 (0.53)</td>
</tr>
<tr>
<td>Lack of regulation (6 items, Cronbach’s α = 0.62)</td>
<td>2.42 (0.62)</td>
<td>2.29 (0.64)</td>
</tr>
</tbody>
</table>

**Learning styles: mental model of learning**

<table>
<thead>
<tr>
<th></th>
<th>SGSE</th>
<th>PE</th>
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<tbody>
<tr>
<td></td>
<td><em>M (SD)</em></td>
<td><em>M (SD)</em></td>
</tr>
<tr>
<td>Intake of knowledge (9 items, Cronbach’s α = 0.71)</td>
<td>3.30 (0.61)</td>
<td>3.37 (0.48)</td>
</tr>
<tr>
<td>Construction of knowledge (9 items, Cronbach’s α = 0.77)</td>
<td>2.97 (0.61)</td>
<td>2.91 (0.59)</td>
</tr>
<tr>
<td>Use of knowledge (5 items, Cronbach’s α = 0.81)</td>
<td>3.21 (0.73)</td>
<td>3.22 (0.73)</td>
</tr>
<tr>
<td>Stimulating education (8 items, Cronbach’s α = 0.87)</td>
<td>2.87 (0.78)</td>
<td>2.90 (0.73)</td>
</tr>
<tr>
<td>Cooperative learning (8 items, Cronbach’s α = 0.83)</td>
<td>2.71 (0.77)</td>
<td>2.71 (0.68)</td>
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**Learning styles: learning orientation**

<table>
<thead>
<tr>
<th></th>
<th>SGSE</th>
<th>PE</th>
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<tbody>
<tr>
<td></td>
<td><em>M (SD)</em></td>
<td><em>M (SD)</em></td>
</tr>
<tr>
<td>Personally interested (4 items, Cronbach’s α = 0.63)</td>
<td>3.16 (0.71)</td>
<td>3.23 (0.71)</td>
</tr>
<tr>
<td>Certificate oriented (4 items, Cronbach’s α = 0.65)</td>
<td>3.81 (0.72)</td>
<td>3.87 (0.66)</td>
</tr>
<tr>
<td>Self-test oriented (5 items, Cronbach’s α = 0.68)</td>
<td>3.21 (0.76)</td>
<td>3.17 (0.72)</td>
</tr>
<tr>
<td>Vocation oriented (5 items, Cronbach’s α = 0.72)</td>
<td>3.53 (0.73)</td>
<td>3.42 (0.73)</td>
</tr>
<tr>
<td>Ambivalent (5 items, Cronbach’s α = 0.74)</td>
<td>2.15 (0.75)</td>
<td>2.08 (0.80)</td>
</tr>
</tbody>
</table>

Notes. 1 Item 5 was deleted to improve reliability. 2 Item 95 was deleted to improve reliability. 3 Item 69 was deleted to improve reliability. 4 Item 60 was deleted to improve reliability.

Students’ Learning orientations are also measures with five subscales. Personally interested students attend classes because of their genuine interest in a specific domain or the opportunities to enrich themselves. Certificate oriented students strive for high achievements and passing exams and are motivated by obtaining a certificate or degree. Self-test oriented students attend school to test their capabilities and to prove what they are capable of. Vocation oriented students attend school to acquire professional skills for a specific vocation, and finally, ambivalent students show an insecure and doubtful attitude towards their capabilities and school.

**School motivation and performance**

School motivation was measured by four items on a 5-point Likert type scale with = low motivation and 5 = strong school motivation (Cronbach’s α = 0.78; *M* = 3.19; *SD* = 0.73). These four self-report items were: “How motivated are you for school?”, “How do you experience school?”, “How much effort do you put into school?”, and “How content are you attending school?”.

School performance was measured by two items on a 5-point Likert type scale with 1 = poor performance and 5 = good performance (Pearson’s correlation = 0.75; *M* = 3.26; *SD* = 0.79). These two self-report items were: “At this moment what is your average mark?” and “How do you perform in school?”.
3.4 Analyses

Paired-sample t-tests were used to test differences between the various subscales of cognitive processing, regulation of learning, mental models of learning, and learning orientation, using the Bonferroni correction. Stepwise regression analyses were performed with either school motivation or performance as dependent variable, and student background, cognitive processing, regulation of learning, mental models of learning, and learning orientations as sets of independent variables. The analyses were conducted separately for students from senior general secondary education (SGSE) and pre-university education (PE). As the data for each of the two groups of students was limited, we performed separate analyses for each set of independent variables.

4. Results

Students form SGSE and PE differed in school motivation and school performance with SGSE students showing relatively lower motivation ($t(202) = -2.98; p < .01$) and poorer performance ($t(172.20) = -4.86; p < 0.001$). No differences between SGSE and PE students were found in the four sets of learning style variables.

Paired-sample t-tests show that students used memorising and rehearsing as a major cognitive processing strategy ($M = 3.01$), followed by relating and structuring ($M = 2.87$) and analysing ($M = 2.74$), and then concrete processing ($M = 2.56$) and critical processing ($M = 2.52$). Except for the difference between relating and structuring and analysing, and between concrete and critical processing, all other differences were statistical significant (with $\alpha = 0.005$, using the Bonferroni correction).

With respect to the regulation of learning all differences of the paired-sample t-test were statistical significant (with $\alpha = 0.008$). This means that the most used regulation strategy is external regulation ($M = 3.15$), followed by self-regulation strategies such as planning and monitoring ($M = 2.66$). The average score on both lack of regulation ($M = 2.36$) and self-regulation such as consulting additional sources ($M = 2.15$) was relatively low.

Paired-sample t-tests show that students used two mental models of learning most: intake of knowledge ($M = 3.33$) and use of knowledge ($M = 3.22$). These models were followed by construction of knowledge ($M = 2.94$) and stimulating education ($M = 2.88$), and then cooperative learning ($M = 2.71$). Except for the difference between construction of knowledge and stimulating education, and between intake of knowledge and use of knowledge, all other differences were statistical significant (with $\alpha = 0.005$).

With respect to the learning orientation students showed to be motivated most by passing exams and striving for high achievements ($M = 3.84$), followed by a vocation learning orientation ($M = 3.48$) and self-test motivation and personal interest (both $M = 3.19$). Students showed the lowest scores on an ambivalent learning orientation ($M = 2.12$). Except for the difference between self-test orientation and personal interest, all other differences were statistical significant (with $\alpha = 0.005$).

4.1 School motivation

The results for school motivation are presented in Table 2. For both groups of students memorising and rehearsing were cognitive processing strategies that were positive related to their motivation to attend school. For SGSE-students, this was also the case for Concrete processing. For PE-students, cognitive processing that is labeled as Analysing was positively related to school motivation.

In line with the results of cognitive processing, external regulation of learning was positively related to school motivation. In addition, the higher the scores of students from SGSE on self-regulation such as consulting additional sources, the more motivated they were to attend school. Finally, differences in school motivation of students from PE were explained by self-regulation activities such as planning and monitoring.

School motivation of both groups of students was explained by two mental models of learning: the higher the scores on Construction of knowledge and the lower the scores on Stimulating education (a view that teachers and text books should stimulate student learning), the higher school motivation. Remarkably, we found a positive relationship between Intake of knowledge and school motivation for student of pre-university education (and not for the other students).

With respect to students’ learning orientation we found three significant effects. For both groups of students personal interest and a self-test motivation were positively related to students’ motivation to attend school. For SGSE-students, ambivalent orientation (showing an uncertain attitude towards school and their own capabilities) was negatively related to school motivation.
Table 2: Stepwise regression analyses for school motivation and performance of students from senior general secondary education (SGSE) and pre-university education (PE).

<table>
<thead>
<tr>
<th>Covariates</th>
<th>School motivation</th>
<th>School performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SGSE B (s.e.)</td>
<td>PE B (s.e.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (ref. female)</td>
<td>--</td>
<td>0.31 (0.14)</td>
</tr>
<tr>
<td>Age</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Subject</td>
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<table>
<thead>
<tr>
<th>Cognitive processing</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Deep: relating &amp; structuring</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Deep: critical processing</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Stepwise: memorising &amp; rehearsing</td>
<td>0.28 (0.09)</td>
<td>0.24 (0.11)</td>
</tr>
<tr>
<td>Stepwise: analysing</td>
<td>--</td>
<td>0.27 (0.13)</td>
</tr>
<tr>
<td>Concrete processing</td>
<td>0.26 (0.10)</td>
<td>--</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Regulation of learning</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Self-regulation-process</td>
<td>--</td>
<td>0.19 (0.09)</td>
</tr>
<tr>
<td>Self-regulation-content</td>
<td>0.23 (0.09)</td>
<td>--</td>
</tr>
<tr>
<td>External regulation</td>
<td>0.40 (0.11)</td>
<td>0.39 (0.13)</td>
</tr>
<tr>
<td>Lack of regulation</td>
<td>--</td>
<td>-0.41 (0.09)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-0.58 (0.12)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mental model of learning</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Intake of knowledge</td>
<td>--</td>
<td>0.41 (0.15)</td>
</tr>
<tr>
<td>Construction of knowledge</td>
<td>0.58 (0.12)</td>
<td>0.36 (0.12)</td>
</tr>
<tr>
<td>Use of knowledge</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Stimulating education</td>
<td>-0.20 (0.09)</td>
<td>-0.20 (0.10)</td>
</tr>
<tr>
<td>Cooperative learning</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Learning orientation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Personally interested</td>
<td>0.40 (0.09)</td>
<td>0.25 (0.10)</td>
</tr>
<tr>
<td>Certificate oriented</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Self-test oriented</td>
<td>0.26 (0.09)</td>
<td>0.30 (0.10)</td>
</tr>
<tr>
<td>Vocation oriented</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Ambivalent</td>
<td>-0.19 (0.08)</td>
<td>--</td>
</tr>
</tbody>
</table>

\[\text{Note.} \ \text{204 students (110 SGSE and 94 PE) included in each of the five models for both school motivation and school performance; s.e. = standard error. Only significant effects (with } \alpha = 0.05 \text{) are printed.}\]

### 4.2 School performance

The results for school performance are presented in Table 2. No effects were found of students’ cognitive processing on their school performance.

For both groups of students a negative relation was found with lack of regulation which means that the lower the scores on lack of regulation, the higher the school performance of students. For SGSE-students, a positive relationship between external regulation and school performance was found.

With respect to the mental models of learning, two significant effects were found for SGSE-students. The more students view learning as a construction of knowledge, and the less they see it as something that should be stimulated by teachers, the better their school performance.

Finally, for both groups of students an uncertain attitude towards school and their capabilities was negatively related to performance in school: The less they reported an ambivalent orientation, the better they performed.
5. Discussion and conclusion

In contrary to the outcomes of the field studies and teacher consultation mentioned in the introduction, we did not find differences in learning styles between students from senior general secondary education and pre-university students. Students from both school levels generally reported a preference for memorising and rehearsing as strategies they use to acquire knowledge, using external regulation of their learning process, defining learning in terms of intake of knowledge and use of knowledge, and an orientation to attend school to get a certificate or degree and to study for a specific vocation. Although Picarelli et al. (2006) combined some of the original subscales, similar outcomes were found. If we combine these components into the four learning styles Vermunt (1998) recognised in the ILS, students of both school levels particularly showed either a reproduction-directed or an application-directed learning style (cfr. Vermunt & Vermetten, 2004).

We did find differences in school motivation and performance: Students from senior general secondary education reported a lower motivation to attend school and lower performances compared to pre-university students. Although we did not find differences in learning style, some components of learning style had a different effect on both school motivation and performance for both groups of students – in addition to some main effects of learning styles.

In both groups of students, rehearsing and memorising and a preference for external regulation of the learning process were positively related to school motivation. This was also the case for orientation to attend school out of genuine interest and a self-testing motivation. However, for both groups the mental model of learning which includes the idea that students’ learning should be stimulated by teachers was negatively related to school motivation. This combination suggests that at both school levels students’ learning environment can probably be depicted as a reproduction-directed or application-directed learning environment: Students with corresponding learning style were motivated to attend school. However, these main effects on school motivation were not replicated with school performance. The only main effects we found with performance included that the higher scores students had on lack of regulation and on an ambivalent orientation, the lower their performance. These relationships are confirmed in earlier research in higher education of Busato, Prins, Elshout, and Hamaker (1998, 1999).

The relationship between learning style components, on the one hand, and school motivation and performance, on the other hand, also was different for students from both school levels. Among other differences, students from senior general secondary education generally were more motivated to attend school, when they had a stronger preference for concrete processing strategies, whereas pre-university were more motivated when they had a more analysing processing strategy. There was a remarkable difference that included that the more students from pre-university see learning as intake of knowledge, the more they were motivated to attend school. In teacher consultation mentioned in the introduction section, this is a relationship that would be expected for the lower school level, senior general secondary education. Finally, for school performance of students from senior general secondary education a positive relationship was found with external regulation of the learning process and viewing learning as construction of knowledge, and a negative relationship was established with seeing learning as something that should be stimulated by the teacher.

In sum, our results only partly confirmed the outcomes of expert studies and field consultations about senior general secondary education. Compared with pre-university students, we did not find differences in learning style, but we did in school motivation and performance. Overall, the learning environment of senior general secondary education could be depicted as an environment that ask for a reproduction- and application-directed learning styles of students, but this could also be said about pre-university education. More and more extensive research is needed to find out differences between these school levels and the way they build on learning style and capabilities of students.

6. References


Gender Differences and Game-Based Learning in Secondary Education

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Abstract

In the Netherlands, differences in school motivation and performance between boys and girls are a major issue in political debates. In the first years of secondary education in the Netherlands, boys tend to underachieve and to be disengaged from school. Game-based learning might improve the school motivation and performance of both boys and girls. In two studies with game-based learning, gender differences were examined in students’ school motivation and learning outcomes. Both boys and girls showed an increase in motivation and learning outcomes. Only in the second study about a digital role-play citizenship game, boys additionally showed a larger increase in media literacy than girls. This means that game-based learning showed potential to solve the so-called boys problem in Dutch secondary education.

Keywords: Gender differences, game-based learning, motivation, performance

In the Netherlands, differences in school motivation and performance between boys and girls are a major issue in political debates. In the first years of secondary education in the Netherlands, boys tend to underachieve and to be disengaged from school. Boys and girls in secondary education perform differently in language and math tests, although no differences were found in other standardised tests (Driessen & Van Langen, 2010). Some politicians and educationalists claim that curriculum programs and pedagogy in the first years of secondary education cause this so-called boys problem asking for commitment, self-regulation skills, and language skills. Game-based learning might be a way to trigger commitment and scaffold students’ learning process using text as well as images and video clips. This would imply that a curriculum including game-based learning might improve the school motivation and performance of both boys and girls. In two quasi-experimental studies, the inclusiveness of game-based learning is studied by examining gender differences in effects of game-based learning on school motivation and learning outcomes.

1. Game-based learning

Computer and video games can let student experience ways of learning that stress immersion in a practice, supported by structures that lead to expertise, professional-like skills, and innovative thinking. Digital games are seen as excellent tools for facilitating and supporting situated learning of students (cfr. Gee, 2005; Huizenga, Admiraal, Akkerman, & Ten Dam, 2009; Prensky, 2001; Shaffer, Squire, Halverson, & Gee, 2005; Winn, 2002). Rich virtual worlds are what make games powerful contexts for learning. In game worlds, learning no longer means confronting words and symbols separated from the things those words and symbols are about in the first place. In virtual worlds, students can experience the concrete realities that words and symbols describe. Through such experiences, across multiple contexts, students can understand complex concepts without losing the connection between abstract ideas and the authentic problems that can

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be used to solve. Games are being recognised as fruitful narrative learning environments, moving beyond fragmented information (Akkerman, Admiraal, & Huizenga, 2009; Jenkins, 2004). The developments of location-aware and mobile technology give many exciting opportunities to create such new ways of learning. These technologies can embed learning in a natural environment, using the treasures of information that the environment conceals. It is possible to merge digital and urban play spaces to connect locations, contexts, and meaning.

It can be argued that digital games – with or without location-aware and mobile technology – can transform education and change the widely shared perspective that games are “mere entertainment”. The attitude of today’s young people towards their video and computer games is the very opposite of the attitude that most of them have towards school. Yet it is the very attitude we would like all our learners to have: interested, competitive, cooperative, results-oriented, and actively seeking information and solutions. It therefore makes a great deal of sense to try to merge the content of learning and the engaging and thereby motivating strength of games. A motivated learner shows a clear interest in what he or she is doing and enjoys what he or she is doing, tries hard and persists over time (Garris, Ahlers, & Driskell, 2002).

Many studies of games and motivation are based upon the motivation work of Malone and Lepper (1987), who proposed a link between motivation and intrinsic learning. More specifically, seven factors which include both individual and interpersonal factors have been postulated to promote intrinsic motivation. The individual factors are challenge, curiosity, control, fantasy, competition, cooperation, and recognition. According to many authors, many of these factors are triggered by the use of games (see for example: Admiraal, Huizenga, Akkerman, & Ten Dam, 2011; Egenfeldt-Nielsen, 2006; Garris et al., 2002; Prensky, 2001). Other researchers examine various conditions of using games in order to trigger engagement or flow, such as user-friendly interface (Pilke, 2004), challenge matching the level of difficulty (Sweetser & Wyeth, 2005), immediate and appropriate feedback (Kiili, 2005), reflection on game experiences (Lim, Nonis, & Hedberg, 2006), competition (Jayakanthan, 2002), content creation (Kiili, 2005), and gamefullness (İnal & Cagiltay, 2007; Kiili, 2005).

2. Gender inclusiveness of games

Game-based learning might be a way to engage both boys and girls (see for example: Annetta, Minogue, Holmas, & Cheng, 2009; Lim et al., 2006; Schwabe & Göth, 2005). However, the gender inclusiveness of digital games is still under-researched. Although the gender gap in the use of technology and knowledge about it has diminished, there are still indications that the use of technology in education affects girls and boys differently (Cooper, 2006). For example, boys play computer games more often than girls (Cassell, 2002), and girls take fewer technology classes than boys in high school (Pinkard, 2005), but girls use e-mail at school more often than boys (Volman, Van Eck, Heemskerk, & Kuiper, 2005). Girls tend to respond less positively than boys on items aimed at measuring computer attitude in general, whereas they report enthusiastically about applications for word processing and drawing (Volman & Van Eck, 2001).

Much has been written about the factors that might determine the gender inclusiveness of educational technology (Heemskerk, Brink, Volman, & Ten Dam, 2005). In other words, what makes digital games attractive and suitable for both boys and girls? Girls seem to prefer games and educational tools facilitating cooperation to more competitive tools. They generally tend to like games appealing to creativity more than tools that ask for dexterity, and appreciate detailed and colorful images in games and educational technological tools (American Association of University Women, 2000; Fiore, 1999).

In this paper, two studies will be reported on the gender differences in the engaging aspects of games and their learning effects. Two main hypotheses are formulated:

   H1. Both boys and girls will increase their motivation and learning outcomes by the use of a digital game.

   H2. The increase in motivation and learning caused by the game is larger for boys than for girls.

3. Study 1. A mobile city game of Amsterdam

The game studied is called ‘Frequentie 1550’, and addresses the history of the city of Amsterdam in late medieval era. The mobile game is a one day activity meant for secondary school students to actively
experience the history of Amsterdam by walking through the city, experiencing buildings, receiving messages, completing game assignments, while using UMTS/GPS video phones for communication and exchanging the information with team members.

At the start of the game day, the students gathered at the main location, The Waag of Amsterdam. Here the students were introduced into the main story line of the game, the game structure, the tasks, and the tools to be used.

The old city of Amsterdam was divided into six areas, each dealing with a different theme in medieval times. These six themes ('labor', 'trade', 'religion', 'rules and government', 'knowledge', and 'defense') were introduced to the students by means of an introductory video clip that was sent to them as soon as they entered a specific area. These clips presented words that could help the group to complete the assignments of that area.

The game was played in groups of four or five students. Each group was divided into a ‘city team’ (CT) of two or three students who walked through the city and a ‘head quarter team’ (HQT) of the other two or three group members who stayed behind the computer in the main building. The teams switched places in the second half of the day, so that each student participated in both the HQT and the CT. The CT was assigned one of the six areas as starting point for walking, and was asked to conduct small location-based media tasks in order to explore, map and master the area and its theme, before moving to the learning tasks of the next area. The CT was able to show a map of medieval Amsterdam on their phones (see Figure 1). The HQT digitally followed the route of his CT, guided them towards and through the learning tasks by using various information sources. This team also collected all the materials that were produced to complete the tasks. The HQT could use two maps: one about medieval Amsterdam and one about present Amsterdam.

At the end of the day all students gathered in the main building, where the HQTs were located. Each of the groups was invited to shortly present some of their collected media to the other groups.

Figure 1: Map of medieval Amsterdam with the six areas © Waag Society

3.1 Method

Using a post-test only control-group design with a proxy pre-test, 458 first-year (grade 7) students (251 female) from 20 classes of 5 secondary schools in Amsterdam participated in this study. Ten classes (232 students; 126 females) played the one-day mobile History game and the other ten classes attended a regular lesson series on the same topic.
In addition to student background (gender, ethnicity, age, attitude towards collaborative learning), students’ motivation to attend History lessons was measured with a 6-items questionnaire (with a Cronbach’s $\alpha = 0.84$) and performance in History with a 30-items test on Medieval Amsterdam (with an inter-observer agreement of Cohen’s $\kappa = 0.91$ with two researchers). School motivation was measured on a 5-point Likert type scale with 1 = hardly motivated and 5 = highly motivated), and performance was measured as the proportion correct answers (from 0 to 1). The proxy pre-test for performance was a rating by the teachers on a 5-point scale of the ability in History of each of the students they teach. This score was recoded into a score between 0 and 1, with score 1 equalling the highest ability.

For school motivation repeated measures analyses were used with the difference between pre- and post-test for school motivation as within-subjects variable, and condition and gender as between-subjects factors. In additional analyses, students’ ethnicity, age, and attitude towards collaborative learning were added as covariates. For performance, analyses of covariance were conducted with performance as dependent variable, condition and gender as fixed factors, and the proxy pre-test as covariate. In additional analyses, students’ ethnicity, age, and attitude towards collaborative learning were added as covariates.

### 3.2 Results

The results of the analyses are summarised in Table 1. First we describe the results of the repeated measures analysis with school motivation. Both boys and girls are significantly more motivated by game-based learning (experimental condition) compared to attending the lesson series (control condition; $F(1,273) = 4.54; \ p = 0.034; \ \eta^2 = 0.02$), although boys’ motivation tends to decrease slightly – although not significantly – in the lesson series. These results (effect of condition, no interaction effect of gender and condition) persisted after adding covariates such students’ ability, age, ethnicity and attitude towards collaborative learning.

For performance, both boys and girls performed better with game-based learning compare to the regular lesson series ($F(1,423) = 151.97; \ p < 0.001; \ \eta^2 = 0.27$), with a trend that for girls the difference with the control group was larger than for boys ($F(1,423) = 3.34; \ p < 0.068; \ \eta^2 = 0.01$). This gender difference was confounded with ability: girls are also the better performers in general. After including the proxy pre-test scores, the main effect of condition resided: Both boys and girls performed better in the experimental condition (i.e., game-based learning) than in the control condition (i.e., regular lesson series; $F(1,422) = 154.70; \ p < 0.001; \ \eta^2 = 0.27$). There still was a smaller trend that for girls the difference with the control group was larger than for boys ($F(1,422) = 2.85; \ p = 0.092; \ \eta^2 = 0.01$). Including other covariates such as students’ age, ethnicity and attitude towards collaborative learning did not change this outcome.

### Table 1: Results of the repeated measures analysis with condition and gender for school motivation and of the co-variance analysis for performance

<table>
<thead>
<tr>
<th></th>
<th>Experimental condition</th>
<th>Control condition</th>
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<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td></td>
<td>$M$ ($SD$)</td>
<td>$M$ ($SD$)</td>
</tr>
<tr>
<td>School motivation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>2.96 (0.79)</td>
<td>3.02 (0.80)</td>
</tr>
<tr>
<td>Girls</td>
<td>2.88 (0.76)</td>
<td>2.95 (0.83)</td>
</tr>
<tr>
<td>All</td>
<td>2.91 (0.77)</td>
<td>2.98 (0.82)</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>0.51 (0.27)</td>
<td>0.57 (0.24)</td>
</tr>
<tr>
<td>Girls</td>
<td>0.56 (0.30)</td>
<td>0.62 (0.23)</td>
</tr>
<tr>
<td>All</td>
<td>0.54 (0.28)</td>
<td>0.60 (0.24)</td>
</tr>
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</table>
4. Study 2. A digital role-play citizenship game

A digital role-play game (SplitsZ!) with an online workspace was used in which students completed assignments, both within class and at home, with the aim to develop their media literacy. Media literacy can be understood as the ability to participate in the virtual world in a reflective, critical, and responsible way. The intervention included a series of some 18 lessons in which 6 levels of the educational game SplitsZ! were played (on average, 3 lessons for each level). Students played this role game with the aim of promoting a fictional celebrity. In each level, the students played different roles (e.g., celebrity, manager, marketing manager, and journalist). The SplitsZ!-environment resembled a media site with towers built with billboards and monitors (see Figure 2 for a snapshot of one of the towers). Each tower was owned by a couple of students, who constructed their towers with media products that they had created in the workspace. The assignments in each level were prepared by the teacher and completed by the student in class and at home (e.g., with their parents). Each level was played within one lesson. The other two lessons in each level were set up with reflections on the assignments and a class debate. In sum, students learnt how to present themselves and others online, to assess online sources critically, and become aware of the influence of multimedia on their behaviour and on society, with a focus on the presentation of and communication with images and video clips.

4.1 Method

Using a one-group pre-test-post-test design data was collected of 12 classes (with 235 first-year (grade 7) students (59% female) from 7 secondary schools) in the Western part of the Netherlands. Students played this citizenship role-game SplitsZ! during 8-16 weeks. Only 80 students from 4 classes completed the post-test; the data of one student was removed after outlier analyses.

Students’ media literacy was measured with a 15-items questionnaire, indicating behaviour about and attitude towards downloading information (images, clips and text) from the Internet (7 items, Cronbach’s $\alpha = 0.71$) and uploading information on the Internet (8 items, Cronbach’s $\alpha = 0.73$). All items were formulated in statements and students had to indicate how applicable the statements were on their own situation ($1 = $ not at all to $5 = $ to a large extent). This questionnaire was based on media literacy of Hargittai (2005, 2009) and Cameron, Wise, and Lottridge (2007). We also measured students’ use of social software, communication software, games and virtual worlds (all items on a 5-point scale with $1 = $ low frequency and $5 = $ high frequency) as well as their gender and age.
Repeated measures analyses were used with the difference between pre- and post-test for both measures of media literacy as within-subjects variables, and condition and gender as between-subjects factors. In additional analyses, students’ age and technology use were added as covariates.

4.2 Results

The results of the repeated measures analyses are summarised in Table 2. For media literacy in terms of downloading information from the Internet we found a small main effect of time and an interaction effect of gender. Students generally showed a higher score on media literacy in the post-test than in the pre-test ($F(1,67) = 3.28; p = 0.075; \eta^2 = 0.05$). This main effects was caused by a difference between boys and girls: Boys increased significantly more than girls ($F(1,67) = 3.82; p = 0.055; \eta^2 = 0.05$). A similar, yet stronger, outcome we found with media literacy in terms of uploading information on the Internet. Students had increased significantly in media literacy at the post-test ($F(1,67) = 6.79; p = 0.011; \eta^2 = 0.09$). Again this main effects was caused by a gender difference: Boys increased significantly more in media literacy than girls ($F(1,67) = 5.04; p = 0.028; \eta^2 = 0.07$).

Both interaction effects with gender became even somewhat stronger (with $\eta^2 = 0.08$ for downloading information and $\eta^2 = 0.11$ for uploading information) after controlling for students’ ages and their use of social software, communication software, gaming and virtual worlds.

Table 2: Results of the repeated measures analyses with gender for uploading and downloading web-based information

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>$M$ (SD)</td>
<td>$M$ (SD)</td>
<td>$N$</td>
</tr>
<tr>
<td><strong>Uploading information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>2.36 (0.69)</td>
<td>2.82 (0.77)</td>
<td>30</td>
</tr>
<tr>
<td>Girls</td>
<td>3.25 (0.72)</td>
<td>3.28 (0.78)</td>
<td>39</td>
</tr>
<tr>
<td>All</td>
<td>2.86 (0.83)</td>
<td>3.08 (0.80)</td>
<td>69</td>
</tr>
<tr>
<td><strong>Downloading information</strong></td>
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<td></td>
</tr>
<tr>
<td>Boys</td>
<td>3.10 (1.04)</td>
<td>3.45 (0.72)</td>
<td>30</td>
</tr>
<tr>
<td>Girls</td>
<td>3.86 (0.66)</td>
<td>3.84 (0.75)</td>
<td>39</td>
</tr>
<tr>
<td>All</td>
<td>3.53 (0.92)</td>
<td>3.67 (0.76)</td>
<td>69</td>
</tr>
</tbody>
</table>

5. Discussion and conclusion

The outcomes of both studies only partly confirmed our hypotheses. With respect to our first hypothesis, for both school motivation (Frequency 1550) and learning outcomes (Frequency and SplitsZ!) both boys and girls showed an increase in scores. This means that in both cases game-based learning generally improved student motivation and learning outcomes. However, the second hypothesis was only confirmed in the second study: Boys showed a larger increase in media literacy (both downloading and uploading information) than girls, in addition to the main effects. The results of study 1 even tend to be the opposite with girls profiting more than boys. In addition, the pre-test scores of boys generally were not significantly lower than girls, which would be expected on the basis of debate about the ‘boys problem’. However, both studies included a limited number of students and the games used were quite different in focus and content. Even so, game-based learning seems to work out for both boys and girls.

6. References


Abstract

One of the educational objectives of the Lisbon treaty is to increase basic skills in science, technology, engineering, and mathematics (STEM) disciplines. One cause of poor student performance is mismatches between the predominant teaching style of most instructors in those disciplines and the learning styles of most students. A strategy for achieving the Lisbon objective would be to develop a teaching methodology that can bridge that gap. The inquiry-based science education (IBSE) method has the potential to serve this purpose. The goals of this research project are to assess teaching styles of science instructors and learning styles of their students in several Italian schools and to determine whether the IBSE method effectively addresses the students’ diverse learning needs.

The research will be conducted in two steps. We will first select validated learning style and teaching style assessment instruments appropriate for use in elementary, middle, and high schools in Parma, translating them into Italian if necessary and conducting studies to verify the validity of the translations. The instruments will be administered to random samples of subjects—150 students at each educational level and 200 teachers.

In the second step we will analyze the IBSE method and its ability to address diverse learning styles. Control and experimental groups at the high-school level will be matched on a measure of academic ability, taught the same material using, respectively, the traditional teaching method and the IBSE method, and given the same examinations.

We observed that: (1) Learning style distributions vary with age and type of school; (2) the dominant teaching style depends on the type of school; (3) the dominant teaching style will be mismatched with the learning styles of most students, especially in higher grades; (4) academic performance depends on the degree of compatibility between learning and teaching styles; (5) IBSE is more effective than traditional teaching at addressing a wide range of learning styles.

Keywords: Learning and teaching styles, IBSE, academic performance

References

Cassidy S. (2004), Learning styles: an overview of theories, model, and measures, Educational Psychology 24(1)
The Role of Self-knowledge as Individual Factor in Learning Achievement in Adult Literacy Classes

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Abstract

The purpose of this paper is to explore the importance of personal goals in adult’s engagement or disengagement in literacy classes. According to motivational theory (Atkinson, 1964, Pintrich & Schunk, 2002) and goal theory (Ford & Nicholls, 1987; Ford, 1992) goals affect action. Goals are the object or aim of our actions. They are the driving force of our actions (Maier & Brunstein, 2001). The fact that adults achieve different learning outcomes and apply what they have learned differently, implies that these adults have different goals or motives for engaging in literacy classes (Roebken, 2007). If adults engage in learning, the adults direct their learning activities toward the attainment of their goals by effort expenditure. If adults disengage in learning, the adult learners not only withdraw their effort but also their commitment from unattainable goals (Wrosch et al., 2003). According to Wrosch et al. (2003) disengagement is most adaptive if it leads to pursuing new meaningful goals. Goals are defined at various levels of abstraction. Carver and Scheier (1998) distinguish between do-goals (related to concrete actions) and be-goals (related to the person). Be-goals are higher order goals and are located at the highest level in the goal hierarchy. According to Bourgeois (2009) higher order goals have higher motivational significance for engaging in learning activities.

We used a mixed method combining qualitative and quantitative approaches to understand relations between adults’ motives to learn and their engagement or disengagement in learning. Different analyses were used for quantitative data while in-depth qualitative analysis was performed with interviews.

The data was collected by the first author in 2008 in Togo using a short questionnaire and interview guide in order to question adult learners participating at least once in adult literacy classes. The questionnaire focused on individual socio-demographic characteristics and was filled in individually (sex, age, civil status, degree of participation in literacy classes, type of learning activities undertaken). The interviews were conducted at individual and group level (depending on the environmental conditions) and focused on the variables under study (personal goals and engagement or disengagement). The adults were identified in local communities (rural areas) and marketplaces (urban areas). In total, 152 adult learners were approached. In addition, teachers were interviewed as well in order to have in-depth understanding of adults’ engagement or disengagement in literacy classes.

The adult learners’ sample consisted of 132 participants, exclusively women, engaged in learning activities derived from 10 literacy classes. 97 students (73%) were recruited in rural areas and 35 students (27%) in urban areas. The teachers’ sample was composed of 20 volunteers of which 30% were women.

Adult learners’ age ranged from 20 to 70 years with a mean of 43.6 (SD = 11.72). 78% of the adults were married and 22% were single, divorced or widow. 54% of them never went to school previously; 32% attended primary school and 14% attended secondary school. Finally, the type of learning activities in which the adult learners were involved included writing, reading, calculating and competences-based life skills such as child care, education, children rights, and women rights.

Mean age of the adult participants was relatively high. Civil status indicated that the majority of the adult learners have families and have to care for their children, their household and have to contribute to the community. Only 14% completed literacy classes but the majority of the adult learners 89%) stated to have achieved specific learning outcomes in literacy classes.

Four specific learning outcomes were reported. These were: writing (82%), reading (27%), calculating (23%) and competence skill-based development (60%). The first three were referred to as instrumental learning and the last one as competence development. Analyses showed that students reported writing as the learning which was mostly undertaken.

The adult learners consider both do-goals and be-goals while they engage in literacy classes. However, they prioritize existential needs. These literacy classes will help them to attain these do-goals. Some adult participants express be-goals (feelings of accomplishment). During classes, these students compared their achievement over time. They were able to recognize their own progress by gaining knowledge on learning.
They noticed that they were able to execute skills they had never expected to master such as writing their own name. Writing was achieved progressively and significantly as they appreciated its importance and utility in order to receive credits and to sign with their name. The feelings of accomplishment helped them to move forward in their learning and to better perform.

The results of this study indicated that those adults who strive to attain do-goals persist differently depending on what skills they want to master. Some ‘disengage’ because they notice they already attained their goals during classes and do not feel the need to further engage in learning while they already attained their goals. Those adults who formulated be-goals showed two different patterns: Either they continue to follow literacy classes as they show high effort expenditure or they disengage early because their learning goals are to abstract.

Insight into the goals learners pursue in class is essential to facilitate learning as goals are the driving force moving people forward. To our knowledge this type of study (goals and their relation with engagement or disengagement) has never been done among adult learners engaged in literacy classes.

**Keywords:** Goals, engagement, adult literacy classes.

**References**


The Onion Model: Myth or Reality in the Field of Individual Differences Psychology?

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Abstract

Following recent calls for a more student-centred learning environment, this study aims to empirically test the assumptions of Curry’s onion model and as such provide better insights into the influence of diverse individual learner differences on student learning outcomes. Involving a sample of 113 management and MBA students of a business school located in Belgium, data were collected on these students’ cognitive styles, approaches to studying, didactical preferences, and learning outcomes. Hierarchical regression analyses and path analysis yielded only partial support for the hypotheses that concepts of the outer layers of the onion would explain more of the variance in learning outcomes than concepts that are situated in the centre of the onion (Hypothesis 1), and that the causal relation would run from concepts of the inner layers over concepts of the outer layers to learning outcomes (Hypothesis 2). Further research, using bigger samples and taking a longitudinal approach, is needed to strengthen our understanding, although we are convinced that this study contributes to further conceptual clarification in the field of individual learner differences on the hand and to relevant insights for educational practice on the other hand.

Keywords: Individual learner differences; test of onion model; cognitive styles; approaches to studying; didactical preferences

1. Introduction

Educational scholars and practitioners are increasingly convinced that a ‘one-size-fits-all’ paradigm is no longer an effective education model, as learners approach learning in different ways (Evans, Cools, & Charlesworth, 2010). This implies that contemporary educators have to use diverse learning methods, didactics, and educational interventions to create a constructive and effective learning climate for all learners. To reach this objective, however, it is necessary to develop a good understanding of the impact of individual differences on learning outcomes. Although ample research has been conducted on the roles of cognitive and learning styles and approaches to studying in the context of education (e.g., Armstrong, 2000; Backhaus & Liff, 2007; Riding & Rayner, 1998; Sadler-Smith, Allinson, & Hayes, 2000), we still have no definite answer as to how and when cognitive styles and approaches to studying predict learning outcomes beyond other individual characteristics (Cools et al., submitted). One of the reasons for this lack of understanding might be related to the fact that literature in the field of individual style differences is diffuse (Zhang & Sternberg, 2009). Different authors use concepts such as cognitive styles, learning styles, and learning preferences randomly and interchangeably, and there seems to be no consensus on how these concepts are interrelated (Sadler-Smith, 1999a, 2001a, 2001b).

In an attempt to bring order in the multitude of concepts, Curry (1983, 2000) designed the onion model, which situates existing style theories in an integrated model that distinguishes three levels that are organised as the layers of an onion. The outermost layer is labelled ‘instructional preferences’ (i.e., the individual’s choice of how to learn). Because this layer interacts most with the external features of the learning environment (e.g., learner expectations, teacher expectations), Curry (1983) expected that this is the least stable and most influenced layer. The second layer is labelled ‘information-processing style’ and refers to the individual’s approach – in the classical information-processing perspective – to assimilate information (i.e., orientation, sensory loading, short-term memory, enhanced association, coding system, long-term storage). According to Curry (1983), information processing is not directly involved in the environment and she therefore expected that this layer is more stable than the outer layer, but still subject to the influence of learning strategies. The innermost ‘cognitive personality style’ layer refers to the individual’s approach of

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assimilating and adapting information. This adaptation of information does not directly interact with the environment, but is a function of the deep, more permanent personality.

The onion model is one of the most widely cited integrated models within the style field (Coffield, Moseley, Hall, & Ecclestone, 2004) and ample studies build further on the model’s assumptions (e.g., Hsieh, Jang, Hwang, & Chen, 2011; Richardson, 2011), as it provides an interesting way to distinguish related concepts theoretically. Nevertheless, only few studies have been conducted to empirically test the assumptions of the model (Cools, 2009). Moreover, these studies show contradictory results (e.g., Sadler-Smith, 1999a; Sadler-Smith et al., 2000). To address this research gap, we conducted an empirical study on the relation between diverse individual learner differences and learning outcomes in a management education context to further test the onion model. We subsequently define cognitive styles (inner layer), approaches to studying (middle layer), and didactical preferences (outer layer), and how they are assumed to relate to learning outcomes and to one another before moving to the methodology and results.

1.1 Cognitive styles

Cognitive styles have recently been defined as “individual differences in processing that are integrally linked to a person’s cognitive system… they are a person’s preferred way of processing… they are partly fixed, relatively stable and possibly innate preferences” (Peterson, Rayner, & Armstrong, 2009a, p. 11). Studies investigating the cognitive style concept conclude that students’ cognitive styles are likely to be stable characteristics (Peterson et al., 2009b; Riding & Sadler-Smith, 1997), which implicates that they can be generalised across different contexts and that they are not likely to change based on a specific learning context. Therefore, we consider cognitive style as a concept belonging to the inner layer of the onion model.

Despite the wide diversity of available cognitive style models (Kozhevnikov, 2007), many researchers have focused on the distinction between analytic and intuitive thinking (Hodgkinson & Sadler-Smith, 2003), assuming that cognitive styles can be positioned on an axis, distinguishing an analytic, structured, detail-oriented cognitive style on one side of the axis, and an intuitive, divergent, global cognitive style on the other side of the axis. Following recent evolutions in the style field, however, we preferred a multidimensional rather than a unidimensional perspective in this research (Kozhevnikov, 2007; Sadler-Smith, 2009). Cools and Van den Broeck (2007; 2008a; 2008b) recently developed and validated a multidimensional cognitive style model based on three cognitive styles: knowing, planning, and creating. Individuals with a knowing style prefer a logical, rational, and impersonal way of information processing, and make informed decisions on the basis of a thorough analysis of facts and figures and rational arguments. Individuals who score high on planning are attracted by structure, search for certainty, make decisions in a structured way, and are concerned with efficiency in decision making. Individuals with a creating style search for renewal, like to work in a flexible way, prefer creative and unconventional ways of decision making, and make decisions based on intuition. As previous research in diverse Western and non-Western samples (e.g., students, managers, employees, entrepreneurs) found strong support for the construct validity and predictive validity of this new three-dimensional model (Cools, De Pauw, & Vanderheyden, submitted; Cools and Van den Broeck, 2007, 2008a; 2008b; Cools, Van den Broeck, & Bouckenooghe, 2009), we chose to use this framework in the current study.

1.2 Approaches to studying

An approach to studying is generally defined as “the manner in which studying is grasped” (Ashworth & Greasley, 2009, p. 561), pointing to students’ mental orientation to studying. Entwistle and Peterson (2004a, p. 537) defined an approach to studying as “a context- and content-specific way of carrying out academic tasks”. It is assumed that students prefer to use a certain approach to studying across different learning contexts (Ashworth & Greasley, 2009), although this does not imply that an approach to studying can be considered to be a stable psychological trait, since students have the flexibility to change their approach to studying according to their perception of the specific context (Entwistle & Peterson, 2004b; Segers, Nijhuis, & Gijseelaers, 2006; Struyven, Dochy, Janssens, & Gielen, 2006; Vantommeout, Donche, Gijbels, & Van Petegem, 2009, 2011). Consequently, students’ approaches to studying are defined by features of the learning and teaching environment as well as students’ characteristics and experiences, and as such depend on both the ‘context’ and ‘the learner’. Therefore, approaches to studying are considered to be a concept belonging to the middle layer of the onion model.

Most authors investigating students’ approaches to studying have build further on the work of Marton and Saljö (1997), distinguishing between a deep and a surface approach (Furnham, Christopher, Garwood, &
videos in class. Students who score high on commonly used didactics of passive learning are taking notes, listening to a lecture, and watching supporting groups, while a preference for herself. Didactics of group learning are, for instance, participating in group works, group assignments, are, for instance, class discussions, doing exercises, case studies, and attending workshops. To the contrary, models of instruction that lay the responsibility of learning with the learners. Didactics that fit this approach distinguish between four didactical preferences.

Inspired by the earlier work of Sadler-Smith (1999a; Sadler-Smith et al., 2000) and Chuang (2004), we social skills. Therefore, this concept is seen as belonging to the outermost layer of the onion model.

Didactics of individual learning are self-study, doing individual work in psychology, while the same learner prefers to learn through interaction and group work when learning about social skills. Therefore, this concept is seen as belonging to the outermost layer of the onion model.

1.3 Didactical preferences

Sadler-Smith (1997, p. 52) defined didactical preferences as “individual’s propensity to choose or express a liking for a particular instructional technique or combination of techniques”. Following this definition, students’ didactical preferences depend heavily on the context in which learning takes place, as they will judge the appropriateness of a particular method in relation to the specific subject and context. It is, for instance, possible that a learner wants to learn through individual methods when studying theories of psychology, while the same learner prefers to learn through interaction and group work when learning about social skills. Therefore, this concept is seen as belonging to the outermost layer of the onion model.

Inspired by the earlier work of Sadler-Smith (1999a; Sadler-Smith et al., 2000) and Chuang (2004), we distinguish between four didactical preferences. Active learning is an umbrella term that refers to several models of instruction that lay the responsibility of learning with the learners. Didactics that fit this approach are, for instance, class discussions, doing exercises, case studies, and attending workshops. To the contrary, passive learning refers to a preference to absorb new knowledge by listening to a lecture, and watching supporting videos in class. Students who score high on group learning generally like and learn more by learning in groups, while a preference for individual learning techniques entails that a person likes to learn by him- or herself. Didactics of group learning are, for instance, participating in group works, group assignments, business games, and group discussions. Didactics of individual learning are self-study, doing individual work assignments, and writing individual papers. As there is not much previous work on learning or didactical preferences, we chose to use this four-dimensional model within our research.

1.4 Relationship of individual learner differences to learning outcomes

Quite some research has been conducted on each of the aforementioned individual learner differences in an attempt to predict students’ academic achievement based on their individual characteristics. Some researchers studied the influence of cognitive styles on academic achievement, which yielded unequivocal results. Diseth and Martinsen (2003), for instance, did not find a correlation between cognitive style and academic performance. Although Armstrong (2000), Au (1997), and Backhaus and Liff (2007) found higher academic grades for analytic students in their research, they attributed this to the assessment methods used to score the students rather than to cognitive style differences per se, as it is generally assumed that cognitive styles and overall ability are independent (Cools, 2009; Riding & Rayner, 1998). Furthermore, although some authors do not find a relationship between approaches to studying and academic performance (e.g., Backhaus & Liff, 2007), there seems to be widely held consensus that the approaches to studying students take are related to their academic performance. Research found that a deep approach to studying is positively related to academic performance, as students with a deep approach obtain higher scores on examinations (e.g., Chamorro-Premuzic & Furnham, 2008; Diseth, 2003; Drew & Watkins, 1997). A positive relationship has also been found between a strategic approach to studying and students’ academic performance (Duff, 2003; Diseth & Martinsen, 2003). On the contrary, a negative correlation has been reported between a surface approach and academic performance (Diseth, 2003; Diseth & Martinsen, 2003; Duff, 2003). The direct link between didactical preferences and learning outcomes is less clear, as only few studies have been conducted to investigate this link. Dobson (2009), for instance, found a significant positive relation between preferred sensory modality and course scores. Naimie, Siraj, Abuzaid, and Shagholi (2010) also found evidence for the hypothesis that learning outcomes improve when instructional material is matched to students’ didactical preference. However, it is still unclear from research in this area in general whether
didactical preferences of students should be matched or mismatched with the didactics used to obtain the best academic performance (e.g., Evans & Cools, 2011; Hayes & Allinson, 1993, 1996; Pashler, McDaniel, Rowher, & Bjork, 2009), which is a conclusion that can be extended towards the relation between all these individual learner differences and learning outcomes.

1.5 Research objectives and hypotheses

As mentioned in the introduction, few empirical studies have been conducted to test the assumptions underlying the onion model. Moreover, these studies left us with divergent and sometimes even contradictory results (Price, 2004; Sadler-Smith, 1999a, 1999b, 2001a; Sadler-Smith et al., 2000). Sadler-Smith et al. (2000) and Sadler-Smith (1999a), for instance, framed their research as a test of the onion model, investigating the link between cognitive styles and learning preferences. Sadler-Smith et al. (2000) concluded that their results do not provide sufficient support for any existing link and that the relationship between cognitive style and learning preferences is likely to be mediated by other individual characteristics, such as gender. In contrary, Sadler-Smith (1999a) stated that there is a link between cognitive styles and learning preferences, which according to him provides some support for the onion model. A further examination of the relationship between learning style and cognitive style led Sadler-Smith (2001a) to conclude that cognitive style and learning style are different constructs, which is according to Sadler-Smith (2001b) evidence for the appropriateness of the onion model. The link between cognitive styles, learning styles, and learning preferences was also investigated by Price (2004), but her results did not provide consistent information for predicting students’ academic performance on the basis of these individual learner differences.

Looking at these empirical tests of the onion model, three observations are notable. First of all, it is remarkable that abovementioned studies make use of correlations and analysis of variance to investigate the relationship between the different concepts, as neither correlations nor analysis of variance presume a causal relationship between concepts and hence make it impossible to draw conclusions about the conceptual assumptions of the onion model. A high correlation between cognitive styles and learning preferences suggests that these concepts are interrelated (Sadler-Smith, 2001a), but does this also imply that cognitive style is more robust than learning preferences, as the onion model of Curry (1983) suggests? Second, most studies that aim to test the onion model only took concepts of two layers into account in their design instead of concepts belonging to all three layers of the model. Finally, Curry (1983) originally designed the onion model to organise the cognitive and learning styles field in a more accurate way as a means to get a better understanding of the learning process to eventually improve the learning outcomes of all learners. This implies that studying the effect of concepts belonging to the three layers of the onion model on learning outcomes is as important as investigating the interrelatedness between the concepts themselves. However, most authors do not take learning outcomes into account to test the usefulness of the onion model for educational practice (e.g., Sadler-Smith, 1999a, 2001a, 2001b; Sadler-Smith et al., 2000).

Given these observations, we aim to further empirically test the assumptions underlying the onion model by investigating the relationship between concepts belonging to the three layers of the model on the one hand and their link with learning outcomes on the other hand. More specifically, the causal link between cognitive styles, approaches to studying, and didactical preferences is tested in relation to students’ learning outcomes, using hierarchical regression analysis and path analysis. We hypothesize (1) that concepts of the outer layers will explain more of the variance in learning outcomes than concepts that are situated in the centre of the onion model (Hypothesis 1), and (2) that the causal relation runs from concepts of the inner layers over concepts of the outer layers to learning outcomes (Hypothesis 2).

2. Method

2.1 Sample

Data were collected by means of a self-reporting questionnaire from students of a Belgian business school in the Spring term of 2010. The sample contained 113 students (mean age = 26, SD = 4.99, ranging from 21 to 48 years; 65% men and 35% women; 61% national and 39% international students; 65% postgraduate master in management students and 35% MBA students).
2.2 Measures

Cognitive styles. The 18-item Cognitive Style Indicator (CoSI; Cools & Van den Broeck, 2007) was used to measure cognitive styles, distinguishing between a knowing style (4 items; $\alpha = .73$), a planning style (7 items; $\alpha = .86$), and a creating style (7 items; $\alpha = .84$). The response format is a five-point likert scale from 1 (totally disagree) to 5 (totally agree).

Approaches to studying. We used the Revised Approaches to Studying Inventory (RASI; Duff, 2004; Entwistle & Tait, 1994) to measure approaches to studying. This 45-item instrument uses a five-point likert scale response format from 1 (totally disagree) to 5 (totally agree) and consists of six subscales, of which we used the three subscales linked to different approaches of learning: a surface approach to learning (10 items; $\alpha = .77$), a deep approach to learning (10 items; $\alpha = .69$), and a strategic approach to learning (10 items; $\alpha = .74$).

Didactical preferences. To measure students’ didactical preferences, we searched for an existing validated scale that would be appropriate for use within the Belgian business school. As no adequate measure seemed to exist, we started from the items of Sadler-Smith (1997, 1999a) and Chuang (2004) to compile our own didactical preferences questionnaire. Based on additional feedback from five professors of the business school, some further adaptations were made to the instrument. Preliminary analyses (item analysis, exploratory factor analysis) reduced the initial 33-item questionnaire to 21 items, distinguishing between four subscales: active (5 items; $\alpha = .68$), passive (7 items; $\alpha = .70$), individual (4 items; $\alpha = .64$), and group (5 items; $\alpha = .70$). The response format is a five-point likert scale from 1 (I did not like this didactic at all) to 5 (I like this didactic very much). As didactical preferences are influenced by the specific context in which learning takes place (see above), students answered these questions with a specific course in mind.

Learning outcomes. Following the reasoning that students’ approaches to studying and their didactical preferences can differ according to the specific learning context, academic achievement was conceptualised as the final score of the students on the Management and Organisation course in which they participated during this study. Students were given a score on 20. The scores were normally distributed, with a mean of 14.26 ($SD = 1.51$; min = 10; max = 18).

3. Results

To test Hypothesis 1, hierarchical regression analyses were conducted to examine how the concepts belonging to different layers explain variance in academic achievement, entering the variables in four steps. Model 1 contained only the control variable gender, as this has been found to be a potentially influencing factor in previous research (Sadler-Smith et al., 2000). Model 2 added cognitive styles to this model. Model 3 consisted of cognitive styles and approaches to studying, and Model 4 in its turn added didactical preferences to previous model. As can be seen in Table 1, gender (Model 1: $R^2 = .04$; $F(1,111) = 4.05, p < .05$) had a small effect on students’ academic achievement, with women having a higher overall score than men ($\beta = .19, p < .05$). Cognitive styles alone (Model 2) did not yield significant results in explaining academic achievement ($R^2 = .05$; $F(4,108) = 1.33, p = .26$). Model 3 (gender, cognitive styles, and approaches to studying), was a better predictor of students’ academic achievement than Model 2 (gender and cognitive styles) ($\Delta R^2 = .10, F(3,105) = 4.34, p < .01$). Model 4 (adding didactical preferences) in its turn was a better predictor than the default zero model ($R^2 = .18; F(11,101) = 2.04, p < .05$), but it was no significant improvement compared to Model 3 ($\Delta R^2 = .03; F(4,101) = .92, p = .45$). These findings suggest that Model 3 is the best fitting model. Consequently, Hypothesis 1 is only partly confirmed, as approaches to studying (the middle layer), and not didactical preferences (outer layer) as expected, showed the highest contribution to students’ learning outcomes. Specifically, a strategic approach to studying ($\beta = .25, p < .05$) has been found to have a positive impact on students’ academic achievement, whereas a surface approach had a negative effect ($\beta = -.24, p < .05$).
Table 1: Hierarchical regression of cognitive styles, approaches to studying, and didactical preferences on academic achievement (N = 113)

<table>
<thead>
<tr>
<th>Variables</th>
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<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
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<tr>
<td></td>
<td>β</td>
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<tr>
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<tr>
<td>Knowing</td>
<td>.04</td>
<td>.37</td>
<td>.04</td>
<td>.37</td>
</tr>
<tr>
<td>Planning</td>
<td>-.05</td>
<td>-.46</td>
<td>-.03</td>
<td>-.32</td>
</tr>
<tr>
<td>Creating</td>
<td>.08</td>
<td>.74</td>
<td>.03</td>
<td>.24</td>
</tr>
<tr>
<td>Approaches to studying</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep</td>
<td>-.06</td>
<td>-.53</td>
<td>-.003</td>
<td>-.03</td>
</tr>
<tr>
<td>Strategic</td>
<td>.25</td>
<td>2.63*</td>
<td>.29</td>
<td>2.93**</td>
</tr>
<tr>
<td>Surface</td>
<td>-.24</td>
<td>-.29*</td>
<td>-.20</td>
<td>1.77†</td>
</tr>
<tr>
<td>Didactical preferences</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>-.15</td>
<td>1.24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Passive</td>
<td>-.13</td>
<td>1.19</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Individual</td>
<td>-.03</td>
<td>.33</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Group</td>
<td>.01</td>
<td>.08</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Summary statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>.04*</td>
<td>.05</td>
<td>.15*</td>
<td>.18*</td>
</tr>
<tr>
<td>$\Delta R^2$</td>
<td>.01</td>
<td>.10**</td>
<td>.03</td>
<td>.03</td>
</tr>
</tbody>
</table>

Note. † $p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$

To test Hypothesis 2, we conducted path analysis to examine the causal relationship between the different concepts (see Figure 1), which yielded mixed results.

Figure 1: Path analysis to test causal relationship

The chi-square/degrees of freedom ratio ($\chi^2/df$) of the tested model was 3, which is well below the standard criterion of 5 (Schumacker & Lomax, 2004), thereby suggesting that the model shows an adequate fit to the data. However, when looking at other fit indices, the model did not show an adequate fit: the Comparative Fit Index (CFI) as well as the Normed Fit Index (NFI) were much lower than .90 (CFI = .19, NFI = .31), and the Root Mean Square Error of Approximation (RMSEA) was above .08 (RMSEA = .13). Nevertheless, our hypothesised model demonstrated much better fit to the data than alternative models that we tested, with relative chi-squares ranging from 3.83 to 5.23. Interestingly, our hypothesised model also shows several significant causal paths. As can be seen in Table 2, a significant positive path runs from the creating ($p < .05$) and the knowing ($p < .001$) cognitive style to a deep approach to studying and a negative one from the creating style to a surface approach to studying ($p < .05$). Additionally, following significant paths were found from approaches to studying to didactical preferences: positive paths from a deep approach to studying to a preference for active ($p < .001$) and individual ($p < .01$) didactics, and from a strategic approach to studying to a preference for active ($p < .001$) and group ($p < .001$) didactics, and a negative path from a surface approach to studying to group didactics ($p < .05$). We found no significant path coefficient from didactical preferences to academic achievement. To conclude, Hypothesis 2 is only partially confirmed: the model running from cognitive styles over approaches to studying to didactical preferences showed the most adequate fit, although based on the different fit measures we can not accept the model.
Table 2: Causal relation between cognitive styles, approaches to studying, and didactical preferences to academic achievement (standardized path coefficients) (N = 113)

<table>
<thead>
<tr>
<th>Cognitive styles</th>
<th>Approaches to studying</th>
<th>Didactical preferences</th>
<th>Academic achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deep</td>
<td>Strategic</td>
<td>Surface</td>
</tr>
<tr>
<td>Knowing</td>
<td>.20***</td>
<td></td>
<td>-0.01</td>
</tr>
<tr>
<td>Planning</td>
<td>.08</td>
<td>.20</td>
<td>.20</td>
</tr>
<tr>
<td>Creating</td>
<td>.19</td>
<td></td>
<td>-0.28</td>
</tr>
<tr>
<td>Approaches to studying</td>
<td>Deep</td>
<td>Strategic</td>
<td>Surface</td>
</tr>
<tr>
<td>Deep</td>
<td>.59***</td>
<td>.19</td>
<td>.42**</td>
</tr>
<tr>
<td>Strategic</td>
<td>.65***</td>
<td>.11</td>
<td>.28</td>
</tr>
<tr>
<td>Surface</td>
<td>.04</td>
<td>.17</td>
<td>-0.14</td>
</tr>
<tr>
<td>Didactical preferences</td>
<td>Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01, ***p < .001

4. Discussion and conclusion

Following recent calls for a more student-centred learning environment (Whetten, Johnson, & Sorenson, 2009), this study aimed to empirically test the assumptions of Curry’s onion model. The uniqueness of the study was threefold: the joint focus on concepts of three layers of the onion model simultaneously, the examination of their link with learning outcomes, and the use of appropriate statistical methods to investigate the assumed relationships of the concepts of the onion model. Hierarchical regression analyses and path analysis yielded only partial support for the hypotheses that concepts of the outer layers of the onion would explain more of the variance in learning outcomes than concepts that are situated in the centre of the onion (Hypothesis 1), and that the causal relation would run from concepts of the inner layers over concepts of the outer layers to learning outcomes (Hypothesis 2). More specifically, we found that approaches to studying (middle layer) and not didactical preferences (outer layer) best predicted students’ academic achievement. In terms of the causal relation between cognitive styles, approaches to studying, didactical preferences, and learning outcomes, path analysis led to mixed results, with the best fit to the data for the hypothesised model (onion model) in comparison with alternative models, but overall only good fit for some fit indices and not for others.

Further research, using bigger samples and taking a longitudinal approach, is needed to strengthen our understanding, although we are convinced that this preliminary study contributes to further conceptual clarification in the field of individual learner differences on the hand and to relevant knowledge for educational practice on the other hand by providing better insights into the influence of diverse individual learner differences on student learning outcomes.

5. References


**Acknowledgement**

We are grateful to the Vlerick Academic Research Fund, partially subsidised by the Flemish government, for their financial support to execute this research project.
To Be Conformative or not – A Question of Style or Education?
A Comparative Study of Teacher Students in Sweden and Community Education Students in Scotland.

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Abstract

Education systems in Sweden and Scotland are currently undergoing reforms which have shifted curricula from content driven to student focused approaches. In Higher Education, the shift from elite to more accessible mass education may bring direct implications for teaching and learning. Institutions continually seek evidence of the effectiveness of methods used to facilitate student learning and it is important for teachers in Higher Education to be aware of the different ways that students learn. This article examines the learning styles preferences for 70 students in Sweden and Scotland to consider whether, in light of international research on learning styles, these groups differed. Findings were used to explore why and how this might impact on higher education in terms of students’ learning strategies. The findings suggested the need for diverse teaching approaches and concluded that community education and teacher students differed in their preferences towards sound, design and conformity. The article considers how these differences might be explained and so, might be of interest to those engaged in teaching and learning in Higher Education and those working in discrete professional practice communities.

Keywords: learning styles preferences; teacher education; teacher training; community education: conformity

1. Introduction

The changes from elite to mass higher education brings multiple challenges with regard to pedagogy (Kreber, 2007) and involves changing traditional approaches to teaching and assessment practices so ‘… that not only ‘all’ get admitted into our programs but ‘all’ also have a fair chance to succeed’ (Kreber, 2007 p. 3). While welcomed in improving access to Higher Education this mass education can be one reason why universities feel that students sometimes struggle to cope with their studies and seek to develop efficient and effective study skills and learning strategies in order to balance competing demands of university, family and working life (Ryan, 2010). Students also strive to find individualized educational plans and constructive teaching strategies that work for them in facilitating the successful completion of their degree course. For example, Swedish (Boström, 2011) and Scottish students (Ryan, 2010) are offered a range of coaching and academic support, dedicated to developing study techniques, such as learning strategies, speed reading, note taking. These support mechanisms are intended to enable students to successfully graduate in their specialist fields and to develop capacities that will stay with them beyond their time at university.

Yet, students show a great deal of individual differences in their approaches to learning and so do their teachers. This led us to question how students learn and, if we can demonstrate systematic differences in learning styles, how might these be explained or attributed to differences in teaching styles? Are there advantages to teaching students in the ways they prefer to learn or is there a more complex explanation? The utility of matching teaching methods to learning styles has been widely debated (Redmond, 2010), but when students are presented with learning new and difficult concepts, research shows significant improvement when individual learning styles are matched to instructional strategies (Dunn & Griggs, 2007; Lauridsen 2007). Matching been shown as effective, both in terms of grades and in the meta-cognitive development of students in different fields such as law (Boyle, 2000), engineering (Ingham, 1998) and teacher education (Burke, 2000).

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1 Research on matched versus mismatched strategies is about everything from team building to difficult and new concepts and to analytical objectives. In this study, discussion is limited to what is theoretically a new and difficult concept.
The purpose of this article is to examine differences and similarities in learning styles preferences of students, whose professional interests are in two areas of education: school teacher education; and community education. This research sought to examine whether the two groups differed from each other. Both groups were drawn from undergraduate degree programmes, leading to a professionally endorsed qualification. The content of learning for each of these student groups included basic pedagogical skills and theoretical understandings on how teaching and learning is developed or created.

The remainder of this paper is structured as follows. First, it provides a short introduction of learning styles according to the Dunn and Dunn Learning Styles Model (Dunn & Griggs, 2007). Next, it reviews previous research that informed the study, before outlining the methods used to generate findings. Finally, findings relating to group differences are reported and the implications of these differences for effective teaching will be discussed.

2. What is learning styles theory?

The topic of “Learning Styles” may refer to more than 70 different published models, often with self-contradictory assumptions about learning, different research and instructional designs, and different starting points (Coffield, Ecclestone, Faraday, Hall, & Moseley, 2004; Evans & Waring, 2011). There are many different theories and models of learning styles with varying dimensions and characteristics; different theories focus on different aspects, cognitive processes, personality descriptions, talent, sensory modalities, learning process, thinking styles, etc. (Riding, & Rayner, 1998). In general, learning styles theories assume that all may learn, though in different ways and at different levels. The area is comprehensive and addresses both individual and group level, but also impacts on organizations as a whole (Stensmo, 2006).

In Scandinavia, the two most well-known learning styles models are Kolb’s Learning Styles Model, which describes the brain process and is frequently used as a starting point in problem-based learning (Hård af Segerstad, Klasson, & Tebelius, 1996) and Dunn’s Model (Boström, 2004b), which is multidimensional and widely-used with children, adolescents and adults. Similarly, in Scotland, Kolb’s work is also well-known and used across a range of disciplinary areas as the basis of reflective practice and the creation of experiential learning opportunities (Kolb, 1984). Thinking about learning styles has evolved as part of a wider conversation on learning strategies that encourage deep approaches to learning (Entwistle and Ramsden, 1983; Entwistle, 1993; Marton and Saljö, 1976)

3. The Dunn and Dunn Learning Styles Model

Dunn’s Model is probably one of the most comprehensive, researched, and practiced learning styles theory (Lauridsen, 2007). According to DeBello (1990), there are 11 models that have some or extensive academic research behind them and thus, may be considered more solid than others. In an extensive review de Bello compares these eleven models that are focused on learning strategies. These various models see learning styles from slightly different perspectives and measure or observe using their own methods and terminologies, thus each of the eleven models may differ. Some models are limited to only one variable, eg cognitive or psychological areas (such as Kolb, 1984), while others are multi-dimensional (Schmeck 1998) covering both cognitive and psychological stimuli together with emotional and sociological factors. Even those who contest learning styles theory (such as Coffield et al., 2004; Furnham, Jackson and Miller, 1999; Evans and Warring, 2011) consider Dunn’s model to be one of the ten most prolific. The model covers several dimensions of learning and teaching and has practical and methodological tools for research, which are unique concerning learning styles research (Lauridsen, 2007; Dunn & Griggs, 2007).

Dunn’s Model focuses primarily on the acquisition of new and difficult information. According to Dunn, Dunn, and Perrin (1994), an individual’s learning style provides insight into the ways by which students begin to concentrate on process, and to internalize and remember concepts. Learning styles comprise both biological and developmental preferences that mean identical instructional environments, methods, and resources are effective for some learners and ineffective for others (Thies, 1999 - 2000).

2 Here after referred to as Dunn’s Model
3 Preference means that this is an individual's strengths or needs for learning difficulties and new materials. The preference is marked in the assessment between 20 - 40 or 60 to 80 (see Annex 1).
Forty years of research, both quantitative and qualitative, has shown that there are different learning style factors (also called elements) that can be measured. These elements are divided into five different areas (stimuli): environmental, emotional, sociological, physiological and psychological stimuli (see Figure 1) which in varying degrees affects every individual.

These twenty elements have, in qualified international research, revealed a variety of construct validity evidence (Dunn, Griggs, Olson, Gorman & Beasley 1995). At the individual level, it is essential to be aware of what affects motivation, concentration, and retention and then to match it in style (www.learningstyles.net). This learning-style model is directly applicable on the direct learning situations and should not be confused with psychological models or tests. Most people have preferences, but the patterns of individual style features may be unique. In turn, learning styles are also related to academic performance, gender, age, culture, and processing style.

4. Previous research

There are more than 900 scientific studies on the Dunn´s Model, of which about around 400 are doctoral dissertation theses and other scientific articles. Research on the implementation of this model is spread over 130 universities worldwide, such as U.S. (Whitley & Littleton, 2000); Sweden (Boström, 2004b; Calissendorff, 2005), Norway (Buli – Holmgren, Guldhall & Jensen, 2007), Hungary (Honigsfeld, 2001), Brunei (Pengrad – Jadid, 1998), Bermuda (Bascome, 2004), Germany (Hlawaty, 2002) and Russia (Ulubabova, 2003).

Research has examined many different aspects: different types of school, different ages, and different types of participants, teachers, adults, businesses and others. With regard to the settings in which learning style directed teaching is applicable, there are studies ranging from kindergarten to primary and secondary school, adult education, universities, and senior citizen education. Yet, despite being introduced in the early stages of the BA Degree in Community Education, there was no empirical evidence on how learning styles preferences were reflected in community education students’ experiences of learning, and whether this impacted on the teaching strategies adopted. We also noted that studies focused on whether learning-styles pedagogy has an effect on participants’ performance, retention, attitudes, and behaviors in the classroom and study skills but there was minimal agreement on how any of the learning styles theories might coalesce (Zhang & Sternberg, 2005) or indeed in how they might compliment or inform other theories on learning.

4.1 Learning styles in Higher Education

There are about 60 international studies on Dunn´s Model that apply to higher education. Experimental research with college students has documented significantly higher achievement in a wide range of disciplines; bacteriology, legal writing, marketing, and physics, when learning styles based teaching was used in comparison with traditional methods (Mangino & Griggs, 2007).
Other studies focused on how learning strategies and study skills can be adapted to the students’ learning-styles preferences. For example, research on study techniques that match individual preferences, indicate positive effects in terms of both performance and attitudes when students use individual study advice (Griggs, 1995). Awareness of individual learning styles also seems to affect meta-cognitive skills and the ability of students to utilize personal strategies (Schering, 1999; Hamlin, 2001; Boström, 2004a; Boström & Lassen, 2006). The students seem to have new and deeper perspectives on their own learning potential. Thus, in order to maximize the quality of education, it is important to design in-service training programs for students where their preferences are matched. Further, it has been suggested that students who are not doing well in the education system seem to benefit the most from learning styles pedagogy (Raupers, 2007).

There are many studies conducted in the United States about the use of learning styles pedagogy in teacher training education and in-service training for teachers. One concrete example is the teacher education program at St Joseph's College, NY, where courses in different subjects, math methods for example, are taught through the individual’s perceptual preferences (Burke, 2000). Burke suggests it is particularly important to pay attention to emotional elements such as motivation, structure and persistence, and to give each student individual study strategies after taking the learning styles assessment. Burke also highlights the need to adjust instructional methods for different groups. This led us to examine learning styles preferences across different student groups, and so to our comparison between Sweden and Scotland.

Whitley & Littleton (2000) suggested integrating learning styles with pedagogy to enhance co-operative learning among students and to raise individual student awareness of their own best options for learning. They also proposed building on student strengths to develop personal learning strategies, which was similar in emphasis to the suggestion that teaching should be planned with pedagogical preference in mind (Dunn and Burke, 2007).

Effects of learning styles strategies on adults in human services have been researched in target groups such as social workers, nurses, case workers and direct-care staff from various perspectives such as perceptual preferences, homework, sociological preferences and matching preferences. Research results suggest that awareness of learning styles preferences and strategies are essential to realize goals to continually learning and assisting others in learning process for human service employee (Hamlin, 2001).

### 4.2 Learning Styles research in Higher Education in Sweden and Scotland

Three comparative studies on learning styles preferences in higher education have been published in Scandinavia (Calissendorff, 2008; Stensmo, 2006; Boström, 2011). Stensmo’s (2006) study compared a group of teacher students in practical-aesthetic subjects in terms of perceptual preferences with a normal distribution of teachers’ groups. Future teachers in practical-aesthetic subjects seemed to learn more kinesthetically (whole body involved) as compared to traditional future teacher students.

Boström (2011) compared teacher students to music teachers’ students and found statistically significant differences between the two teacher student groups in their choice of more formal designs, routine, and the times of the day when they would prefer to learn. The findings suggested the need for widely diverse teaching approaches in higher education.

This was also the case in Scotland where, students engage in discussion of the pros and cons of a range of theoretical perspectives during classes in academic enquiry and critical pedagogy. During classes they identify their own learning styles, using different theories (such as Honey and Mumford, 1982; Kolb, 1984) to explore their learning preferences. Despite the contested nature of discourse on learning styles, student feedback suggests the concept is helpful in understanding how they learn. In particular, their thinking about learning styles and discussion of preferences help to make visible their pervious understandings of how knowledge is constructed in a range of social and situated learning environments (Giroux, 2005). Student feedback suggested sufficient interested in learning styles preferences for these theories to be revisited and for more research to be developed. The lack of research in learning styles in community education students, suggested this as an area in need of examination. During in-class discussions, non-traditional students provided insights into their lack of success or enjoyment in previous experiences of learning in school or other formal environments (Ryan, 2010). Thus, for some students, awareness of learning styles may offer a reasonable way of enhancing their capacities to think more deeply about how they learn and how they might utilize a breadth of methods or approaches to create learning environments in community education settings.
5. Method and purpose

This study was designed to compare teacher students to community education students to see whether, and if so, how, they differed from each other, and in light of this, what can be done to match the students learning and teaching experiences with their learning styles preferences?

The following hypothesis was generated:

\[ H_1: \text{There will be significant differences in learning-styles preferences comparing teacher students in Sweden to community education students in Scotland.} \]

5.1 Participants

Empirical data were collected during the years 2009 - 2011. There were 70 participants in the study and these were randomly selected from a total population of 460 students from two universities. This study of 70 trainee teachers and community educators included 22 men and 48 women. The division between the two groups consisted of 35 prospective teachers and 35 prospective community educators.

5.2 Materials

The Productivity Environmental Preference Survey (PEPS), (Dunn, Dunn, & Price, 1984, 1991, 2000) was used to identify participant learning styles preferences. The PEPS analysis consists of 100 items, each with five Likert-type scale points. To reduce response sets, some of the items were reverse-worded with reversible issues. The Likert formats ranged from 1 (definitely disagree) to 5 (absolutely agree). The PEPS can be answered in approximately 25 minutes. Data collected from this assessment yielded computerized profiles of each student’s preferred learning-styles traits based on the 20 variables based on Dunn and Dunn elements illustrated in Figure 1. The PEPS has repeatedly evidenced predictive validity (Dunn et al. 1995; Nelson, Dunn, Griggs, Primavera, Fitzpatrick, Bacilious, & Miller, 1993) and the reliability coefficients for each elements typically fall into the .75 to .88 range (Dunn et al., 1995). The Swedish translation of the instrument was utilized. Examples of questions are contained in Table 1. Responses were processed by computer to obtain scores for each individual on each subscale, rescales to have a mean of 50 and a standard deviation of 10. Table 1 gives examples of PEPS items.

6. Results

The hypothesis that there would be significant differences in learning-styles preferences comparing teacher students to community education students was confirmed.

### Table 1: Examples of PEPS Item

<table>
<thead>
<tr>
<th>Nr.</th>
<th>Questions to answer:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I prefer working in bright light.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>I like to work alone.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>It is easy for me to concentrate late at night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>I like to draw or use diagrams when I work,</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>I often have to be reminded to complete certain tasks or assignments.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>The one job I like doing best, I like to do with an expert in the field.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>I can think better when lying down than sitting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>I prefer cool temperatures when I need to concentrate.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>I like to block out noise or sound when I work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>People keep reminding me to complete my work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 2: Distribution of Low, Flexible, and High Preference Scores for teacher students and community education students.

<table>
<thead>
<tr>
<th>ELEMENTS</th>
<th>low Teachers</th>
<th>flexible Teachers</th>
<th>high Teachers</th>
<th>Chi-square</th>
<th>Significance a</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light</td>
<td>0</td>
<td>80</td>
<td>94</td>
<td>20</td>
<td>6</td>
<td>3.188 *</td>
</tr>
<tr>
<td>Temperature</td>
<td>11</td>
<td>71</td>
<td>74</td>
<td>17</td>
<td>14</td>
<td>0.11 ns</td>
</tr>
<tr>
<td>Design</td>
<td>31</td>
<td>54</td>
<td>83</td>
<td>17</td>
<td>6</td>
<td>7.84 *</td>
</tr>
<tr>
<td>Motivation</td>
<td>11</td>
<td>80</td>
<td>71</td>
<td>9</td>
<td>14</td>
<td>0.78 ns</td>
</tr>
<tr>
<td>Persistent</td>
<td>3</td>
<td>71</td>
<td>77</td>
<td>26</td>
<td>14</td>
<td>0.57 ns</td>
</tr>
<tr>
<td>Conformity</td>
<td>14</td>
<td>77</td>
<td>43</td>
<td>9</td>
<td>6</td>
<td>10.98 ***</td>
</tr>
<tr>
<td>Structure</td>
<td>3</td>
<td>37</td>
<td>51</td>
<td>60</td>
<td>49</td>
<td>2.28 ns</td>
</tr>
<tr>
<td>Alone Peres</td>
<td>11</td>
<td>43</td>
<td>57</td>
<td>46</td>
<td>31</td>
<td>1.64 ns</td>
</tr>
<tr>
<td>Authority Figure</td>
<td>9</td>
<td>66</td>
<td>60</td>
<td>26</td>
<td>26</td>
<td>0.59 ns</td>
</tr>
<tr>
<td>Several Ways</td>
<td>29</td>
<td>71</td>
<td>69</td>
<td>0</td>
<td>9</td>
<td>3.24 ns</td>
</tr>
<tr>
<td>Auditory</td>
<td>11</td>
<td>49</td>
<td>60</td>
<td>40</td>
<td>37</td>
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Figure 2: Percentage distribution of learning styles preferences with high averages
6.1 Descriptive data

Table 2 shows the mean scores for each of the learning-styles elements. Most scores fell essentially between 40 and 60, the region of no strong preferences. Students with scores of between 40 and 60 learn without any special accommodations to their learning styles preferences \textit{as long as they are interested in the content}. When not interested, they learn superficially and are engaged only in short term memory (Dunn & Griggs, 2007). However, Table 2 also shows that large percentages of teacher students and community educators had scores that fell below 40 and above 60 on each of the learning styles elements, indicating that they would benefit from special accommodations to their learning styles preferences.

A review of Table 2 above, and the details provided in Figure 2 and 3, indicates that none of the groups want it to be completely silent and that more teacher students prefer sound compared to community education students. The latter need more light. As for temperature, the distribution is fairly equal. The element design shows teacher students prefer a more informal setting and community education students more formal design, which was surprising, considering the informal approach to pedagogy taken within community education. Motivation is quite equal for both groups. When it comes to persistence, teachers seem to have a higher degree of this trait. Concerning conformity there is a large difference; the community education students are much more non-conforming compared to the Swedish students. A majority of the students in both groups have a strong need for structure (50 – 60%). In the case of sociological preferences, the table shows that teacher students are a bit more group-oriented compared to their Scottish colleagues. The needs for authority and variety, reveals no major discrepancies.

With regard to the perceptual preferences, the Swedish students seem to be less auditory and visual and the Scottish students more kinesthetic and tactile. Regarding the need for snack intake, community education students appear to have a higher percentage level compared to the other population. Time for learning appears not to differ so much. It is evident that across the two groups, most students preferred afternoon as the best time of day for learning. The need for mobility appears to be quite similar between the two groups and there were similar tendencies in strengths and needs.

6.2 Interferential statistics

Table 2 shows, as mentioned above, distributions of high, flexible, and low preference scores for each of the PEPS subscales for both groups of student teachers. In order to explore group differences, a series of 2 (groups) by 3 (score levels) chi-square tests were computed, along with the Cramer’s V effect size statistic.
A review of Table 2 indicates that three of the PEPS subscales, sound, design, and conformity\(^4\) show statistically significant differences and moderate effect sizes between the two student groups. Thus, teacher students are more likely to prefer sound and informal and are more conforming than community education students. If we use a Cramer’s V values of .30 or better as an indicator of moderate effect size, motivation and structure, although not statistically significant in the present study, might be statistically significant, given a larger sample size and, thus, greater statistical power.

7. Discussion and implications

We acknowledge that we are not comparing like with like degree programmes. Yet, we felt there was a shared interest across both student cohorts in that they each focus on developing effective strategies for education, and for understanding the metacognitive process of learning. The results illustrated that teacher students differ from community worker students at two universities in Sweden and Scotland in their learning style preferences, with observed significant differences specifically in the areas of sound, design, and conformity. No previous study has been conducted to compare teacher students with community worker students. This result should therefore be seen as a new and unexplored field of research. In a recap of international studies on different populations it should be noted that there are often differences between various groups, but the individual variations are greater, (Dunn & Griggs, 2007). With regard to the two studied populations the following are noted: it will not compare the two student groups with similar international research, since such studies are not available; the study confirmed that student groups with different orientations appeared to have distinctive preferences (Stensmo, 2006).

Concerning the feature of sound and design, this study showed that teacher students compared to community worker students, prefer sound and informal design when learning new and difficult information. In this case, it may be suggested that the teacher students have their future careers in mind. Their awareness of the importance of environmental preferences, for them and for the children they are going to teach, might make them more aware of this than their Scottish colleagues. However, we feel that this reason is not a satisfactory explanation of why teacher education students appeared to prefer sound and informal design. Community education is intrinsically informal in its design, with learning often developed through conversations in cafes or in community based learning facilities. Thus, perhaps the question of informality appears not to register with community education students for some other reason?

Community education is routinely grounded in critical pedagogy (Freire, 1996) where the starting point for learning is a consciousness raising dialogue that often crosses disciplinary boundaries, and where teachers become learners and learners become teachers. Problem based approaches to learning have been suggested as helping to create authentic learning opportunities that are located in experience, understanding and increased capacity for self-directed learning (Savin-Baden, 2000; Finucane, Johnson and Prideaux, 1998). Thus, perhaps the community education students valued a more problem-based and critical approach which may have clouded the distinction between informal or formal education because there was no way of recording a critical but informal approach using the Dunn and Dunn model?

The third style feature which distinguished the groups was conformity. Teacher students are much more conforming compared to the other group. This comparison led us to consider the dispositions of students in Higher Education who participate in professionally endorsed courses that help to prepare them for professional careers in for example, school and community education. We wondered whether explanations of the differences in relation to sound, design and conformity were in any way linked to the professional practices that the students sought to join on graduation. Thus, it appeared that thinking about and understanding learning styles offers a useful starting point for planning and development of teaching and learning strategies, this is only one part of a configuration of elements are used to create and develop learning. For example, this may be due to the focus of study, the educational platform and the pedagogical perspective.

\(^4\) Conformity refers to tendencies to follow or not follow other people’s guidelines. Conforming students adapt to given directives and frameworks. They work as the teacher expects. Non-conforming students’ works best when they get possibilities to choose strategies. They like to do thing their way and resist directions from others, unless they personally have requested it (Minotti, 2007).
The teacher education examined in this study relies on different pedagogical perspectives and methods that engage students in different learning theories such as cognitive, constructivist and socio-cultural (Mid Sweden University, 2011). This education is profiled against the theme of teacher as leader. Leadership in school permeates a range of skills in teacher education, including discussions of school organization and school leaders’ role, the elements dealing with social psychological processes and choice of working in the classroom. Successful work in school therefore requires both that individual teachers' special abilities are recognized and appreciated, and that efforts be made to allow teachers to learn from each other's leadership styles. Teachers oriented towards a task-oriented leadership, which is good at conveying traditional subject knowledge, develop their abilities to meet socially oriented goals and become better at creating a classroom climate that promotes students' self-knowledge acquisition, as well as vice versa (Berg, 2010).

In Scotland, Community Education, a term initially coined to bring Youth and Community Work and Adult Education into alignment (Tett, 2010), was developed through informal and critical approaches that could be used to counter a qualifications driven agenda set by more formal education. Community Education is suggested as a problem-posing critical pedagogy with a democratic social purpose (Coburn, 2010; Martin, 2007; Wallace, 2008). As such, the benchmark statements for development of HE degrees (QAA, 2009) incorporates clear guidance that students will be expected to learn and create strategies that should equip them with the understanding, skills and attributes needed to challenge inherent power relations that maintain the status quo. In this sense, like all forms of education, community education is not value free, and its particular value base may explain this high level of non-conformity.

### 7.1 Practical Implication

The study showed differences in the preferences of learning of two student groups in Sweden and Scotland, which could be useful when considering similar practices in education in other countries. Students in teacher education differ from students in community education subjects. These differences should be taken into account when planning, teaching and examining courses where different student groups take part, for example in shared areas of curriculum. A variation in teaching, learning and assessment is therefore required to meet student learning needs.

The implications of this study relate to a) teaching strategies, b) prospective teachers and community educators understanding of their own style and how these affect their leadership, and c) understanding of the learning styles of participants and students. For student groups to meet different needs, the insights provided by learning styles preferences of both teachers and students, may be useful in promoting diversity in teaching, learning and assessment. Conclusions to draw from this study for both populations are their high need for structure. Many students enrolled in these two universities (60 - 70%) learn better when they have frameworks, assumptions, plans, and practices on how they should learn difficult and new knowledge. We do not equate this high need for structure as always being about formality or increased levels of teaching by an expert teacher. Rather, learning should be developed in stages that are aligned to the learning styles, approaches and capacities of the student and where traditional views on pedagogy are challenged by conversations that can explore the possibility of a nexus between formal and informal learning (Coburn, 2010) where non-conformity may even be celebrated for its role in promoting creativity.

With learning-styles preferences as a pedagogical platform, both for groups and individuals, teachers become aware of their own differences and those of students. This could bring additional tools for practices in response to the twenty-first century’s challenge for university education to be more widely available to all and where non-traditional students have the opportunity and a fair chance to succeed (Krebers, 2007).

### 8. Conclusion

An understanding that learning styles preferences may combine with particular practice dispositions to maximize student learning experience can be used to enhance graduate capacity for teaching and learning in future. It is important for prospective teachers and community educators to become aware of how they learn and how they will apply this learning within professional practice.

While further research studies, involving larger samples, will be needed to see if, and why these groups differ, this research has been interesting in formulating some key questions around learning styles theory and how this fits within a wider discourse on learning approaches. It has been useful to compare the responses of students in Scotland and Sweden, to see where pedagogies appear to coalesce in working with students who
will be educators themselves in future. It was also interesting to see differences in conformity, and to begin to explain why this might be the case. The findings were inconclusive in discovering whether the difference in levels of conformity was due to the learning styles, strategies and capacities that students brought with them to their courses, or if they were influenced by the professional community of practice (Wenger, 1998) that they sought to join on graduation (either as teachers or community educators). This research leaves us with more questions than answers. In particular we are interested in the extent to which learning styles preferences may be part of a wider puzzle about learning approaches, values and principles.

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Character, Communication, and the Classroom with Learning Styles

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Abstract

The purpose of this investigation was to determine if character development education impacts the implementation of learning style strategies in planning differentiated instruction and student teaching in a graduate education programme. Based on a premise of learning style instruction (Dunn and Dunn, 1992) and the six international traits of being a person of good character (Phi Delta Kappa, 2000), this research addressed the linkage between these two factors. Original work was grounded on multi-media reports regarding the lack of character development components practiced in a classroom and resultant school discipline problems. It was hypothesized that students who experienced a three-hour character development workshop were more inclined to incorporate learning style strategies/differentiated classroom instruction than those who did not attend. This applied to their ability to conduct lessons for student learners at various grade and cognitive levels. This research study examined student learning outcomes of teacher candidates in a graduate education programme and was based on performance on lesson plan rubrics evaluating motivation, instructional materials and strategies, adaptations, differentiation of instruction, developmental procedures, and independent practice. Additionally teacher candidates were evaluated with a teaching performance rubric that addressed the areas of motivation, instructional delivery, pacing, speech delivery, practice, and classroom management. When comparing mean scores of a lesson plan and teaching performance rubrics with teacher candidates who completed the character development workshop, prior to the coursework, or student teaching assessments, and teacher candidates who did not complete the character development workshop before being evaluated, an improvement was noted in key elements of the rubrics. This information suggests that the exposure to and practice of character development may enhance the quality of instruction in the classroom setting.

Keywords: Character development, Communication, Learning styles, Differentiated instruction, Teaching practices

1. Introduction

A Character Development programme was designed in 1999 by Dr. Schiering and instituted in New York State Project SAVE (Safe Schools Against Violence in Education) workshops and college undergraduate and graduate level pre-service teachers, as well as for teachers in New York and New York City elementary, middle, and secondary schools in 2000. A few years later Timothy Ryley joined in conducting this course and after that Dr. Cerruto. The three-hour presentation continues to this day and has been presented internationally. The emphasis in the programme adheres to persons of good character, heightens awareness of positive dispositions, acceptance of others, understanding of individuals’ personal abilities, and the importance of a positive classroom community.

By incorporating these aforementioned personality characteristics there has been evidenced a willingness by teacher candidates to respect learners’ learning preferences by respectfully teaching in accordance with how they process information.

During the eleven years of this course, several things have become apparent, and these are:

1) underpinning every classroom curriculum there needs to be an overall comprehension that we learn how to communicate with one another, effectively, and 2) when we teach character development which adheres to learning style, the classroom becomes a safe place, one of comfort and concern for those we teach who will, hopefully, 3) pass along these components to those with whom they encounter along life’s path.

The need for the course rests on what multi-media sources have informed a world-public about schools once considered the neutral meeting ground for persons of diverse backgrounds, now being far less than neutral

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What has all too often happened is schools pointing to parents, parents at schools, and society in general pointing at everyone else (Brooks & Goble, 1997, p. 21-38). This is noted when referencing poor classroom grades and general poor “socialization practices.” Presently, researchers continue to decry the critical need for developing both cognitive and social skills, as well as providing an equitable balance between these attributes. These are essential for ethical growth in children (Brazil, 2004). Britzman and Hanson (2005) sum up the current state of affairs when referring to our present society placing enormous academic pressure on children, which is often at the expense of character development. With the use of learning style instructional cognitive theory through techniques implemented in the classroom, students come to know not just learning preferences, but how these impact classroom interactions both academically and socially.

Without character development and the practice of learning styles acknowledging students’ preferences for learning, research has shown an increased level of disconnect among students. Also, the ever expanding use of technology influences lack of interpersonal and intrapersonal communication skills as persons text message, use cell phones, but are not customarily involved in personal face-to-face social discourse (Schiering, 2000-2011; Schiering and O’Connor, 2005).

In USA Today magazine (2004), Cordy & Wilson reported 74 percent of student learners cheating on homework, 38 percent having stolen something, 43 percent believing one had to cheat or lie to get ahead in life, 27 percent diminished parent interest or involvement rate in character development between grades K-5 and 9-12. Strangely and conversely, 95 percent of 12,000 school age children thought it was important to be trustworthy (Josephson, 2002). Can children who are lying, cheating and stealing anticipate, from the character traits they profess to have, others being trustworthy? Student and even adult negativity, resulting from grossly inappropriate behaviour, continues to be part of international media reports.

Partially due to the aforementioned negative perspectives that result in antisocial behaviours, bookstores are filled with literature addressing character development. These focus on ethical behaviours, including bullying prevention, tolerance, friendship, feeling special, overcoming setbacks, and strengthening relationships with others, friends, family and/or a higher power, as well as integrity. The goal is to promote self-awareness and self-esteem by providing information that will create amicable relationships, resulting in persons of good character and, ultimately, to create peace within an individual and in a community (Schiering & O’Connor, 2005).

Over 5,000 books and videos on Character Development synthesize the need for character development strategies when relating children relying on what they see in life to determine how people treat each other. As Dr. Martin Luther King stated in a speech in 1947:

“We must remember that intelligence is not enough. Intelligence plus character -- that is the goal of true education. The complete education gives one not only power of concentration, but worthy objectives upon which to concentrate. The broad education will, therefore, transmit to one not only the accumulated knowledge of the race but also the accumulated experience of social living”

(Schiering, Bogner, Boli-Holmberg, 2011, p. 226)

Our not remembering this has exacted a price far too overwhelming and resulted in our finite awareness of the need for social change. This is part of growing-up too fast. As David Elkind (2001) relates in his book by the same title, “...this is because, the real danger of growing up fast is that children learn the rules of social license before they learn the rules of mutual respect” (n.p.)

2. A Course in Character Development

The character development course introduces participants to the six-international character traits and provides multiple opportunities for personal interactive activities to share with other participants. The interplay of beliefs, values, morals, and ethics on behaviour is explored through role plays, self reflective exercises, and sharing activities involving communication techniques. The impact of stress and negativity on character traits is addressed through experiential tasks including the causes of stress and preventative means.

The course begins with attention given to the six international traits of being a person of good character. These include respect, being trustworthy, kind, responsible, caring, and a good citizen. These are based on Phi Delta Kappa International’s character traits. Selecting the concept of one’s being “respectful” the
attendees are asked what they consider to be words connoted with this. A list of their responses is placed on a chart.

With these addressed, communication has begun and the workshop focuses on what causes persons to be less than respectful, and how to change that through implementing the six character traits in a classroom setting and in one’s everyday life (Cerruto, 2009).

Addressing negativity comes next which is followed by concrete examples on how one recalls statements of a less than positive nature, while discarding complimentary ones. Why one holds onto the negative is explained by modelling of this character trait, sometimes through masked humour; sarcasm. “This can be changed by you,” everyone’s told, “because you are a change agent. You are in control of what you say, and the actions you take. An act of your conscious will need to be engaged and practiced with positivity” (Schiering, 2009, p. 68).

The remainder of the workshop addresses literature that is used to relate 1) moral and ethical behaviour that relates to 2) problem solving when one is faced with making a decision, as well as what 3) stress factors impinge on our demonstrating good character traits. A few of these are, a sense of not belonging, teacher dislike, and emotions revolving around feelings of being unaccepted.

Character development and learning styles are presented as solutions to stress and negative feelings as the leaders relate, in their closing comments, that character development impacts how teachers need to teach in accordance with the way students learn. The workshop/course concludes with a review of what was presented in the three hours, discussions that influenced us most, as well as remembering that each of us is a change agent and can alter the course of education by practicing being persons of good character using learning styles.

3. Learning Styles/ Differentiated Instruction

We believe that underlying every classroom curricula is the need to address character development through “style” adherence. This is accomplished with modelling being persons of good character and addressing content curriculum with differentiated instruction, instructional strategies, adaptations, and developmental procedures, varying in accordance with how students’ learn. As McLean stated in 1999, “Teaching and learning should be a function of social change and should be an effective tool in developing critical and unbiased understanding, and thereby greater educational, political, economic and cultural justice” (p.55-91 ). And, “critical pedagogical approaches can help students construct an engaging knowledge, based on their realities and also help them to use their background experiences as a self-empowerment tool,” (Freire & Macedo, 1995, p. 377-402). Clearly, learning styles relates that “Not all students are alike. Based on this knowledge, differentiated instruction applies an approach to teaching and learning so that students have multiple options for taking in information and making sense of ideas.”

This explanation continues with Hall’s (2002, p.3) reference to Tomlinson (2001) in that the concept of learning style/ differentiated instruction provides “different avenues to acquiring content, to processing, and to develop products so students may learn effectively.” Hall explains that “Content refers to what the teacher plans to teach. Process relates to how he/she plans instruction with respect to this being with the whole-class, in groups or partnerships, as well as activities used to instruct. The product is the assessment of the content that has been taught and this is, most commonly, a summative evaluation”’ (Schiering, Bogner, Buli-Holmberg, 2011 in press). In such cases learning styles and character development are realized through the use of one and the development of the other through this application (Schiering, 2008).

A popular learning style Model in the United States is that of Rita Dunn (1984) and the Dunn and Dunn Learning Style Model (1978, 1992, & 1993). It rests on research conducted during nearly four decades. As with other learning style models the statement of most individuals can learn; different instructional environments, resources, and approaches respond to different learning style strengths, is addressed. Over time, many educators have noted that different individuals within their classroom perform better at some tasks than others. And, individuals who perform well in one discipline may perform badly in another and vice versa.

Drawing from these observations, educators and theorists have concluded that individuals possess varying learning styles that correspond to the individual’s differences in perceptive ability, cognitive processing, information management, and sensory variability. Students experiencing learning style classroom
accommodations come to know how he/she learns and compares this to others to develop an appreciation, and later acceptance of these qualities. This creates classroom harmony and accord and is character development in action.

Interestingly, another factor concerning learning styles in classroom design. While some students prefer a highly structured classroom which is considered formal design with furniture to accommodate that, other students prefer a more relaxed and informal environment. Students work is affected by the sense of comfort they have within the classroom which is impacted by the way the room is physically configured. Additionally this classroom arrangement serves as an invitation to learn and teach oneself by having a place that connotes acceptance. While this belief is adhered to by many teachers, it is also conceptualized as being important to realize that creating this physical setting is enhanced by what transpires within that place; giving attention to what is occurring intellectually, conversationally, and emotionally in learning style format.

4. The Transition of Theory into Practice: Character Development and Learning Styles

There is almost an intuitive or invisible transition between the practice of character development and the implementation of learning styles in teaching. It seems as though there is a cognizant, purposeful, and intentional process of incorporating character development techniques into learning experiences. The SAVE workshop highlights how to connect character development with instruction. Ultimately this is what has been observed:

- Character development practiced in teacher candidates’ classrooms,
- Respecting the differences in students’ learning style preferences,
- Exhibition of dispositions of acceptance of these differences.

Through the coursework in the graduate education programme learning styles are implemented in instruction which provides the invisible thread connecting character development principles and learning styles theory.

5. Lesson Plan

Applying character development traits with the understanding that like any other skill it is a learned response that becomes natural through practice, lesson plans are developed. The following information on the components of a lesson plan come from *The Four Kinds of Sentences Lesson Plan* (Schiering, 1965; 2000 – present) and *Teaching and Learning: A Model for Academic and Social Cognition* (Schiering, Bogner, Buli-Holmberg, 2011 in press).

5.1. Motivation:

Candidates know, understand, and use the major concepts, principles, theories, and research that support individual students’ motivation; candidates use their knowledge and understanding of individual and group motivation to foster self motivation.

Application: The teacher will sing the “Four Kinds of Sentences” song and have students practice it.

5.2. Instructional Materials and Strategies

Candidates demonstrate a high level of competence in use of content, and they know, understand and use concepts to help students successfully apply their developing skills to many different materials; candidates understand and use a variety of teaching strategies.

Application:

**Materials:** Handout of the Four Kinds of Sentences song, sentence strips, markers, masking tape, and storybook containing the different sentence types.

**Strategies:** Direct instruction, indirect instruction, small groups, partnerships, hands on instruction, collaborative groupings (Schiering, Bogner & Buli-Holmberg, 2011 in press).

5.3. Adaptations

Candidates understand how students differ in their development and approaches to learning, and to create instructional opportunities that are adapted to diverse students.
Application: For the learner with an auditory disability, the lesson activities and components within them will be provided on an overhead projector and/or Smart Board.

5.4. Differentiation of Instruction
Candidates understand how students differ in their development and approach to learning and create instructional opportunities that are adapted to diverse students.

Application: Since all learners do not learn in the same manner, the students will be separated by learning-style perceptual preferences:

- The tactile learner will create a Velcro Matching game with the names of each sentence type and examples of each of these.
- The visual learner will create a power point presentation of the four sentence types.
- The auditory learner will create an audiotape of the sentence types with definitions provided on the audiotape.
- The kinesthetic learners will conduct a role-play of the four different types of sentences and ask to have the audience identify each one being presented.

5.5. Developmental Procedures
Candidates know, understand, and use the major concepts to construct learning opportunities that support individual students’ acquisition of knowledge. They demonstrate a high level of competence in use of content to help students successfully apply their developing skills to many different areas, as well as understand, and use the connections among concepts, procedures, applications from content areas to build understanding, encourage the application of knowledge, skills, and ideas to real world issues, plan and implement instruction based on subject matter and curricular goals. Candidates use their knowledge and understanding to foster active engagement in learning. Candidates use their knowledge and understanding of effective verbal, nonverbal, and communication techniques to foster active inquiry, collaboration and supportive interaction in the classroom.

Application:

1. The students will be introduced to the four types of sentences: Declarative, Interrogative, Exclamatory, and Imperative. This will be followed by their selecting a partner to give an oral example of each of the sentence types, as the partner identifies each one. Facial expressions, voice modulation and gesturing will be used to accomplish this task. (What are the four types of sentences? What does a declarative sentence tell you, and what punctuation is used at the end of this sentence? What does an Interrogative sentence do and what punctuation is used at the end of this sentence? What does an exclamatory sentence relate, and what punctuation is used at the end of this sentence? What does an Imperative sentence state, and what punctuation is used at the end of this sentence? What types of facial expressions do you use for each one? How do you think this activity helps you identify the correct kind of sentence?)

2. The students, still working with a partner, will write on sentence strips one example of each kind of sentence. This will be without the punctuation mark at the end of the sentences. Sentences will then be tacked on the wall and one student will come forward, read a sentence not of his/her making, identify the kind of sentence, and add the punctuation before calling on another student to do the same thing with another sentence that’s on the wall. (What was the sentence you selected? Were you able to identify the correct kind of sentence, and if so, why do you suppose that was possible? What were the types of sentences placed on the wall? Were you able to place the correct punctuation at the end of the sentence? If so, why do you think you were able to do that? Did you enjoy this activity and if so why and if not, why not? How many sentences were on the wall in total?)

3. In small collaborative groups, the students will remove their sentences from the wall and then cut the individual words from each sentence and scramble these on the floor. (What does it mean to scramble the words? What type of perceptual preferences were you using to do this activity? Is this one that you use to learn best? Why or why not? How many new sentences do you think you can make from the words on the floor?)

4. The students, working together as a whole-class collaborative group, will create as many new sentences from the words on the floor as possible, in 15-minutes. (What does it mean to work collaboratively? How many new sentences do you think you’ll be able to create? Which sentence, if any, did you think to create? What type of ending punctuation did most of the sentences require?)
Was each sentence type presented in the new ones created? Why or why not? What was your opinion of this activity? How many were actually created from the words on the floor? Which cognitive and/or meta-cognitive skills did you use to do activities one through four? Which Reciprocal Thinking Phases were represented in each activity?]

5. The students will form a line, and the teacher will give instructions for different hand gestures for each type of sentence she reads aloud, as the students go to the school gym. Later, they will record their answers to the following questions in their English notebooks. (What is the gesture for a Declarative sentence? What is the gesture for the Interrogative sentence? What are the gestures for the Exclamatory and Imperative sentences? Was this an easy task as we walked to the gym; why or why not? How many sentence types do you suppose you identified correctly?)

5.6. Independent Practice
Candidates demonstrate a high level of competence in use of content to construct learning opportunities that support individual students’ acquisition of knowledge. Candidates know, understand, and use the connection among concepts to motivate students to build understanding and encourage the application of knowledge, skills, and ideas to real world issues.

Application: For homework, the students will write a paragraph with at least one representing each of the four sentence types and share these with the teacher the following day.

6. Teaching Performance
In conjunction with the lesson plan, character development is connected to teaching performance. The teaching performance assignment requires teacher candidates to develop and teach a lesson to students in their field placement class. The lesson plan should specify strategies that will facilitate student learning in a content area, follow the standard Molloy College Lesson Plan, and include applicable New York State Standards. The following elements of the assignment that implement character development are, as above the same ones with the application being applied in the afore-stated Application sections.

Motivation
Candidates establish mental set towards achieving the proposed objectives. Candidate activates and assesses prior knowledge by providing deliberate opportunities for students to discover the connections between content and lift experiences. Students see the purpose and the “big” picture.

Instructional delivery
Candidates model instructional strategies according to developmental procedures of the lesson. Opportunities are provided for checking student understandings. Differentiation of instruction is evident and meets the needs of all student learners. Accurate content and information is evident. The use of instructional aids are varied, multiple, appropriate, and motivational. The teacher candidate moves about the room to address student needs. The; lesson contains elements of enthusiasm. The teacher candidate shows poise and confidence. Students actively engage in the learning process throughout the lesson. There is evidence of lesson closure.

Pacing and Application
The teacher candidate adapts pace by monitoring students and adjusts to meet student needs.

Speech delivery
The teacher candidate’s speech delivery is not hurried and does not contain any noticeable distracters.

Practice
The teacher candidate provides guided practice and independent practice.

Classroom management
Monitoring is subtle and preventative. The teacher candidate is alert to student behaviour and uses positive reinforcement prompts.

In both the teacher lesson plan and performance, the components of character development are exercised when attending to students’ needs.
7. Methodology

All initial certification graduate education students are required to attend the Character Development workshop prior to graduation; however, the students determine when to register and to attend. Between fall 2007 and 2009, 22 and 27 teacher candidates mean scores on the Lesson Plan Rubric were addressed with the fall semester being those students who didn’t experienced the Workshop being compared to those in fall 2009 who had. Between fall 2007 and spring 2009, 18 and 23 teacher candidates mean scores on the Teaching Performance rubric were addressed. The fall 2007 scores were for those who didn’t attend the Save workshop, while the 2009 scores were of those who had taken this workshop. One of the researchers conducted all of the workshops, assisted by one of two teachers, in a classroom at the institution. The 2007 group was the Control group and the 2009 group was the Experimental one.

Average scores from the Lesson Plan and Teaching Performance rubrics that reflect dimensions of SAVE/Character Development workshop included the elements of motivation, instructional materials and strategies, adaptations, differentiation of instruction, developmental procedures, and independent practice; motivation, instructional delivery, pacing, speech delivery, practice and classroom management, respectively.

The scoring scale for the lesson plan rubric was based on a Performance Scale: 1- Unacceptable: Candidate does not meet minimum programme criteria; 2 –Acceptable: Candidate meets programme criteria with competency; and 3 –Target: Therefore, the possible range of raw scores for each element of the rubric was between one (1) and three (3).

8. Results

In the following two charts, mean scores for students in fall 2007 and 2009 who completed the Lesson Plan assignment and had not attended the Save workshop are compared to those in the same semesters who completed the Lesson Plan and those who did attend the Save workshop. This was also the case for the comparisons for Teaching Performance components during the fall 2007 and spring 2009 semesters. Overall, teacher candidates demonstrated an ability to incorporate elements of character development in their written lesson plans and teaching performance, which were equal to or slightly better than those who didn’t attended the workshops.

8.1 Teacher Lesson Plans Percentages

Planning lessons with character development in mind showed small percentage differences between fall ’07/’09 with the range being 1.5% to 6.59%, for students attending the SAVE workshop having higher mean scores than those who did not attend it.

<table>
<thead>
<tr>
<th>Table 1: Lesson Plan Rubric Scores, Fall 2007/Fall 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase III Lesson Plan Graduate Education Initial Certification</td>
</tr>
<tr>
<td>Elements N=22</td>
</tr>
<tr>
<td>Element 3: Motivation</td>
</tr>
<tr>
<td>Element 4: Instructional Materials &amp; Strategies</td>
</tr>
<tr>
<td>Element 5: Adaptations</td>
</tr>
<tr>
<td>Element 6: Differentiation of Instruction</td>
</tr>
<tr>
<td>Element 7: Developmental Procedures</td>
</tr>
<tr>
<td>Element 9: Independent Practice</td>
</tr>
</tbody>
</table>
8.2. Teaching Performance Percentages

Performing lessons with character development incorporated demonstrates teacher candidates’ attention to elements of this as percentage increases ranged between 6.12%-10.49% from fall 2007 to Spring 2009.

Table 2: Teaching Performance Rubric Scores, Fall 2007/2009

<table>
<thead>
<tr>
<th>Phase III Teaching Performance Graduate Education Initial Certification</th>
<th>Fall 2007</th>
<th>Spring 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements N=18</td>
<td></td>
<td>N=23</td>
</tr>
<tr>
<td>Element 2: Motivation</td>
<td>2.74</td>
<td>2.93</td>
</tr>
<tr>
<td>Element 3: Instructional Delivery</td>
<td>2.79</td>
<td>2.97</td>
</tr>
<tr>
<td>Element 4: Pacing</td>
<td>2.55</td>
<td>2.76</td>
</tr>
<tr>
<td>Element 5: Speech Delivery</td>
<td>2.67</td>
<td>2.95</td>
</tr>
<tr>
<td>Element 7: Practice</td>
<td>2.72</td>
<td>3.00</td>
</tr>
<tr>
<td>Element 8: Classroom Management</td>
<td>2.78</td>
<td>2.95</td>
</tr>
</tbody>
</table>

9. Discussion

Based on the preliminary results of this study, teacher candidates who attended the SAVE/character development course were more likely to apply the elements that incorporated learning style preferences. This was exhibited in their lesson plans and being persons of good character when performing them. This is a clear carryover from theory to practice by writing a lesson plan and effectively implementing it.

Due to the small sample size, limited scoring range, these results are only suggestive of the impact the SAVE/Character development workshop on teaching candidates’ perspective of: 1) individual cognitive and social-emotional differences, and 2) learning style preferences. It is suggested that the collection of more data and the statistical analysis of the data take place.

10. Conclusions

The purpose of this investigation was to determine if character development education impacts the comprehension and implementation of learning style strategies in lesson planning and performance in the graduate programme. Examination of teacher candidates’ mean scores on Lesson Plan and Teaching Performance rubrics suggest an increase in performance in areas reflecting being persons of good character, as evidenced by the creation and implementation of innovative teaching and learning techniques for optimum classroom application, after attending the SAVE/character development workshop. This performance suggests that teacher candidates take into account students’ individual cognitive and social-emotional needs, as demonstrated by their application in empirical realms of students’ learning style preferences.

Continued efforts in the college classroom should occur to enhance the impact of character development through the use of learning style strategies. Perhaps the most interesting outcome of this study is the realization that the college classrooms of these teacher candidates were considered to be places where they felt comfortable learning with the idea of carrying this over to their own classroom by connecting character development with learning styles.
11. References


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To Group or not to Group: a Response to Individual Differences Seen Through the Eyes of the Students

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Abstract

Despite a large body of research, and this across many disciplines, on the use of group projects in higher education there is comparatively little work has been done from the student point of view and even less which examines to what extent the use of group work in the higher education classroom can be seen as an appropriate response to individual differences in learning. This paper reports findings from an exploratory study the aim of which was to investigate student perception of the group project experience. The research was carried out in a Swiss Business School with undergraduate management degree students (n=91). Qualitative analysis of student reflective statements through the identification of key words further clustered to form categories was done in the first instance. Participants were subsequently asked to complete the Cognitive Styles Index (CoSI) (Cools & Van den Broeck, 2007) in order to allow for an additional analysis and finally the project score was used to provide a measure for team performance. The data suggest that the use of group projects are a particularly appropriate response to the individual differences in learning that one encounters in today’s higher education classroom and that the extent to which differences in cognitive style are related to the group experience and performance might only be minimal with the exception of the impact of the planning style. These findings are of particular relevance to educators interested in the use of group work in higher education and as a response to the increasingly diverse student bodies that one encounters today.

Keywords: group projects, higher education, cognitive styles

1. Introduction

Management education programmes are increasingly being called upon to develop skills in the students that they can draw upon in their future careers. One way in which such skills can be encouraged is through the use of group projects. A well designed project can be expected to develop competencies that include group interaction and decision making skills, time-management and goal setting, expressing opinions and giving feedback, interpersonal skills and an understanding for group dynamics (Gatfield, 1999; Helms & Haynes, 2010; Jones, 2006; Mello, 1993).

The use of group projects in management education is widespread and has been the subject of considerable research focussed on a variety of issues including: group design and administration (Ashraf, 2004; Bacon, Stewart, & Silver, 1999; Garvin et al., 1995; Holtham, Melville, & Sodhi, 2006); team effectiveness (Cohen & Bailey, 1997; Deeter-Schmeltz, Kennedy, & Ramsey, 2002; Dommer, 2007; Payne, Guastaferro, & Mummert, 2011; Willcoxson, 2006); and enhancing learning (Bacon, 2005; Biggs, 1999; Swaray, 2011; Young, Klemz, & Murphey, 2003) among others. Despite this wealth of research, a review of the literature suggests that comparatively little work has been done from the student point of view and even less which examines to what extent the use of group work in the higher education classroom might be seen as an appropriate response to individual differences in learning.

The background to this research lies within the framework of a group project used in an undergraduate marketing course in which, as part of the project, a reflective statement was required. At the outset this was simply part of the assignment and not originally conceived as a research project thus the exploratory nature of what is presented in this paper. Upon reading the reflective statements, however, it became increasingly clear that this was an excellent opportunity to give the students a voice, the results of which are presented below.

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2. Methodology
The initial sample comprised 91 1st year 1st semester undergraduate management education students working in self-selected groups of 3-5 participants on a marketing project over the duration of eleven weeks. The sample population included both male and female students between the ages of 22 and 25. The majority of students had not met prior to the start of their studies and did not know each other. For many of them the experience with groups projects was limited, few had any real experience of collaborative learning. In light of this, and along with the final project, students were required to submit an individual reflective statement related to the group work experience with detail of the positive and the negative aspects. The aim was to establish the students’ reaction to both the project and to group work.

A total of 91 reflective statements were collected, unfortunately with a response rate of 54% only 49 questionnaires were returned. In retrospect this was influenced by the timing of the questionnaire distribution and the difficulty in getting the completed questionnaires back to the instructor. The final sample size was further reduced to 34 as only complete groups for which both reflective statements and completed questionnaires were available for all group members have been taken into consideration in the analysis. In light of this being exploratory work, however, the small sample size is never-the-less sufficient to provide an indication of the student response as well as to establish the interest in conducting a similar study in subsequent semesters.

The collected statements were analysed qualitatively through the identification of key words which were then clustered to form categories (Miles & Huberman, 1994). In the first instance all the words or phrases that were related to the positive and negative aspects of group work were highlighted. The statements were reread a second time using the same process to see that all the pertinent words/phrases had been extracted. These were then grouped into three categories, two related to advantages of group work: competency-related, skills-related, and one to the disadvantages of group work.

Participants were also asked to complete the 18-item Cognitive Style Indicator (CoSI) (Cools & Van den Broeck, 2007), a self-report questionnaire. This instrument provides measures of a creating style (out of the box and tending towards the unconventional), a knowing style (the logical and rational), and a planning style (organised and efficient). The inclusion of this measure was in order to expand the scope of this research.

Finally the project grade was used to provide a measure for team performance and to see what, if any, relationship might exist between the group experience, cognitive style and performance. The Swiss Higher Education System awards number grades from 1.0 (insufficient) to 6.0 (excellent) with the projects concerned having grades in the following ranges: 4.5-4.8 (satisfactory); 4.9-5.2 (good); 5.3-5.6 (very good); 5.7-6.0 (excellent).

3. Results
The results are shown for the first for the qualitative analysis and then for the quantitative followed by a discussion of a possible relationship suggested by the findings.

3.1 Qualitative analysis
Only the reflective statements of the participants for whom a completed quantitative instrument was available have been used in the analysis providing a final sample of 34 individuals divided into 9 groups of 3-5 individuals. Going back to the literature on “graduateness” it is interesting to see that the compiled key word results can easily be divided into two main categories: competencies and skills, and include much of what both employers and educators would like to engender. Rather than present just a list of key words it is more pertinent to provide exemplars of what the students have to say in the most frequently represented categories. These are shown below in Tables 1 and 2.
Table 1: Competency Exemplars

<table>
<thead>
<tr>
<th>Category</th>
<th>Exemplar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working in a team</td>
<td>I really enjoyed working in a group [...] learning to listen to others, looking for solutions to problems together, correcting each other is enriching. The variety of information and ways of seeing things all having to come together really strengthens the end result. (gp3e)</td>
</tr>
<tr>
<td></td>
<td>This project was, without a doubt, a real challenge: how to organise the group; find one’s place; take everyone’s interests and desires into account; impose one’s ideas when they are the best and know when to stand down when another group member has something more pertinent to say. (gp5a)</td>
</tr>
<tr>
<td></td>
<td>I learned how important it was to always remain united because we were a team and we had a project to work on and it was only in doing it together that we would succeed. (gp8a)</td>
</tr>
<tr>
<td>Debate and discussion</td>
<td>Above all, group work allows for discussion, exchange and debate. (gp1c)</td>
</tr>
<tr>
<td></td>
<td>In fact working in a group allows one to reinforce the relationship with others through the various discussions and debates held. (gp6a)</td>
</tr>
<tr>
<td></td>
<td>Problems were often solved through discussion and debate which could be seen as a waste of time but on the contrary is an advantage. (gp4b)</td>
</tr>
<tr>
<td></td>
<td>One advantage of group work is the different ideas and ways of seeing things that everyone brings with them, this can be a problem but also a resource. (gp8a)</td>
</tr>
<tr>
<td>Ability to synthesize</td>
<td>We had to share our knowledge and bring different points of view together. (gp8d)</td>
</tr>
<tr>
<td></td>
<td>The fact that there were several of us meant that bringing our ideas together gave more depth to our final project. (gp9e)</td>
</tr>
<tr>
<td></td>
<td>Group work implies the bringing together of multiple viewpoints. (gp9d)</td>
</tr>
</tbody>
</table>

Table 2: Skills Exemplars

<table>
<thead>
<tr>
<th>Category</th>
<th>Exemplar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time management/organisation</td>
<td>Thanks to this project I have learned the significance of the word organisation and I must admit that it is a pleasure to finish one’s work ahead of time. (gp6e)</td>
</tr>
<tr>
<td></td>
<td>I had to learn to manage my time based on others which was not always that easy. (gp4c)</td>
</tr>
<tr>
<td>Goal setting</td>
<td>The group experience has taught me that the goal is to complete the job and that sometimes calls for setting aside personal issues which have nothing to do with the final objectives. (gp8d)</td>
</tr>
<tr>
<td></td>
<td>We divided up the work and fixed deadlines. (gp3c)</td>
</tr>
<tr>
<td>Decision making</td>
<td>Everyone has their own way of seeing things and we had to learn to compromise on what was included in the report. (gp9d)</td>
</tr>
<tr>
<td></td>
<td>In fact this project allowed us to see to what extent we could adapt ourselves to others, manage conflict, share viewpoints and in the end make decisions that were acceptable to everyone in the group. (gp8c)</td>
</tr>
</tbody>
</table>

In addition to the above, many students mentioned both how enriching the project was and what good preparation it was for their future careers.

In terms of disadvantages or drawbacks not all of the groups had anything to say and those that did focussed largely on difficulties in communication and finding time to meet. Overall the experience was seen as very positive.
3.2 Quantitative analysis

In addition to the reflective statements, the results from the Cognitive Style Indicator (CoSI) as well as the project grades have been compiled. These are shown in Table 3. The average scores for the three sections: creating, knowing and planning are shown in addition to the compiled overall score by group. The group grade has also been provided as a performance measure.

Table 3: Average CoSI scores for in ascending order by overall compiled score

<table>
<thead>
<tr>
<th>Group</th>
<th>Grade</th>
<th>Creating Average</th>
<th>Creating Std. Dev.</th>
<th>Knowing Average</th>
<th>Knowing Std. Dev.</th>
<th>Planning Average</th>
<th>Planning Std. Dev.</th>
<th>Compiled scores Average</th>
<th>Compiled scores Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.65</td>
<td>3.7</td>
<td>0.52</td>
<td>3.2</td>
<td>0.38</td>
<td>3.2</td>
<td>0.54</td>
<td>61.33</td>
<td>8.50</td>
</tr>
<tr>
<td>7</td>
<td>4.90</td>
<td>4.3</td>
<td>0.47</td>
<td>3.9</td>
<td>0.88</td>
<td>2.6</td>
<td>0.85</td>
<td>63.25</td>
<td>9.25</td>
</tr>
<tr>
<td>6</td>
<td>4.85</td>
<td>3.6</td>
<td>0.29</td>
<td>3.4</td>
<td>0.72</td>
<td>3.5</td>
<td>1.03</td>
<td>63.33</td>
<td>10.21</td>
</tr>
<tr>
<td>2</td>
<td>4.95</td>
<td>3.3</td>
<td>0.42</td>
<td>3.6</td>
<td>0.75</td>
<td>3.8</td>
<td>0.25</td>
<td>64.00</td>
<td>7.07</td>
</tr>
<tr>
<td>4</td>
<td>4.80</td>
<td>3.8</td>
<td>0.69</td>
<td>3.6</td>
<td>0.72</td>
<td>3.5</td>
<td>0.24</td>
<td>65.50</td>
<td>7.51</td>
</tr>
<tr>
<td>9</td>
<td>5.50</td>
<td>4.0</td>
<td>0.65</td>
<td>3.9</td>
<td>0.72</td>
<td>4.1</td>
<td>0.38</td>
<td>66.67</td>
<td>7.37</td>
</tr>
<tr>
<td>5</td>
<td>5.65</td>
<td>3.7</td>
<td>0.93</td>
<td>3.6</td>
<td>1.08</td>
<td>4.0</td>
<td>0.37</td>
<td>67.80</td>
<td>11.88</td>
</tr>
<tr>
<td>3</td>
<td>5.65</td>
<td>3.9</td>
<td>0.31</td>
<td>3.4</td>
<td>0.75</td>
<td>4.0</td>
<td>0.47</td>
<td>68.50</td>
<td>3.79</td>
</tr>
<tr>
<td>8</td>
<td>4.65</td>
<td>3.7</td>
<td>0.36</td>
<td>3.3</td>
<td>0.63</td>
<td>4.0</td>
<td>0.50</td>
<td>72.25</td>
<td>8.26</td>
</tr>
</tbody>
</table>

The above data suggest that there may in fact be a relationship between performance and the level of planning of the group as a whole. With the exception of group 8 with a relatively low grade, the other groups show a parallel progression with grade and the group mean for planning. The other sections, creating and knowing, seem not to have any clear relationship to the final outcome.

With respect to the qualitative comments there is no indication of a relationship between cognitive style and the comments made by the individuals. On the whole all of the students had positive comments to make and many comments were repeated over and over again from one group to another.

In the end the difference between success and failure of group projects seems to lie elsewhere. These particular groups were given an assignment in which a number of checks and balances had been included to preclude social loafing e.g. the groups had the possibility to exclude a member who was then responsible for completing the same project alone; as well as continual absenteeism e.g. through the use of tutorial time for group work. The structure provided by the guided tutorials which accounted for a total of four hours over the semester might well have influenced student reaction to the group project although this was not something that came up in the reflective statements.

4. Conclusion

The work presented in this paper is not without limitations. First, the sample size was relatively small even for exploratory work and secondly the research being rather serendipitous was not organized as best it could have been. It was also unfortunate that the number of groups for which the style instrument was completed only nine. As a result it was not possible to perform any statistical analysis. None-the-less the findings are of value in that they provide some insight into what students have to say about the merits of group work. It is also interesting to see that students found few, if any disadvantages to the group work in this particular instance. Other research has shown the contrary and this may be more closely linked to the manner in which the group project is carried out, however, rather than in reaction to the group work itself.

Practical implications for educators include the following: the use of tutorial time to supervise and or coach the group; clear task descriptions which emphasize the group (team) aspect of the exercise; the inclusion of barriers to social loafing.

In conclusion the research presented above supports the idea that the use of group projects as a pedagogical tool is a way not only to cater to individual differences but to go one step further by exposing students to just such differences in order that they further develop their manner of doing things. This can be seen as a fitting
response to the diversity in approaches to learning that one sees in today’s higher education classrooms and something which will serve them well as they enter into the professional world.

5. References


Do Cognitive Styles Matter? A Four-Decade Review in the Field of Management and Work and Organisational Psychology

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Abstract

Following recent pleas for evidence-based management, this study aims to present an overview of empirical insights about the impact of cognitive styles on management and organisational behaviour, providing a four-decade historical review (1969-2009). The focus of this review lies on the one hand on the implications of cognitive styles for organisations in general by looking at strategic and human resource management aspects (i.e., person-environment fit, entrepreneurship and innovation), and on the other hand specifically on the influence of cognitive styles on people’s day-to-day task-oriented and people-oriented workplace behaviour. Based on this historical review, following general recommendations to strengthen the rigour and relevance of future style research in the area of work and organisational psychology and management can be put forward: (1) increase the number of qualitative and mixed-method studies, (2) stimulate a longitudinal perspective to examine the malleability and impact of styles in occupational settings, (3) encourage a better contextualisation of style research through field research and international comparative studies, and (4) replicate and extend findings of previous research using different style instruments.

Keywords: Cognitive styles; historical review, management and organisational implications

1. Introduction

Cognitive styles – defined as partly fixed, relatively stable and possibly innate individual preferences in information processing that are linked to a person’s cognitive system (Peterson et al., 2009) – are intensively studied in the area of work and organisational psychology (WOP) and management research in an attempt to understand and predict how people behave in organisational settings. Although cognitive styles are considered to be crucial determinants of organisational behaviour that manifest themselves in individual workplace actions and organisational systems and processes (Sadler-Smith & Badger, 1998), level of interest in the field has waxed and waned over the years because of (1) the unclear conceptualisation of the concept in relation to personality, cognition, and other concepts from the field of individual differences psychology, (2) the large number of style dimensions, and (3) the variable quality of some early empirical style research (Zhang & Sternberg, 2009). To get a better view on the assumed relevance of a cognitive style perspective for business and management settings, this paper aims to provide a focused two-part overview of research on the applications of style in the workplace, the first part looking at the organisational level and the second one at individual behaviour.

2. Cognitive styles and organisational behaviour

2.1 Person-environment fit

In the field of cognitive styles, a great deal of attention has been paid to understand the work environment preferences and career choices of people with diverse cognitive styles as well as the consequences of what is called cognitive fit or misfit.

2.1.1 Work environment preferences

Work environments differ in terms of the information-processing requirements that are placed on individuals (Hayes & Allinson, 1998). As cognitive styles are individual preferences in information processing, researchers investigated whether or not they influence people’s work environment preferences. Summarising this research (Allinson & Hayes, 1996; Gardner & Martinko, 1996; Kirton, 2003; Whooten et al., 1994), analytical thinkers have been found to prefer working in well-defined, stable, structured, ordered, and

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relatively impersonal situations, in which they can function within existing rules and procedures and prevailing structures. People with an intuitive style favour unstructured, changing, highly involving, innovative, flexible, dynamic, relatively personalised environments, in which they can work autonomously.

2.1.2 Vocational choices and career preferences

In addition to empirical studies on work environment preferences, quite some scholars have examined the link between cognitive styles and occupation type or career orientation (e.g., Järlström, 2000; Nordvik, 1996). These studies have sought insights into how individual differences influenced career decision making and vocational development, assuming that people with different cognitive styles differ in their vocational choices and self-select for particular jobs as they choose particular occupations on the basis of their preferences for certain task and job characteristics. Studies looked at accountants, artists, nurses, scientists, bankers, teachers, managers, IT professionals, and at diverse types of students as a way to identify the cognitive profile of a broad variety of occupations (e.g., Allinson & Hayes, 1996; Alvi et al., 1988; Cools et al., 2009a, 2009b; Gridley, 2007; Gul, 1986; Kirton, 2003; Parkinson & Taggar, 2007; Witkin et al., 1977).

2.1.3 Cognitive fit or misfit

Following the wide attention for PE fit in other research domains, Chan (1996) introduced the concept of cognitive misfit within the cognitive style field, which he defined as the degree of mismatch between an individual’s cognitive style and the predominant style demands of the work context. Contrary to the large emphasis in theoretical works on the importance of cognitive fit to stimulate job satisfaction and work motivation, few studies have investigated empirically whether or not cognitive (mis)fit actually leads to these expected outcomes. Within the style field, six studies were found in the area of cognitive (mis)fit. Chilton et al. (2005) found that performance decreased and stress levels increased as the gap between software developers’ cognitive styles and the perceived environment demands became wider. Mitchell and Cahill (2005) observed that plebes who voluntarily withdrew from a preparatory training program of the US Naval Academy before completion scored significantly higher on innovation than the ones who stayed, which they attribute to the presumably lower compatibility of this style with the military environment. In a recent study with entrepreneurs, Brigham et al. (2007) found that cognitive misfit led to lower levels of satisfaction with the work environment and higher levels of intention to exit and actual turnover. In a study with engineering functions, Chan (1996) concluded that cognitive misfit provided significant contribution to predict actual turnover, but it was uncorrelated with employee performance. Chang et al. (2008), studying turnover amongst R&D professionals, did not find support for their hypothesis that R&D professionals with an innovative cognitive style would show less turnover than adaptive (i.e., analytical) types. Cools et al. (2009a) found limited support for the hypotheses that people in cognitive fit are more satisfied with their job on the one hand, and that they show less intention to leave and less job search behaviour than people in cognitive misfit on the other hand. However, they did find that people with a creating style show more job search behaviour and intention to leave than people with a planning style, irrespective of the cognitive climate they are working in.

2.1.4 Conclusions and implications

Two major conclusions can be drawn from this review of person-environment fit research in the cognitive style field. First, there are many studies that aim to understand the work environment and vocational preferences of people with diverse cognitive profiles. These studies use a wide range of style measures and look at people who are already employed as well as at diverse types of students who still need to make their career choice. In terms of future research, it might be interesting to replicate the findings of previous investigations, preferably using a different style measure than the one used in the original study or even better a composite measure combining diverse style instruments, as some studies reported inconsistent findings. These inconsistent research findings from past research might be due to the wide range of style measures used in this type of research or alternatively to the unclear conceptualisation of what a specific job or function implies (e.g., Cools et al., 2009a; Hicks et al., 2007). With regard to the latter aspect, Kirton (2003) claimed that there are not only differences between functional groups within organisations, but also within the boundaries of jobs, implying that functions can contain differing cognitive style orientations within them depending on the style demands of the job (e.g., production engineer versus R&D engineer), which is also an area that needs further investigation.
Second, with regard to cognitive (mis)fit, it is striking that five of the six studies discussed focused on one specific occupation (except for Cools et al., 2009a) and that four of these studies used the Kirton Adaption-Innovation Inventory (KAI; Kirton, 1976) to measure cognitive styles, hence adhering to a unidimensional perspective on cognitive styles. Further studies in this area need to (1) take into account different occupational groups in their design and (2) consider multidimensional style perspectives, which is in line with more recent conceptual developments in the style field (e.g., the application of dual-process theory, see Sadler-Smith, 2009). In addition, the PE fit field in general recently conceptualised PE fit as a multidimensional construct, containing fit with the vocation, organisation, job, group, and other people, that evolves over time (Jansen & Kristof-Brown, 2006). Moreover, research on the effects of PE fit on work attitudes, behavioural outcomes, and job performance led to unequivocal results (Hoffman & Woehr, 2006), which was also apparent in the cognitive style studies in this area. In this sense, future cognitive misfit studies also need more complex models in which more individual and environmental factors, a longitudinal perspective, and multiple levels are taken into account.

2.2 Entrepreneurship and innovation

Two broad streams of research on entrepreneurship and innovation can be distinguished within the cognitive style field, one stream focusing on characterising the cognitive profile of entrepreneurs, and a second stream looking at the implications of diverse types of cognitive profiles on the entrepreneurial process and firm performance.

2.2.1 Entrepreneurs versus non-entrepreneurs

Several scholars compared entrepreneurs and non-entrepreneurs to investigate whether or not they differ in their cognitive profile. Goldsmith and Kerr (1991), for instance, reported a higher score on an innovative cognitive style for students following an entrepreneurship class. Similarly, Cools et al. (2009b) found that final year’s students with a creating style showed a preference to be self-employed (rather than being organisationally employed), while the planning style showed a negative correlation with entrepreneurial intention. Buttner and Gryskiewicz (1993) and Stewart et al. (1998) found a more innovative cognitive style among entrepreneurs than among managers in large established organisations; the latter tended to prefer a more adaptive cognitive style. Armstrong and Hird (2009) found that entrepreneurs tended to be more intuitive and less analytic than non-entrepreneurs; more intuitive entrepreneurs also exhibited higher levels of entrepreneurial drive. Allinson et al. (2000) observed that entrepreneurs had a more intuitive style than the general population of managers, but did not differ in their cognitive style from the senior managers and executives in their samples. This finding seems to confirm the belief that intuition increases with hierarchical level, as managers on higher levels – like entrepreneurs – also face uncertainty, time pressure, ambiguity, and incomplete information, which requires of them a more intuitive problem-solving approach (Allinson & Hayes, 1996; Sadler-Smith, 2004).

Following these partially inconsistent findings of previous research in this area, Groves et al. (2008) investigated whether entrepreneurs score higher on nonlinear thinking, as found in most earlier studies, or whether they show a balance between linear and nonlinear thinking, arguing that entrepreneurs need to perform many different tasks that are both analytical and intuitive in nature. As they predicted, the entrepreneurs showed a greater balance in linear/nonlinear thinking style than the professional actors (who scored higher on nonlinear thinking) and accountants (scoring higher on linear thinking) in their study.

2.2.2 Diverse types of entrepreneurs

Within the second stream of entrepreneurship research in the cognitive style field, style differences have been studied in relation to the business opportunity identification process to try to answer the question why some types of entrepreneurs are better able to discover and exploit particular entrepreneurial opportunities than others and how diverse types of entrepreneurs differ in their entrepreneurial processes. Buttner and Gryskiewicz (1993), for instance, found that more innovative entrepreneurs had been operating their business only for a short period (i.e., two years or less), whereas more adaptive entrepreneurs had been operating their business a longer time (i.e., more than eight years). Innovative entrepreneurs also tended to start more ventures than adaptive entrepreneurs (on average 2.4 versus 1.2 businesses respectively). These authors also found that adaptive entrepreneurs spent more time than innovative ones in administrative activities, which is in line with their preferred cognitive style. Barbosa et al. (2007) examined whether entrepreneurs with diverse cognitive styles and risk preferences differ in their entrepreneurial intentions and self-efficacy.
Interestingly, they found that intuitives and analysts differed in their entrepreneurial self-efficacy, with intuitive entrepreneurs showing lower perceived self-efficacy concerning the establishment of relationship with investors (relationship self-efficacy), the economic management of the new venture (managerial self-efficacy), and their capacity to tolerate ambiguity and stress (tolerance self-efficacy). However, intuitive entrepreneurs who also had a high risk preference demonstrated higher levels of opportunity identification self-efficacy.

Other studies within this stream of research focused on the link between cognitive styles and firm growth and performance, making a comparison between the cognitive profiles of entrepreneurs from high performing and low performing firms. Ginn and Sexton (1990), for instance, found cognitive profile differences between founders of rapid-growth versus slower-growth firms, with founders of rapid-growth firms showing a stronger preference for an intuitive approach when gathering information. Sadler-Smith (2004) found that the intuitive cognitive style showed a positive relationship with financial (sales growth) as well as non-financial (efficiency of operations, public image and good will, and quality of products and services) firm performance.

2.2.3 Conclusion and implications

In relation with the recently established cognitive approach within the entrepreneurship field, research on the cognitive profile of entrepreneurs is of potential high economic value. Two major conclusions can be drawn from this research area. First, it can be concluded from this stream of style-related entrepreneurship research that entrepreneurs seem to differ from certain types of non-entrepreneurs (e.g., managers of large organisations). However, these findings are inconsistent across studies reported, with some authors claiming that entrepreneurs do not necessarily score higher on a more intuitive style, but rather show a balance between intuition and analysis (e.g., Groves et al., 2008). In parallel with the earlier suggestions made in relation to PE fit research, a multidimensional in contrary to a unidimensional style perspective needs to be encouraged in future research to get a clearer view on the cognitive profile of entrepreneurs in comparison with diverse types of non-entrepreneurs.

Second, it is clear from the cognitive style studies in the entrepreneurship field that entrepreneurs do not constitute a homogeneous group. Interesting differences have been found between entrepreneurs with different cognitive styles in terms of entrepreneurial processes, firm performance, and growth. Overall, these results seem to be consistent with Olson’s (1985) original idea that particular information-processing approaches are effective at different phases of the entrepreneurial lifecycle. He expected individuals with a more intuitive cognitive style to be more effective in the initiation phase of the entrepreneurial process (i.e., the stage in which new ideas are generated), whereas individuals with a more analytical style would be better in the implementation phase (i.e., the stage in which ideas are put in practice). Further research in this area, using diverse or integrated cognitive style measures as well as a broad range of performance indicators in a longitudinal way, is particularly valuable to stimulate evidence-based practice.

3. Cognitive styles and behaviour in organisations

This section focuses first on empirical results with regard to decision making as an aspect of task-oriented behavioural aspects, and subsequently looks at interpersonal relationships and teamwork as relevant people-oriented behaviours.

3.1 Task-oriented behaviours

The relationship between cognitive styles and decision making has aroused significant interest amongst researchers, as cognitive styles may help explain why people with similar skills and abilities come to different decisions. Research within this domain can be divided in the following categories: decision-making behaviour, decision-making biases, and strategic decision making.

3.1.1 Decision-making behaviour

Studies on decision-making behaviour clearly show that the courses of action in decision making are expressive of decision makers’ cognitive styles (e.g., Antonietti & Gioletta, 1995; Betsch & Kunz, 2008). Leonard et al. (1999), using diverse cognitive style measures, for instance found that people with an analytical style make decisions on the basis of abstract thinking, logic, and careful analysis. Kirton (2003)
concluded that adaptors (using the KAI) tend to take the problems as a given and focus on generating ways to develop better solutions for immediate high efficiency. Innovators focus on redefining problems and producing multiple, non-obvious ideas. Quantitative and qualitative research with the Cognitive Style Indicator (CoSI; Cools & Van den Broeck, 2007) confirms that people with different cognitive styles use different problem-solving strategies and demonstrate various decision-making behaviours (Cools & Van den Broeck, 2007, 2008).

3.1.2 Decision-making biases

People tend to engage in diverse irrational decision-making practices (i.e., cognitive biases, framing effects), which have been shown to vary according to cognitive style differences. For instance, Hayley and Stumpf’s (1989) study with senior and middle managers revealed that different MBTI types (Myers-Briggs Type Indicator; Myers et al., 2003) habitually use distinct heuristics to gather data and evaluate alternatives in strategic decision making. While many Sensing-Feeling (SF) types manifested availability biases (focusing mainly on value-latent or emotional information), a majority of Intuiting-Feeling (NF) types exhibited vividness biases (focusing mainly on idiosyncratic and memorable information). In a later study, Stumpf and Dunbar (1991) found that individuals with particular cognitive styles take patterns of actions that reflect specific biases. Intuiting-Thinking (NT) types were prone to a positivity bias (i.e., emphasis on opportunities and low attention to threat), Sensing-Feelers were prone to a social desirability bias (i.e., conformance to socially acceptable business practices), and Intuiting-Feelers were prone to a reasoning-by-analogy bias (i.e., novel actions for target organisation based on comparison to situation in some other organisation).

As far as framing effects are concerned, McElroy and Seta (2003) found that holists were especially likely to be influenced by the way in which a decision was framed (conforming to the predictions of prospect theory, which expect risk aversion for gains and risk seeking for losses), whilst analytics were not likely to be influenced (conforming to the predictions of expected utility theory, which expect that the way in which the decision is framed does not change the expected utility of the risk-seeking or risk-averse options). Similarly, McIntosh (2005) found that individuals scoring highly on the REI experientiality scale were more likely more swayed by the way in which problems were framed (conforming to predictions of prospect theory).

3.1.3 Strategic decision making

A number of studies have used the MBTI to explore the effects of cognitive style on strategic decision-making processes and outcomes, assuming top managers’ strategic choices reflect their style preferences (e.g., Gallén, 1997, 2006; Hough & ogilvie, 2005). Berr et al. (2000) observed that people with a preference for intuition tended to be consistently perceived (by others) to be more effective in behaviour related to innovation and strategic thinking than managers with a preference for sensing. In addition, they found that perceiving managers were rated better on innovation because they were more willing to take risks or to try something new than their judging counterparts. Hough and ogilvie (2005), using the MBTI, found that Intuiting-Thinking (NT) executives used intuition to make cognitive leaps based on objective information and crafted more decisions of higher quality. Sensing-Feeling (SF) executives took time to seek socially acceptable decisions, made the lowest number of decisions, and made decisions of lowest perceived effectiveness. In a study of 70 senior managers in the spa industry, Gallén (2006) found that Sensing-Thinking (ST) and Sensing-Feeling (SF) types more often described the defender strategy as the most viable option (i.e., offering a stable set of products and competing mainly based on price, quality, service, and delivery), while Intuiting-Thinking (NT) executives preferred a prospector firm strategy (i.e., having a broad product definition, striving to be first in the market, and focusing on change and innovation).

3.1.4 Conclusion and implications

Mohammed and Schwall (2009) recently concluded in their review study on decision making that there has been a lack of systematic research on individual differences in the decision-making context, although this does not seem to be the case for cognitive styles, as they have been extensively studied in the area of decision making (e.g., Hough & ogilvie, 2005; Leonard et al., 1999). Overall, these studies looked at the impact of cognitive style differences on general and specific decision-making behaviours, diverse types of decision-making biases, framing effects, and strategic decision-making practices. It is striking that most research in this area has been conducted using the MBTI as a cognitive style measure. Future research with diverse cognitive style measures is needed to cross-validate findings of previous research and in this sense
can help to gain further insight about the impact of cognitive styles on particular aspects of information processing and decision making, as also suggested by Leonard et al. (1999).

3.2 People-oriented behaviours

A number of studies have examined cognitive styles in relation to various aspects of people-oriented behaviour and teamwork, including dyadic relationships, team processes, and team performance.

3.2.1 Dyadic relationships

Several researchers examined the influence of style congruence on dyadic relationships (e.g., student-supervisor, mentor-protégé) (e.g., Allinson et al., 2001; Armstrong et al., 1997, 2002, 2004; Witkin & Goodenough, 1977). Some studies found that cognitive style congruence led to satisfaction with the relationship, high performance, mutual understanding and liking, effective interpersonal relations, and good communication (e.g., Allinson et al., 2001), although other studies observed opposite results. Armstrong et al. (2002), for instance, found only partial support for the congruence hypothesis, and Armstrong et al. (1997) did not find support in their study for the beneficial impact of style congruence on the quality of the relationship between students and supervisors in an educational context. Cheng et al. (2003) found higher performance on a complex decision task for dissimilar dyads than for dyads with a similar cognitive style. These latter studies suggest that dissimilarity between people may under particular circumstances lead to more positive outcomes than similarity.

3.2.2 Teamwork

With regard to the link between cognitive styles and team behaviour, Armstrong and Priola (2001) found that intuitive team members in self-managed work teams contributed more socio-emotional-oriented (i.e., interactions concerned with group solidarity and attraction between members) and more task-oriented acts (i.e., interactions focused on task attainment) than analytical team members did. As the latter aspect was contrary to their hypothesis, they attributed this to the nature of the task facing the teams, which was relatively unstructured and organic. Priola et al. (2004) tested this assumption further, using a more structured and mechanistic task. They found that intuitive individuals could neither relate to the task, nor find a solution; analytics implemented the logical process necessary to solve the problem, while intuitives focused on maintaining group cohesiveness and the integrity.

Looking at the link between cognitive styles and team outcomes, Basadur and Head (2001) concluded that heterogeneity in cognitive styles had a positive effect on team performance in a creative problem-solving task and homogeneity of cognitive styles in a team led to less time needed to complete the task. In a study using project teams composed of different MBTI types, White (1984) also concluded that the more heterogeneous teams (i.e., containing four different types) were more successful than the less heterogeneous teams (i.e., containing two different types) in their systems development activities. Volkema and Gorman (1998) found no main effect of cognitive-based team composition (i.e., four-person homogeneous or heterogeneous teams with regard to cognitive styles) on decision performance. However, they did find that teams that were composed of diverse MBTI styles contributed significantly more and diverse types of objectives within the problem-formulation phase than homogeneous teams, which had a positive impact on team performance. In contrast, Hammerschmidt (1996) found that eight-person teams with a large cognitive gap (i.e., cognitive style differences of more than 20 KAI points between the four-person planning sub-team and the four-person implementing sub-team in his perspective) had lower success rates than more homogeneous teams. Karn et al.’s (2007) study of team cohesion and performance in software engineering teams found highest performing teams to be predominantly MBTI intuitive-thinking types (typical for engineers), and stylistically heterogeneous teams experienced more conflict and performed significantly worse than homogenous teams.

3.2.3 Conclusion and implications

Despite a longstanding research history, no consensus has been achieved yet about whether team diversity has beneficial or hampering effects on team performance (van Knippenberg & Schippers, 2007). This inconsistency is also notable in the cognitive style research in this area, as there are no clear results about the effects of congruence or heterogeneity on dyadic relationships or teamwork in diverse contexts. Further research is needed to enhance our understanding of cognitive styles in interpersonal relationships, investigating socio-emotional effects as well task-related performance. The nature of the task the team has to
perform or the nature of the relation (e.g., leader-member or mentor-protégé) seems to be very important to take into account in this type of research.

4. General conclusion

Obviously, how people behave in their job and organisation depends not only on their cognitive style, but also on environmental factors and the interaction between their style and environmental conditions. In this sense, many empirical studies within the cognitive styles domain have been concerned with investigating some kind of congruence or fit and its consequences for performance, as styles cannot be studied in isolation. These studies have, for instance, examined the impact of style (dis)similarity within interpersonal relationships, the effects of homogeneous versus heterogeneous cognitive-based teams, or the consequences of cognitive fit or misfit in terms of occupations and work demand. Altogether, these studies aim to increase our understanding of how to use cognitive styles effectively in practice. Suedfeld and Tetlock (2001) argued that – despite the criticism on some theories of cognitive styles and the wide diversity of models – there is “widespread recognition that attention to individual differences could help us to understand variation that otherwise had to be consigned to the category of ‘noise’” (p. 285).

However, on the downside, the results of styles research are not consistent and not conclusive in different areas, as a result of (1) the use of different cognitive style measures (with a predominance of the KAI in cognitive fit research, the MBTI in decision-making research, and the CSI in interpersonal research), (2) a lack of qualitative and longitudinal research, and (3) a lack of contextualisation. Hence, considering the overall research base of this review and the above encouraging quote of Suedfeld and Tetlock (2001), following general recommendations to further improve the rigor and relevance of future style research in the area of work and organisational psychology and management can be made: (1) increase the number of qualitative and mixed-method studies in this field of study, (2) stimulate a longitudinal perspective to examine the malleability and impact of styles in occupational settings, (3) encourage a better contextualisation of style research through field research and international comparative studies, and (4) replicate and extend findings of previous research using different style instruments. Together, these recommendations can stimulate further insights about the impact of the context on people with diverse cognitive styles, acting individually or in interaction with others, in diverse settings.

5. References


On the Efficiency of Non-Linear Didactics: Connecting Learning Profiles to Teaching Methods

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Abstract

In this paper I present the outline and preliminary results of a study with real setting semi-experiments regarding linear and non-linear didactics in relation to learning profiles (Vermunt’s ILS). I tentatively conclude that this relation is vague. I propose follow-up research.

Keywords: non-linearity, didactics, learning styles, semi-experiment, real setting

1. Introduction

Inspired by presentations I attended at previous EL SIN-meetings and at the History of Science in Practice Conference 2009 held in Athens, I dared to pose the question: Does non-linear teaching lead to a better understanding for all learning styles relative to linear teaching? In particular, does non-linear teaching of history improves study results? Is there a significant difference related to learning styles? I developed semi-experiments in a real setting to get the answers.

I start with sharing the background to this study. (2) I proceed to the details on the research questions (3), methodology (4), design of the experiments (5) and scheme of the analysis (6). I give some preliminary results (7) and end the paper with a conclusion (8).

2. Background

Kinchin, Chadha, and Kokotailo (2009) argue that linear teaching, to which instructors are ‘forced’ by presentation software as PowerPoint, Flash, Impress and Keynote, hardly contributes to students’ understanding (Kinchin, 2008). These computer programs provide students with shallow, inert, and ‘decontextualised’ chunks of information.

History is mostly taught in a linear fashion, due to the inherent linear structure of the subject matter. Associative teaching, however, could be beneficial to a better understanding. Studying a chronology by heart is one thing, understanding what history is really about is another. The mere reproduction of a development during an exam as it is provided linearly by a textbook is what results. Examiners can only be disappointed by what they hear. Let me speak for myself: the account given of the history of cosmology by the students taking the exam did not whatsoever disclose a great understanding.

I define ‘linear didactics‘ as a teaching method that adopts a linear structure, imposed by software, a chronological dimension of, or any hierarchy inherent to the subject matter. ‘Non-linear didactics’ is a teaching method that presents the subject matter in an associative way, based on the teacher’s personal understanding of the subject matter. ‘Hybrid didactics‘ is a method that is primarily non-linear but refers to a linear structure as a mnemonic tool. Linear didactics are at a first glance more neutral than the other two, because in the former the hierarchy or chronology seem to be independent of the teacher. However, they are nevertheless constructions as well – constructions of which the author(s) are not (really) known to the students.

I wondered whether non-linear teaching could make the difference and I wanted to check this in a real setting. During the poster session of the ELSIN 2010 conference, I proposed a research design (Cornelis, 2010).

3. Research questions

As mentioned, linearity is criticised, as far as computer presentations are concerned (Kinchin, 2008; Kinchin & Cabott, 2010; Kinchin et al., 2009; ). It would be interesting to know indeed whether in general a non-linear approach has a surplus value and is more efficient than plain linear teaching. Efficiency here means
that as many students as possible attain a better understanding, in comparison with the traditional approach, *ceteris paribus*. In other words, in the same period of time, in the same environment, with the same teacher and regarding exactly the same subject matter, but also for all learning styles. It is conceivable that an overall better result is attained, although for some learning styles the alternative approach implies worse results: if those learning styles concern a minority, they have a lesser impact on the overall picture. Having found a method that improves the global results, it only improves teaching if it serves all learning styles. Therefore the primary hypothesis goes as follows: (PH) non-linear teaching leads to a better understanding for all learning styles relative to linear teaching, *ceteris paribus*. Evidently, a hierarchy or a chronology is most of the time predominant. This is evident as historical topics are concerned, but also in teaching for example math, a hierarchical structure is mostly adopted because the systems provided are axiomatic, hence structured. I limited the research questions, however, to subject matter with a clear chronology, in other words to: history (H), history of science (HSc) and history of philosophy of science (HPSc). Two primary research questions emerged: (PQ1) does non-linear teaching of H/HSc/HPSc improve study results as a measure for better understanding? and (PQ2) is there a significant difference related to learning styles? Why HSc and HPSc, the reader might ask? Because I (still) am a philosopher of science. My idiosyncrasy evidently determines this research.

I have chosen to use Vermunt’s ‘Inventory of Learning Style’ (ILS). According to Cassidy’s (2004) taxonomy of learning styles, Vermunt’s ILS is learning centred and focused on processing information. These are exactly the features to which the discussion on linearity pertains. I have used a shortened version of Vermunt’s test (altered non-validated version developed by ISES), and designed a new test based on the following interpretation of ILS:

- **(R)** Reproduction directed: step-by-step learning, externally steered, absorption of knowledge, anxious to forget, test directed, diploma oriented;
- **(U)** Undirected: barely processing, no distinction between the essential and the incidental, negative self-esteem, in need of encouragement, doubt about choice of study;
- **(M)** Meaning-directed: profound processing, sceptic attitude, autonomous learning, mostly self-steered, constructivist, structuring, interest-oriented, analysing, relation-directed;
- **(A)** Application-directed: learning a craft is essential, interested in practical issues, need for practical examples, external and internal steering, focused on application.

Both tests needed validation, so two secondary research questions were stated: (SQ1) is the shortened ILS-test (LST1) valid, and (SQ2) does a second and new ILS-test (LST2) match the results of the first? Since ‘ceteris paribus’ – all (other) things being equal – the testees should be able to take notes if they were used to do so. Additional research questions popped up: is there a relation between features of the notes taken and the particular learning style (AQ1) and/or the results of the test (AQ2).

**4. Methodology**

To prove the surplus value and efficiency of non-linear teaching, the idea is trialled in several classroom settings, on secondary school level and college level. Linear teaching is the threshold. Each time three groups of testees follow respectively an exclusively linear presentation, an exclusively non-linear presentation and a hybrid presentation on the same topic by the same lecturer. The learning styles of the testees are determined prior to the experiment. A zero-measurement of the knowledge on the topic precedes the lectures immediately. The subjects are identically questioned on the topic right away after the lecture (measuring comprehension). The learning styles will be connected to the results. To determine the individual learning styles, two independent learning style profilers are used. Secondary school teachers will validate them. On college level, students are not followed closely (enough) by academic personnel to assess the profilers. Hence, secondary schoolteachers will check the validity of the tests.

**5. Design**

For PQ1 a measurement before and after the lecture is taken. It is a multiple-choice test of 18 questions: 6 questions on chronology, 6 questions on facts, and 6 questions on understanding. The questions are developed by the lecturers/teachers. The same test is taken immediately before and immediately after.
In order to answer PQ2 the students have filled in two questionnaires. The first test consists of 16 statements that the testee score on whether it is ‘minimally or not recognisable for their way of learning’, ‘more or less recognisable for their way of learning’, and ‘very recognisable for their way of learning’. The second test consists of 11 quadruplets of concepts that they score exclusively 1 to 4, corresponding to the relevance to their way of learning’. Both statements and concepts are linked to ILS.

There was no randomisation. Lecturers needed to be historians, historians of science, and historians of philosophy of science. At the secondary school level, I wanted last year pupils. At college level I wanted students that were obliged to follow the lectures. At the Vrije Universiteit Brussel, I teach ‘Onderzoekend Handelen’ (‘Action Research’) within the Teacher Educational Program (Post-graduate level). At Artesis (Hogeschool Antwerpen), I teach ‘Geschiedenis en filosofie van de wetenschappen’ (‘History and philosophy of science’). Topics were chosen in order to make the lectures fit the aims of the respective courses. However, I looked for and found other experts to do the lecturing: my colleagues Jean Paul Van Bendegem and Bart Van Kerkhoven. I evidently could not do it myself, because of the experimenter’s bias. Former history students of the Vrije Universiteit Brussel were asked to do the experiments at the secondary schools: Iris Gysels and Stefan Joosten. Two other teachers were found (thanks to Jill Ansloos) to validate the tests independently. Jelle De Boos, a former student of me, made it possible to test the learning style profilers on another group of 17-year olds. The sites are listed in Table 1.

### Table 1: Overview of the campuses and schooling level

<table>
<thead>
<tr>
<th>Campuscode</th>
<th>Name</th>
<th>Location</th>
<th>Level of schooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Vrije Universiteit Brussel</td>
<td>Brussel</td>
<td>College</td>
</tr>
<tr>
<td>II</td>
<td>Artesis</td>
<td>Antwerpen</td>
<td>College</td>
</tr>
<tr>
<td>III</td>
<td>Koninklijk Atheneum</td>
<td>Tervuren</td>
<td>Secondary</td>
</tr>
<tr>
<td>IV</td>
<td>Koninklijk Atheneum</td>
<td>Aarschot</td>
<td>Secondary</td>
</tr>
<tr>
<td>V</td>
<td>Koninklijk Atheneum</td>
<td>Mechelen</td>
<td>Secondary</td>
</tr>
<tr>
<td>VI</td>
<td>Kunsthumaniora</td>
<td>Brussel</td>
<td>Secondary</td>
</tr>
</tbody>
</table>

Participants of the experiments at college level were divided in three groups: at random (I) or alphabetically (II). The trials took place on February 21\textsuperscript{st} 2011 (evening) and March 23\textsuperscript{rd} 2011 (afternoon), at times they were used to go to class. They were familiar with the auditoria. To reduce interaction, places to sit were assigned (separated by two seats). The three groups were welcomed at different times. All participants heard the same introductory text, in which they were said that the experiment concerned short-term memory, that they could take notes, and that two tests would be taken (nothing was said about the fact the two tests were exactly the same). They were deceived to make sure they would concentrate on the content, try to memorise, and not focus on the way the lectures were given. Paper to take notes was available (3 pages) on which they were asked to put their name. Before the second test, the notes, however, were gathered (to their big surprise, I might add). They were copied (for the purpose of the content analysis), and returned afterwards. The students of campus II are expected to study the content of the lecture: it is considered to be a part of the overall course. For that reason, the three versions of the PowerPoint presentations are available to them. All participants knew they would be subjected to tests prior to the experiment. They all were informed, except about the real aim of the experiment.

One class period takes about 45 minutes, so the lectures given have a duration between 40 and 45 minutes. The lecturers prepared each three PowerPoint presentations of which the first corresponds to a linear lecture, the second to a non-linear one, and the third to a hybrid one. However, the three PowerPoint presentations are equally sober and linear. The hybrid presentations only differ from the non-linear version in having a supplementary timeline a each slide depicted, to which the lecturer pointed when relevant. The presentations were videotaped for further analysis. Table 2 shows the scheme of the experiments held at campuses I and II.

### Table 2: Scheme of the college-experiments

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3</td>
</tr>
<tr>
<td>Learning style tests</td>
<td>5</td>
</tr>
<tr>
<td>Zero-measurement</td>
<td>10</td>
</tr>
<tr>
<td>Lecture</td>
<td>40-45</td>
</tr>
<tr>
<td>Measurement (same test)</td>
<td>10</td>
</tr>
</tbody>
</table>
For the college students the topics where ‘scientific methodology from a historical point of view’ (I) and ‘philosophy of science from a historical point of view’ (II). The topics for the secondary schools depend on the subject the teachers have to cover at that time. The trials at secondary school level were eventually scheduled for May 2011 but are postponed for several reasons.

6. Analysis

Table 3 gives an overview of the research design in relation to the research questions. Table 4 schedules the overall experiment.

<table>
<thead>
<tr>
<th>Code</th>
<th>Data gathered</th>
<th>Relates to</th>
</tr>
</thead>
<tbody>
<tr>
<td>LST1</td>
<td>Learning Style Test 1</td>
<td>PQ1, PQ2, AQ1</td>
</tr>
<tr>
<td>LST2</td>
<td>Learning Style Test 2</td>
<td>SQ2</td>
</tr>
<tr>
<td>TR1</td>
<td>Pre Test</td>
<td>PQ1, PQ2, AQ2</td>
</tr>
<tr>
<td>N</td>
<td>Notes</td>
<td>AQ1, AQ2</td>
</tr>
<tr>
<td>TRS</td>
<td>Post Test</td>
<td>PQ2, AQ2</td>
</tr>
<tr>
<td>EX</td>
<td>Exam Test</td>
<td>PQ1, PQ2</td>
</tr>
<tr>
<td>VAL</td>
<td>Validation LST1</td>
<td>SQ1</td>
</tr>
</tbody>
</table>

In order to answer SQ1, the secondary school teachers are asked to determine the learning style of their respective students, prior to confrontation with the results displayed in a radar-diagram (Sites III & IV). However, these school teachers have the ‘experimenters bias’. To compensate, an independent studies takes place: both learning style tests are also held in two other schools and there scored by teachers as well (Sites V & VI).

For AQ1 a content analysis is executed on 120 notes. For PQ1, the test results TR1 prior to the lecture are compared with the results TR2 of the test following the lecture. Progress (TR2 > TR1) or regression (TR1 > TR2) are correlated with the individual learning style and the content analysis: the respective results answer PQ2 and AQ2. I will conduct an ANOVA-procedure to discover differences between TR2 and LST1&2 and a critical path analysis.

SQ2 is answered by comparison of 340 pairs of tests. However this is not easy to do. I adhere the soft line regarding learning style. I think that (1) students do not need to have one learning style. Subsequently, a learning profile can be determined by the combination of two or even three learning styles. Also, (2) students have a preference for learning in a certain way, depending on their abilities (nature and nurture determined), their experience and the situation. So it follows that actually learning profiles are determined here and these are relative to a specific situation, i.e. in a classroom context, processing knowledge regarding H, HSc, or HPSc.

7. Preliminary results

At this moment, it is only possible to give some preliminary results. To the question “PQ1: does non-linear teaching of H/HSc/HPSc improve study results as a measure for better understanding?” the answer is ‘no’. The post-test for site I (VUB) gives 10.2 (out of 20) for the linear presentation, while only 8.6 for the non-linear presentation. Also the post-test for site II (Artesis) gives a lower result for the non-linear structured
course. However, the hybrid presentation (*) shows improvement on all topics (facts, chronology, implementation). (Table 5)

Table 5: Test results on 20

<table>
<thead>
<tr>
<th>Location</th>
<th>n</th>
<th>Method</th>
<th>Post-test</th>
<th>(\Delta)</th>
<th>(\Delta 1)</th>
<th>(\Delta 2)</th>
<th>(\Delta 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site I</td>
<td>23</td>
<td>Linear</td>
<td>10.2</td>
<td>5.3</td>
<td>7.0</td>
<td>4.3</td>
<td>4.5</td>
</tr>
<tr>
<td>Site I</td>
<td>20</td>
<td>non-linear</td>
<td>8.6</td>
<td>3.4</td>
<td>5.3</td>
<td>0.3</td>
<td>4.7</td>
</tr>
<tr>
<td>Site I</td>
<td>17</td>
<td>hybrid</td>
<td>9.2</td>
<td>6.6</td>
<td>7.5*</td>
<td>6.6*</td>
<td>5.9*</td>
</tr>
<tr>
<td>Site II</td>
<td>20</td>
<td>linear</td>
<td>11.9</td>
<td>6.4</td>
<td>5.5</td>
<td>11.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Site II</td>
<td>20</td>
<td>non-linear</td>
<td>10.2</td>
<td>2.8</td>
<td>1.5</td>
<td>5.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Site II</td>
<td>20</td>
<td>hybrid</td>
<td>11.7</td>
<td>5.7</td>
<td>3.5</td>
<td>10.3</td>
<td>3.3</td>
</tr>
</tbody>
</table>

*Note. \(\Delta\): global increase, \(\Delta 1\): on facts, \(\Delta 2\): chronology, \(\Delta 3\): implementation

If the learning styles are considered, we can answer PQ2: is there a significant difference in results related to learning styles? The answer is ‘yes’: both sites confirm that for reproduction-oriented and meaning-oriented students the linear teaching style is slightly rewarding, while application-oriented students have a minor benefit with the hybrid teaching style. These results evidently depend on the validity of LST1 (LST2 is not considered here).

8. Conclusion

It is indeed possible to conduct real setting semi-experiments on learning styles and didactics, but, frankly, is not easy to do. I had 120 college level students to work with and it took a lot of preparation. Nevertheless, I am still convinced that this is the only way to really prove things about learning-styles.

The preliminary results are – I admit – disappointing from a statistical point of view. They do indicate that the non-linear approach (as it is understood by the lecturers) does not benefit all learning styles, it does not even serve those who are expected to benefit the most: the meaning-oriented students.

At this moment, I can tentatively conclude that the linear component is necessary. Maybe that is the way the brain works. The presentations were still to a high degree linear; it would be interesting to repeat the experiment with a greater difference in presentation. I am thinking of using explicit linear bulleted lists for one variant and non-linear mind-maps on the other (as in Kinchin’s original surveys). I also consider linear versus exclusively associative thinking, however without a powerpoint presentation, since that could be in the study at hand a variable with the greatest impact. These two new studies, indeed, are closely intertwined.

9. Acknowledgments

I thank Jean Paul Van Bendegem and Bart Van Kerkhove for the lectures: three times the same stuff, but in complete different styles taught in a consecutive way – it was hard and tiresome. I give thanks to Iris Gysels, Stefan Joosten, and Jelle De Boos for the opportunity to gather learning style data in secondary classes.

I thank Esther Goudsmit and Stijn Verwulghen for their assistance during the experiments, Liesbet Van Gysegem for the data-input (on short notice). Special thanks to Katty Elias, my partner, for coping with my stress.

10. References

Linking Supervisor Coaching Behavior to Follower State Goal Orientation: A Moderated Mediation Study

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Katleen DE STOBBELEIR (Vlerick Leuven Gent Management School, Belgium)

Kim BELLENS (Vlerick Leuven Gent Management School, Belgium)

Abstract

Building on recent theorizing on how supervisors can foster a specific state goal orientation by creating a climate that cues this state goal orientation, the present study examines how supervisor coaching behavior, as a proximal feature of followers’ work environment, affects followers’ state learning orientation and state performance-approach orientation. Multiple hierarchical regression analysis of a sample of 1778 employees demonstrates that when employees perceive their supervisor to display coaching behavior, they are more likely to adopt a state learning orientation, and are more inclined to focus on performance, i.e., performance-approach orientation. Results further show that employees’ perceived organizational support for learning, i.e., the extent to which employees perceive their organization to encourage learning behavior, is a mechanism explaining this relationship. Furthermore, moderated mediation analysis reveals that the extent to which employees perceive their supervisor to enact their coaching role in the context of training transfer, i.e. supervisor transfer climate, is a relevant moderator of the effect of perceived organizational support for learning on state learning orientation. These results highlight the important role that supervisors play in creating work environments that effectively cue employees to adopt a specific state goal orientation. In addition, it warrants attention for potential boundary conditions that may have an impact on this relationship.

Keywords: State goal orientation, Supervisor coaching behavior

1. Introduction

Given the increasingly dynamic nature of work (Howard, 1995), it has become critical to gain insight into the circumstances that enhance employees’ motivation to learn. In this regard, the concept of goal orientation has offered a useful perspective for examination. Recent research on the goal orientation construct conceptualizes goal orientation as a three-dimensional construct (e.g., Lee, Sheldon, & Turban, 2003; VandeWalle, Cron & Slocum, 2001). More specifically, goal orientation consists of learning goal orientation, performance/approach orientation and performance-avoid orientation, referring to the goals that are implicitly pursued by individuals in achievement situations. Research has shown that goal orientation has important implications for numerous performance-based outcomes (e.g., Janssen & Van Yperen, 2004; VandeWalle, Brown, Cron, & Slocum, 1999), and that learning orientation in particular is salient for training in organizational contexts (e.g., Fisher & Ford, 1998; Ford, Smith, Weissbein, Gully & Salas, 1998).

Up till now, researchers have mostly treated goal orientation as a dispositional, individual difference factor (e.g., Fisher & Ford, 1998). Recently, experimental, theoretical and empirical contributions (e.g., Breland & Donovan, 2005; Dragoni, 2005; Steele-Johnson, Heintz & Miller, 2008) demonstrated that individuals can be temporarily induced to prefer a specific achievement goal, i.e. a state goal orientation. However, there remains much to be learned about the situational influences that impact individuals’ state goal orientation.

Building on recent theorizing on how leaders can foster a specific follower state goal orientation by creating a climate that supports this state goal orientation (Dragoni, 2005), the present study develops and tests a model (see figure 1) exploring how supervisor coaching behavior affects state goal orientation. More specifically, we hypothesized that supervisor coaching will influence follower state goal orientation through perceived organizational support for learning, i.e. the extent to which employees perceive their organization to encourage employees who exhibit learning behavior. Furthermore, we propose that supervisor transfer climate, signalling the importance supervisors attach to the application of newly learned skills on the job, will moderate this mediated relationship.

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2. Theory Development and Hypotheses

2.1 Supervisor Coaching Behavior and Follower State Goal Orientation

When supervisors engage in coaching behavior they provide one-on-one feedback and share insights aimed at guiding and inspiring improvements in an employee’s work performance (London, 2003; Yukl, 2002). More specifically, coaching entails behaviors such as providing constructive feedback on how to improve (Cannon & Edmondson, 2001), offering guidance in self-evaluation of performance, facilitating creative thinking, encouraging the exploration of alternative ways of working and expressing confidence in and support for taking on new challenges (Heslin, VandeWalle & Latham, 2006). In line with, but also extending, prior research (e.g. Dragoni, 2005; Steele-Johnson et al. 2008) we propose that these kind of behaviors will lead employees to become more inclined to pursue learning and performance outcomes, and to be less inclined to be focused on avoiding failure.

First, research on the Pygmalion effect (e.g. Eden, 1984; Ford, Ford & D’Amelio, 2008) suggests that individuals behave according to the expectancies that reference group members maintain for them. As a consequence, it is argued that when supervisors set certain expectations, their followers will feel obliged to fulfill these expectations and alter their self-expectancies and subsequent motivations accordingly (Eden, 1984). By investigating how leader role expectations influence both climate for innovation and innovative work behavior, Scott and Bruce (2004) have already provided empirical evidence for this theoretical proposition in the creativity domain. Extending these findings to the realm of learning and improvement, supervisor coaching behavior might signal the expectation that followers should engage in learning and improvement behaviors. Consequently, followers should be likely to set implicit goals geared towards learning, performance and improvement at work.

Another argument that supports our proposition lies in the impact of coaching behavior on followers’ attitudes toward failure. According to Cannon and Edmondson (2001) subordinates are likely to be particularly attuned to the behavior of their supervisor towards failure, which informs their own beliefs about failure. Accordingly, supervisor coaching behavior might lead employees to be less inclined to avoid failures and to more easily discuss mistakes. As such, supervisor coaching behavior directs employees towards a learning and improvement attitude and takes away employees’ concern for the negative consequences of failure.

In line with nascent research findings (Steele-Johnson et al., 2008) with regard to the impact of situational cues on state goal orientation and theoretical contributions (Dragoni, 2005; Cannon & Edmondson, 2001) advocating a close link between supervisor coaching behavior and subordinate motivations for learning and improving, we expect that subordinates will be more inclined to pursue learning goals at work, i.e., hold a state learning orientation, when their supervisor displays coaching behavior. Furthermore, to the extent that coaching behavior helps employees to improve and enhance performance, we propose a positive relationship between this kind of behavior and followers’ concern for performance at work, i.e. state performance-approach orientation. Finally, considering the evidence that coaching behaviors take away followers’ fear of failure (Cannon & Edmondson, 2001), it will not be related to followers’ inclination to avoid making
mistakes at work, i.e., state performance-avoid orientation. As a consequence we will not include state performance-avoid orientation in our further hypothesis development. Thus, we expect:

*Hypothesis 1a:* Supervisor coaching behavior will be positively related to followers’ state learning orientation.

*Hypothesis 1b:* Supervisor coaching behavior will be positively related to followers’ state performance-approach orientation.

### 2.2 Supervisor Coaching Behavior and Perceived Organizational Support for Learning

Building on a number of theoretical and empirical contributions (e.g., Dragoni, 2005; Kozlowski & Doherty, 1989; Scott & Bruce, 1994; Walumba, Hartnell & Oke, 2010) asserting that leadership behavior influences followers’ climate perceptions, i.e., their sensemaking of what is valued and expected within their work environment and the broader organization (James et al., 2008), a case can be made for a close link between supervisor coaching behavior and followers’ perceived organizational support for learning.

Theorists posit that social influence processes lie at the heart of the formation of climate perceptions (Ashforth, 1985; James et al., 2008). Moreover, it is expected that interaction processes within the immediate organizational context (e.g. supervisor, co-worker) are more salient to this sensemaking process than more distal interactions (e.g. senior management communication). As such, supervisors, being the most salient and tangible representative of organizational policies, action and procedures, are believed to provide the basis for subordinates’ climate perceptions.

Several empirical studies (e.g. Kozlowski & Doherty, 1989; Scott & Bruce, 1994) provide support for the theoretical assumption that leadership behaviors steer climate perceptions. For example, Scott and Bruce (1994) investigated the relationship between the quality of leader-member exchange and individual perceptions of a climate supportive for innovation. Their results revealed that subordinates who reported having relationships with their supervisors characterized by high levels of support, trust, and autonomy, also reported the organization to be supportive of innovation and judged the resource supply to be high. In addition, Walumba et al. (2010) found support for the impact of servant leadership behaviors, characterized by high ethical standards and service towards followers, on followers’ perceptions of procedural justice climate and service climate.

When supervisors engage in coaching behavior they signal the importance and value of learning. Due to their proximity to employees they are likely to act as ‘climate engineers’ (Naumann & Bennett, 2000). Accordingly, employees are inclined to attribute supervisor values and expectations to the organization. As such, supervisor coaching behavior, i.e. behavior that draws attention to the importance of improving and learning, is likely to enhance followers’ perceptions of organizational support for learning, i.e. the extent to which an employee perceives that the organization encourages, respects, rewards, and recognizes employees who invest time and energy in learning.

To the extent that leadership behavior is proximal and interpreted as representative for more molar organizational characteristics (Kozlowski & Doherty, 1989), we expect that:

*Hypothesis 2:* Supervisor coaching behavior is positively related to followers’ perceived organizational support for learning.

### 2.3 Perceived Organizational Support for Learning and State Goal Orientation

When employees experience high levels of perceived organizational support for learning, they view their work environment as emphasizing the process of learning, encouraging effort for improvement, and deemphasizing the negative consequences of failure (Ames & Archer, 1988). Indeed, climate researchers have argued that climate perceptions effectively cue the expected behaviors, and even prompt individuals to adopt the valued and prescribed approach (Kopelman, Brief & Guzzo, 1990). For instance, Zhou and George (2001) found that perceived organizational support for creativity signals the importance of and the support for creativity at work, effectively leading dissatisfied employees to voice their dissatisfaction through creative behavior. Similarly, employees experiencing high levels of perceived organizational support for learning might feel that they are encouraged to take on challenges, to try out new alternatives and to view problems as opportunities. These climate characteristics might effectively cue and induce a state learning orientation (Ames & Archer, 1988; Papaioannou, Marsh, & Theodorakis, 2004). To the extent that perceived
organizational support for learning signals the value of continuous improvement of performance, it might also have a positive effect on employees’ state performance-approach orientation. Thus, we expect:

**Hypothesis 3a:** Followers’ perceived organizational support for learning will be positively related to followers’ state learning orientation.

**Hypothesis 3b:** Followers’ perceived organizational support for learning will be positively related to followers’ state performance-approach orientation.

Additionally, in line with theoretical contributions and empirical research findings indicating that leadership behaviors impact followers’ attitudes/behaviors through the climate perceptions they create (Dragoni, 2005; Scott & Bruce, 1994; Walumba et al., 2010) and the arguments for hypotheses 1-3, we hypothesize that supervisor coaching behavior will influence state learning orientation and performance-approach orientation through perceived organizational support for learning.

**Hypothesis 4a:** Followers’ perceived organizational support for learning will mediate the relationship between supervisor coaching behavior and followers’ state learning orientation.

**Hypothesis 4b:** Followers’ perceived organizational support for learning will mediate the relationship between supervisor coaching behavior and followers’ state performance-approach orientation.

### 2.4 The moderating role of supervisor transfer climate

We have argued that the relationship between supervisor coaching behavior and followers’ state learning orientation and state performance-approach orientation is mediated by perceived organizational support for learning. However, we expect that the strength of this mediating relationship will differ according to supervisor enactment of their coaching role in the context of training transfer. Indeed, the availability of feedback and support, opportunities to apply learned skills, and the expectation towards employees that they should apply training on the job, might lead employees to focus more on learning at work, i.e. state learning orientation (Lim & Morris, 2006; Tracey, Tannenbaum, & Kavanagh, 1995).

More specifically, building on prior theorizing (Dragoni, 2005) asserting that supervisor transfer behaviors (i.e., providing time to apply learned skills on the job, encouraging using new approaches in the job, showing interest in newly learned skills) influence followers’ state learning orientation, we theorize that supervisor transfer climate will acts as a boundary condition on the predicted relationship between perceived organizational support for learning and state learning orientation. This assumption is in line with previous research suggesting that the even when trainees perceive support for learning and training transfer in the organizational setting, they may need direct or additional reinforcement from a direct supervisor (or a source close to them) to influence goal orientation (e.g., Chiaburu, Van Dam & Hutchins, 2010). Furthermore, we believe that the direction of this moderation will be such that the mediating relationship, and more specifically the indirect path between perceived organizational support for learning and state learning orientation, will be stronger when followers perceive high levels of support for training transfer and weaker when followers perceive low levels support for training transfer.

As supervisor transfer behaviors do not promote demonstration of ability or competitive attitudes, but rather focus followers’ attention toward applying learned skills on the job, we expect that supervisor transfer behaviors will not significantly affect the mediating relationship between supervisor coaching behaviors and followers’ state performance-approach orientation. Accordingly:

**Hypothesis 5a:** Followers’ perceptions of transfer climate will moderate the strength of the mediated relationship between supervisor coaching behavior and state learning orientation, such that the mediated relationship will be stronger under high transfer climate perceptions than under low transfer climate perceptions.

**Hypothesis 5b:** Followers’ perceptions of transfer climate will not moderate the strength of the mediated relationship between a supervisor coaching behavior and state performance-approach orientation.
3. Method

3.1 Participants

Data were collected by means of a self-reporting questionnaire from employees of 14 companies based in Belgium. The sample contained 1778 employees (mean age = 43, SD = 10.32, ranging from 17 to 66 years; 49.6% men and 50.4% women; 95.5% national and 4.5% international employees; 63.1% low-educated and 36.9% high-educated; 13.4% less than 2 years on the job, 20.8% between 2 and 5 years on the job, 14.8% between 6 and 10 years on the job; 10.8% between 11 and 15 years on the job, 7.7% between 16 and 20 years on the job, 32.4% more than 20 years on the job).

3.2 Measures

Supervisor Coaching Behavior. To measure supervisor coaching behavior we used a 10-item scale developed by Heslin et al. (2006) ($a = .94$). A sample item from this scale is “To what extent does your supervisor offer useful suggestions regarding how you can improve your performance?”. Subordinates rated their supervisor behavior on a 5-point Likert-type scale ranging from not at all to to a very great extent.

Perceived Organizational Support for Learning. Four items of Zhou and George (2001) measuring perceived organizational support for creativity were adapted to reflect perceived organizational support for learning. We wrote three additional items to ensure the robustness of the measure and to cover a range of differing formal and informal learning behaviors (e.g. improving, learning new skills, attending training and development programs). These 7 items were averaged to create a measure of perceived organizational support for learning ($a = .82$). Sample items of this scale are “Learning new approaches to the job is encouraged in this company”, and “In this company it is expected that employees regularly attend training programmes”. Subordinates assessed the extent to which they experienced perceived organizational support for learning using a 5-point Likert-type scale ranging from strongly agree to strongly disagree.

State Goal Orientation. Analogous to prior research measuring state goal orientation in a classroom setting (e.g. Ames & Archer, 1988, Breland & Donovan, 2005) we adapted work domain goal orientation items (VandeWalle, 1997) to better reflect and cue the work environment setting. State learning orientation, state performance-approach orientation and state performance-avoid orientation were respectively measured by 5, 4 and 4 items. Sample items are “I enjoy challenging and difficult tasks at work, where I’ll learn new skills” for state learning orientation ($a = .73$), “I’m concerned with showing that I can perform better than my coworkers” for state performance-approach orientation ($a = .74$), and “I prefer to avoid situations at work where I might perform poorly” for state performance-avoid orientation ($a = .72$).

Supervisor Transfer Climate. We used the transfer climate measure designed by Burke and Baldwin (1999), withholding only those items pertaining to supervisor behavior ($a = .86$). Sample items of this reduced scale are “My supervisor has a positive attitude toward training”, and “My supervisor expects me to apply the knowledge and skills I gain in training back to my job”. Subordinates rated these items using a 5-point Likert-type scale ranging from strongly agree to strongly disagree.

Control variables. As individual characteristics might play an important role in how employees perceive learning and training in their organization (Schmidt, 2009). We controlled for individual demographic characteristics, i.e., age, gender, degree and job tenure.

3.3 Analyses

We tested our study hypotheses in two interlinked steps. First, we examined a simple mediation model (Hypotheses 1–4) using hierarchical multiple regressions in line with Baron and Kenny’s multistep approach (1986). Second, we integrated the proposed moderator variable into the model and we empirically tested the overall moderated mediation hypothesis (Hypothesis 5). More specifically, to test Hypotheses 5a and 5b, we utilized an SPSS macro designed by Preacher and his colleagues (2007). This macro facilitates the implementation of the recommended bootstrapping methods and provides a method for probing the significance of conditional indirect effects at different values of the moderator variable.
Table 1: Means, Standard Deviations, Reliabilities and Correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supervisor coaching behavior</td>
<td>3.51</td>
<td>.85</td>
<td>(.94)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perceived organizational support for learning</td>
<td>3.44</td>
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Note: The diagonal values in parentheses represent the alpha-reliability coefficients. * p < .05; ** p < .01; two-tailed.

Table 2: Hierarchical Regressions for the Impact of Supervisor Coaching Behavior and Perceived Organizational Support for Learning on State Learning Orientation

<table>
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<th>Outcomes</th>
<th>Perceived organizational support for learning</th>
<th>State learning orientation</th>
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<td>Job tenure</td>
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<td>-.07**</td>
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<td>Step 2:</td>
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<td>Step 3:</td>
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<td>Perceived organizational support for learning</td>
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<td>Adjusted R²</td>
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<td>R² Change</td>
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<td>.03</td>
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</table>

Note: * p < .05; ** p < .01; Values are standardized coefficients.
Table 3: Hierarchical Regressions for the Impact of Supervisor Coaching Behavior and Perceived organizational Support for Learning on State Performance-approach Orientation

<table>
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<tr>
<td>Age</td>
<td>.11**</td>
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<tr>
<td>Gender</td>
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<td>.10**</td>
</tr>
<tr>
<td>Degree</td>
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<td>.00</td>
</tr>
<tr>
<td>Job tenure</td>
<td>-.18**</td>
<td>-.07**</td>
</tr>
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<td>.67**</td>
</tr>
<tr>
<td>Perceived organizational support for learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adjusted R² | .06 | .50 | .01 | .03 | .04  |
R² Change    | .44 |   .02 | .01 |     |

Note: * p < .05; ** p < .01; Values are standardized coefficients.
4. Data analysis and results

Table 1 presents the means, standard deviations, reliability coefficients, and correlations among the study variables. An inspection of the correlations reveals that supervisor coaching behavior is positively related to perceived organizational support for learning \((r = .69, p < .01)\), state learning orientation \((r = .21, p < .01)\), and state performance-approach orientation \((r = .14, p < .01)\). Results also indicate a positive correlation between perceived organizational support for learning and both state learning orientation \((r = .22, p < .01)\) and state performance-approach orientation \((r = .15, p < .01)\).

4.1 Tests of Mediation

Collectively, Hypotheses 1 to 4 suggest an indirect effects model, whereby the relationship between supervisor coaching and state goal orientation is transmitted by perceived organizational support for learning. Tests of such mediation hypothesis are guided by the multistep approach proposed by Baron and Kenny (1986). According to this approach, four conditions should be met to establish mediation: 1) the independent variable and dependent variable should be significantly related (Hypothesis 1a, 1b); 2) the independent variable and mediating variable should be significantly related (Hypothesis 2); 3) the mediator and dependent variable should be significantly related (Hypothesis 3a, 3b); 4) the relationship between the independent variable and dependent variable should be non-significant or weaker when the mediator is added. The regression results for testing mediation are reported in Table 2, for state learning orientation, and in Table 3, for state performance-approach orientation.

Results in Table 2 indicate that Hypothesis 1a, referring to the relationship between supervisor coaching behavior and state learning orientation, is supported \((\beta = .17, p < .01)\). Similarly, results in Table 3 provide support for Hypothesis 1b, which proposes that supervisor coaching behavior is positively related to state performance-approach orientation \((\beta = .15, p < .01)\). Supporting Hypothesis 2, we found a significant relationship between supervisor coaching behavior and perceived organizational support for learning in Table 2 and Table 3 \((\beta = .67, p < .01)\). Results further show that perceived organizational support for learning is significantly related to state learning orientation in Table 2 \((\beta = .13, p < .01)\) and to state performance-approach orientation in Table 3 \((\beta = .13, p < .01)\), providing support for Hypothesis 3a and Hypothesis 3b. And finally, we found that after perceived organizational support for learning was taken into account, the effect of supervisor coaching on state learning orientation \((\beta = .08, p < .05)\) became weaker, albeit still significant, suggesting partial mediation. The effect of supervisor coaching behavior on state performance-approach orientation \((\beta = .06, p < ns)\) became insignificant. Consequently, as shown in Table 2 and 3, the mediation hypothesis was partially supported for the state learning orientation model (Hypothesis 4a) and fully supported for the state performance-approach model (Hypothesis 4b).

4.2 Tests of Moderated Mediation

Table 4 and 5 represent the results for hypothesis 5a and 5b. With regard to these hypotheses, we predicted that the indirect effect of supervisor coaching behavior on state goal orientation (i.e. state learning orientation, state performance-approach orientation) through perceived organizational support for learning would be strengthened by high transfer climate perceptions and weakened by low transfer climate perceptions. With regard to state learning orientation (Hypothesis 5a), results indicated a statistical significant interaction between perceived organizational support for learning and supervisor transfer climate \((B = .11, p < .01)\) in the model for state learning orientation (dependent variable model). According to Preacher, Rucker and Hayes (2007), this implies that the indirect effect of supervisor coaching behavior on state learning orientation through perceived organizational support for learning is moderated by supervisor transfer climate. To fully support Hypothesis 5a, the form of this interaction should conform to the hypothesized pattern. Therefore, we applied conventional procedures for plotting simple slopes at one standard deviation above and below the mean of the transfer climate measure (Figure 2). Consistent with our expectations, the slope of the relationship between perceived organizational support and supervisor transfer climate perceptions was relatively strong and positive for high levels of supervisor transfer climate, whereas the slope was weaker for low levels of supervisor transfer climate.
Table 4: State Learning Orientation - Regression Results of Moderated Mediation Analysis

<table>
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<tr>
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<th>Conditional effects at Supervisor transfer climate = mean, +/- 1 SD</th>
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Note: Bootstrap sample size = 5,000. Unstandardized regression coefficients are reported in line with recommendations of Preacher, Rucker and Hayes (2007).

* Range of values respresent an abbreviated version of the output provided by the macro.

Given the interaction, we also examined the conditional indirect effect of supervisor coaching behavior on state learning orientation (through perceived organizational support for learning) at three values of transfer climate (see middle of Table 4): the mean (3.55), one standard deviation above the mean (4.29), and one standard deviation below the mean (2.81). As can be seen the conditional indirect effect is only significant at one standard deviation above the mean. Indeed, verification through bootstrapping indicated that the conditional indirect effect was significant at high transfer climate perceptions (transfer climate = 4; \( p = .00 \)) and non-significant at low transfer climate perceptions (transfer climate = 2; \( p = .18 \)). Overall, the conditional indirect effect pattern implies that
the indirect effect of supervisor coaching behavior on state learning orientation through perceived organizational support for learning is conditional on perceptions of supervisor transfer climate. In other words, perceptions of supervisor transfer climate act as a boundary condition to this mediated relationship.

### Table 5: Supervisor performance orientation - Regression Results of Moderated Mediation Analysis

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<tr>
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Conditional effects at Supervisor transfer climate = mean, +/- 1 SD

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Conditional effects at range of values of Transfer climate

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Note: Unstandardized regression coefficients are reported in line with recommendations of Preacher, Rucker and Hayes (2007). Bootstrap sample size = 5,000.

* Range of values represent an abbreviated version of the output provided by the macro.

With regard to the state performance-approach orientation (Hypothesis 5b), the same analysis was performed, yielding no interaction effect between perceived organizational support for learning and perceptions of supervisor transfer climate (B = -.00, ns) in the model for state performance-approach orientation (dependent variable model), implying that the mediated relationship between supervisor
coaching behavior and state performance-approach orientation through perceived organizational support for learning is not conditional on perceptions of supervisor transfer climate (Preacher, et al., 2007). Note that this does not preclude the conditional indirect effect to be significant at certain values of the moderator. It only implies that this conditional indirect effect will not vary systematically as a function of the moderator.

In sum, the results of our regressions and moderated mediation analyses show that perceived organizational support for learning mediates the relationship between supervisor coaching behavior and state learning orientation (Hypotheses 1a-4a), as well as the relationship between perceptions of the supervisor coaching behavior and state performance-approach orientation (Hypotheses 1b-4b). Furthermore, perceptions of supervisor transfer climate moderated this mediating relationship for the state learning orientation model, such that this mediating relationship only occurs for high levels of transfer climate perceptions, but not in case of low levels of transfer climate perceptions (Hypothesis 5a). For the state performance-approach orientation model no moderating effect was found (Hypothesis 5b).

Figure 2: Interaction Effect of Perceived Organizational Support for Learning and Supervisor Transfer Climate on State Learning Orientation

5. Conclusion
The present study contributes to the growing body of literature on how leadership and climate processes impact relevant follower behavior. More specifically, it explicates how supervisor coaching behavior indirectly affects state learning and state performance-approach orientation through beliefs about the extent to which the organization encourages, respects and values learning behavior. In addition, we found that, in the case of state learning orientation, supervisor enactment of their coaching role in the context of training transfer was a necessary precondition for this mediation to occur.

The present study extends previous research in several ways. First, it provides empirical support for the theorized relationship between supervisor coaching behavior, follower climate perceptions and follower state learning orientation (Dragoni, 2005). Second, it introduces the concept of perceived organizational support for learning in analogy with perceived organizational support for creativity (Scott & Bruce, 2004). Finally, by introducing supervisor transfer climate as a moderator of the
mediated relationship between supervisor coaching behavior and state learning orientation, this study sheds light on an important boundary condition to this relationship.

Our results suggest that if learning and improving is the organization’s goal, there is value in stimulating supervisor coaching and transfer behavior, as these proximal behaviors might more effectively cue employees’ attitudes than senior management communication or formal training programmes. As such, the present study reemphasizes the role of supervisors in fostering a developmental mindset and an effective learning climate (McCauley, 2001).

6. References


Training of Older Employees: Are They Really so Different?

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Veronique WARMOES (Vlerick Leuven Gent Management School, Belgium) – veronique.warmoes@vlerick.com

Abstract

In order to maintain the current social security system in Belgium, it is crucial that the older workforce is productive for a longer time and that the average retirement age is raised. One way to achieve this is to invest in education and training, which is beneficial both for the employer (longer productivity, more experience and knowledge) and for the employee (higher employability). Under the Belgian government’s authority, a study was conducted to investigate the training needs and expectations of older experienced employees (i.e. older than 45). To be able to have a detailed, contextualised understanding, we set up a qualitative research design in which focus groups (7 focus groups) were combined with individual semi-structured expert interviews (with 11 academics or trainers). This combination of research methods led to an in-depth analysis from different viewpoints, namely that of the older employee him/herself, that of the academic world and that of the trainers. More specifically the specific needs, interests, motivators and hindrances of older employees to follow training and education were studied and analysed. The results of this study suggest that older employees do not like to be treated as a separate or ‘special’ group in training contexts. One exception is ICT-training. Furthermore, some differences do exist in the preferred didactical approach.

Keywords: Older employees, education, training, didactics, employability

1. Introduction

It is clear that the Belgian workforce is getting older. At the same time Belgium has the lowest work participation levels of the entire European Union in the age group 55 – 64 years old (Nonneman, 2007). As stated by Young (2006), keeping our older workforce longer employed is one of the major issues of the next decennia. One way to achieve this is by being willing to invest in training for this age group. Here, three factors should be taken into account: (1) the attitude of the employer, (2) the learning potential of the employee and (3) the attitude of the employee (Cully, VandenHeuvel, Wooden, and Curtain, 2000). This research focussed on the latter, namely the different viewpoints and attitudes of older employees.

2. Problem statement and research objectives

The employment rate in Belgium, defined as the active working age population and given as a percentage of the population aged 20-64 year (OECD , 2011a), is rather low (61.6%). A particular problem is the employment rate of the older workforce: a mere 35.3% of people between the ages of 55 and 64 year are employed. With 19.2% below the European average (54.5%), this is the lowest work participation level for older workers in the entire European Union (OECD, 2011b). At the 2001 Stockholm meeting, the goal was set for a 50% employment rate for the population aged 55 – 64 by 2010 (Von Nordheim, 2004). Belgium is thus underperforming in a big way. Moreover an additional issue is the declining average retirement age, which applies not to Belgium, but to Europe as a whole (Vansteenkiste, Herremans, and Sels, 2009). The average retirement age in Belgium in the 1950s was calculated at 64.3 years (Cohen, Elchardus, Mestdag, and Van Thielen, 2003). In 2001 this had dropped to an average retirement age in Belgium of only 56.8 years (Eurostat, 2011).

In meeting the demands and challenges of today’s labour market and maintaining the social security system, improvement is crucial. If we look at Sweden, for instance, the labour force participation for both men and women between the ages of 55 - 64 is an astonishing 70.1%. Probably the contributor to this high rate of participation is the well-established life-long learning approach in the country (Rix, 2005). In fact, all

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members of the European Union have committed themselves to enable people at all life stages to participate in learning and to develop the education and training sector across Europe (European Commission, 2011).

Lifelong learning is critical for everyone, but especially for older adults (Charness and Czaja, 2006). Workers and especially older and experienced workers, need to believe that they have access to training and are still capable of being trained (Maurer, Weiss, and Barbeite, 2003). Workplace and job demands are changing rapidly and the labour market requires an extraordinary amount of flexibility from the contemporary employee. Technology develops faster than ever before. It is not just a question of providing training, but also of providing training that is adapted to the specific needs of the older worker. Only then learning success becomes possible.

This study focused on these specific needs and wants, by examining following questions:

1) Regarding education, what are the specific needs of older workers?
2) What are suitable educational practices for older workers?
3) Which guidelines can be provided for trainers who educate more experienced learners?

![Figure 1. Experience concentration in function of labour market needs.]

3. Theoretical framework

An important theory in this context is the experience concentration theory, which focuses on experience rather than on age (Thijssen, 1992). The theory consists of two premises. First, the quantity of experiences will increase with the person’s age. Second, with increasing age, the diversity of experiences will decrease. A person becomes an expert and focuses more on particular experiences. The combination of both will lead to experience concentration.

Specialists often have experience concentration, with their limited variety of experiences resulting in a high labour efficiency. Generalists, on the other hand, possess a wide range of experiences, leading to experience variation. Both phenomena (concentration and variation) are not bad as such, but their extreme forms can give rise to problems. When experiences are limited, this leads to experience deprivation. When experiences are rather shallow on a variety of domains, this is known as experience fragmentation. Neither has a positive influence on employability (Thijssen and Rocco, 2010). According to Thijssen and Van Der Heijden (2003), experience concentration can be found in three domains: the sociocultural domain, the occupational domain, and the learning-strategic domain. In the sociocultural domain ‘network concentration’ occurs: the social environment and cultural groups shrinks to a smaller group of people. In the occupational domain the phenomenon of ‘functional concentration’ exists: only minor task adaptations are implemented at an older age. Important for this study is the ‘schooling concentration’ in the learning-strategic domain. Educational experiences are often restricted to hands-on and informal learning. Formal learning opportunities such as trainings are often avoided by older employees. This inflexibility and possible resistance to formal education can become an important barrier in older employee’s occupational life. Due to globalisation and growing competition between organisation, flexibility is a prerequisite for functioning successfully in today’s labour market (Aggarwal, 1997). Organisations count on their employees being flexible and willing to follow
occupational (re)training (Peiro, Garcia-Montalvo, and Gracia, 2002; Reilly, 1998a; 1998b). However, as discussed, the phenomenon of experience concentration may influence older employees’ flexibility and willingness for schooling. It is thus important to know what actions and measures can be undertaken to facilitate training participation and to lower the threshold.

4. Methodology

To be able to get a detailed, contextualised understanding of this phenomenon (Creswell, 2003; Shah and Corley, 2006), we chose to set up a qualitative research design, combining focus groups (7 groups with an average of six employees per focus group) and individual semi-structured expert interviews (11 participants). Focus groups are an important source of in-depth information (Morgan, 1998), since discussion among participants can make them more open to discussion, whereby perceptions, experiences and attitudes can be fully expressed and spoken about (Byers and Wilcox, 1991). Participants were all Belgian. Each group was grouped by language (4 Dutch-speaking groups, 3 French-speaking groups) and position (blue collar workers, white collar workers, lower management and higher management). All focus group participants were over the age of 45, ranging from 45 - 64 (mean = 50.08), with 30% female and 70% male participants. The represented sectors where the participants worked, were very diverse: food, retail, bank and insurance, construction, automotive industry, education, government, hospital, agriculture, IT, consultancy, health care, distribution and energy. The number of participants in each group ranged from 6 to 7, which is considered optimal by Bloor, Frankland, Thomas, and Robson (2001). Focus groups lasted for two hours on average.

The following topics were discussed in each focus group: differences between people aged 45+ and younger ones, needs and wants, the didactical approach, motivations and aggravations and follow-up after the training and knowledge sharing. Every participant was given a card with a particular question to be discussed. Regarding the differences between people aged 45+ and younger, participants were asked: “Do you think that training for older employees requires a different approach than for younger colleagues?” With respect to their specific needs and wants: “What topics do you like to learn about?” and “What topics are you obligated to follow?” Regarding the didactical approach: “What kind of didactical materials do you prefer?” and “Do you prefer training inside or outside of the organisation?” Regarding motivations and aggravations participants were asked: “What aggravates you in trainings?” and “What motivates you in training?” Lastly, regarding follow-up after the training and knowledge sharing, people were asked “How do you pass on the newly acquired skills or knowledge to your colleagues?” and “How does your company encourage training for older employees?” Every focus group concluded with an open question for further additions.

Based on experience and knowledge about the topic ‘training and older employees’, individual semi-structured interviews were held with Belgian university professors (n = 3; one woman and two men) and Belgian trainers (n = 8; one woman and seven men). The semi-structured interviews were aligned with the topics of the focus groups. Each interview lasted for two hours on average. This combination of research methods led to an in-depth analysis from different viewpoints, namely that of the older employee, that of the academic world, and that of the trainers.

5. Results

5.1 General differences between older and younger workers

The main difference between older and younger workers is experience. Older workers build on their previous experiences. Therefore, older workers find it very important that their experience is acknowledged and integrated in the training. Trainers need to know the knowledge level for the group of trainees. Ideally this is asked before the actual training takes place, combined with an inquiry into the individual wants and needs. Individual attention from the trainer for older trainees is really appreciated by these older participants.

Although older workers express their insecurity about technology (ICT) related training, they are willing to be educated on that topic. The condition here is that the pace is adapted to the specific needs of the older workers. Since they view younger workers as having a technology advantage, they feel that in ICT, a split in groups according age is justified. A number of studies have been conducted in the past decades with regard to age and computer skills (e.g., Charness, Schumann, and Boritz, 1992; De Koning and Gelderblom, 2006; Gist, Rosen, and Schwoerer, 1988; Mead et al.,1997; Morrell et al., 1995; Selwyn, 2004). In general studies showed that older workers are able to learn new technologies, but they are much slower in doing so.
Divisions according to age are not felt as necessary or justified in any other training other than ICT since it enhances stereotyping and stigmatises people. An “us versus them” scenario is likely to arise even though participants in our focus groups didn’t want this to happen. Instead, mixed groups are seen as helpful by our participants. Younger workers can learn valuable lessons from older workers and older workers can be helped by their younger counterparts in processing information and in keeping up. However, there is one exception: participants of the management level in one focus group wondered whether mixed groups were not something for an ideal world rather than for reality. According to these managers, younger participants can get irritated by the slower pace of their elder counterparts, and older workers in turn can become annoyed when seemingly obvious aspects of the business need to be explained to their younger colleagues. Nonetheless, age remains a controversial and stigmatising factor and can split groups.

5.2 Needs and wants of 45+

There are some physical needs, but these are limited. It is mainly about having an adequate infrastructure, lighting and font size during presentations. With regard to cognitive needs, participants note that they feel fatigue faster than their younger colleagues. It is important to provide sufficient breaks and not have overly long uninterrupted classes (Ford and Orel, 2005). An adapted, quieter pace is appreciated. Breaks can be used to consolidate information, getting up to speed or asking for an explanation in a more informal way. Older participants prefer smaller classes, so the possibility for individual attention still exists. An individual relationship and trust between themselves and the trainer is of vital importance. Older workers thus prefer an individual, interactive approach to training.

Our participants add a clear structure to the above list, as well as repetition of the subject material and a clear goal to work towards. They prefer to get as much information as possible about the content of the class, the limits, and even some theory beforehand. This makes them feel more self-assured at the start of the training.

5.3 Didactics

The opinions concerning didactical approach can be subdivided in two classes: universal principles that are valid not only for the target group of 45+, but for all workers in general, and specific principles that are of vital importance in training older workers.

Participants were asked about their preference regarding the location of the training. There was a difference according to position/function of the participants in the focus groups: blue collar workers and white collar workers prefer a training inside the organisation. In that way, they feel more at ease in their natural work environment. Management however, prefers training outside of the organisation for several reasons. They like to ‘get away’ once in a while from their busy work environment. They like the fact that they cannot be disturbed and thus concentrate better. Even more, they feel it is better for the group spirit and for networking opportunities. The exception to the rule is technical trainings: all position levels agree that this should happen in the organisation to be able to directly implement and adapt what has been learned. The questions arises in several expert interviews if this is specific to our target group of older workers or a general comment for all kinds of education. The same goes for the abovementioned expectations regarding didactics: the course must be concise, step-by-step, hands-on, experiential learning, with a reference book, and the trainer has to be knowledgeable and capable. These are all seemingly universal aspects of what is considered to be ‘good teaching’.

Kubeck, Delp, Haslett, and McDaniel (1996) suggested the need for studies into training methods that are suitable for older workers. Some aspects are very specific for older workers. Older workers are of course not students and should not be treated as such. Trainers should not patronise their participants or act as a school teacher. A trainer should be credible by displaying people-knowledge and professional knowledge. Participants view the ideal trainer as someone who listens, pays attention to the various needs of trainees, is competent, can facilitate discussions smoothly, is good at recappitulating the subject matter and adapts his/her didactical approach to the needs of the group.

The amount of theory for the older participants should be limited, well structured and frequently repeated. According to our participants, trainers should take it into account that older workers already have experience and, as a consequence, certain attitudes and feelings towards certain learning materials. These may be affective prejudices (such as liking), conceptual perceptions (such as foreknowledge), perceptions caused by previous experiences (such as previous successes or failures) and images (such as usefulness, prestige). This is also true for younger learners, but less so then for older workers. As far as didactical approaches go,
participants mention a wide range of different media. However, they are a bit reluctant with role playing games as they do not like being in the spotlight. This is easier if their fellow training participants are familiar faces. ICT applications are an acceptable medium, but not everybody feels completely comfortable with it. Some find it acceptable to receive all information online, others find information on paper necessary. These differences are not surprising since it is often the cognitive style, and not age, that determines preferences in training (for an overview of cognitive styles, see Cools and Van den Broeck, 2007).

5.4 Motivations and aggravations

Older workers are intrinsically motivated to follow training. The main reason for participating in training is self-development, as well as keeping up with the times and social contacts. Blue collar workers add an extra motivation, namely job security. None of the focus group participants liked participating in mandatory training. This finding can be viewed in light of the self-determination theory (SDT; Deci and Ryan, 1985), which makes a distinction in type of motivation according to reason or goal. Intrinsically motivated people follow training because it is satisfying and interesting. Extrinsically motivated people follow training because of external reasons, such as obligations, career moves etc. Intrinsic motivation, which is the case with our older workers, leads to high quality learning and creativity (Deci and Ryan, 2000). The cognitive evaluation theory (CET; Deci and Ryan, 1985), a subtheory of SDT, posits that a need for autonomy combined with a need for competence will lead to intrinsic motivation. However an external obligation will decrease intrinsic motivation, which shows in our results.

It is remarkable how one management group claims that older workers are averse to training and education: “Older workers are not motivated, because they are convinced they already know everything.”. Other participants of focus groups contradict this: they are motivated and they feel the need to learn. Despite the efforts of the Belgian government (e.g. CAPA 1 project, 2006), negative stereotypes about older workers obviously still persist.

Some aggravations older workers experience have to do with the practical aspects of training, such as driving to the training in the evening, driving long distances, traffic jams and trainings outside work hours. Other annoyances relate to the training itself: qualitatively bad training and trainers, a lack of didactical media and unmet expectations. Again these principles seem universal. More specific for this age group are the different fears and uncertainties. Older trainees fear being evaluated, which shows in their reluctance toward role playing games or asking questions in group. They fear not being able to keep up with the pace. Since it has been a long time since they were in school, they also are afraid that their knowledge and skills will not be appreciated.

5.5 Follow-up and knowledge sharing

Sharing what has been learned after the training is appreciated, both in a formal and informal manner. It does not need to be extensive: a short recap about the usefulness of the training and interesting things learned. Participants mention the way of sharing knowledge depends on the organisation culture and the formal rules and systems within the organisation. A transparent policy, structural evaluation of training and training framed within evaluation talks are all factors that contribute to a better follow-up and knowledge sharing. Blue collar workers and white collar workers mention some reluctance to information sharing, in fear of endangering their position.

6. Conclusion

Researchers have since long called for more attention on effective training for specific groups (Tannenbaum and Yukl, 1992). The evolution of international demographics causes reflection on ways in which to improve the current situation. By means of different expert interviews and focus groups we investigated the specific training needs of older workers in Belgium. Five different topics were of interest to us: (1) general differences between older and younger workers, (2) needs and expectations with regard to training, (3) didactical approach, (4) motivations and aggravations, and (5) follow-up and knowledge sharing afterwards.

The experience of each participant is the most crucial factor that should be taken into account: it needs to be recognised and integrated into the training. It determines the satisfaction and motivation of the older worker. Cognitive needs can be met with the right pace and sufficient repetition and structure. Physical needs appear to be limited. Older workers are intrinsically motivated to follow training. Thresholds can be external (like
traffic jams, large distances of home to the training location) or internal (fear of evaluation, standing in the spotlight) to the older worker. What happens after training, depends largely on the organisational culture. It is remarkable how every participant in our study agrees on the advantages of a heterogeneous mixed age group rather than a specific homogeneous group of older workers, with the exception of computer and ICT training.

It is important to realise that today we do not only live in an information society, but also in an ageing society (Bernard and Phillips, 2000). Getting the older workers up to speed is crucial for their employability in today’s world and in order to overcome the “digital divide” (Bernard and Phillips, 2000; Green and McAdams, 2003; Wills, 1999). ICT classes adapted to older workers are thus a necessity. However, research has shown that older adults are often excluded from such trainings (e.g. Hanley, 2002; Madden and Savage, 2000; Selwyn, 2004; Teo, 2001). Future research should look into the conditions needed for increasing the participation of older workers in ICT training.

When a division according to age is necessary, stigmatisation can happen. Further research should look into how to avoid stigmatisation and to avoid the reinforcement of negative stereotypes when adapting course content or the pace to the needs of a particular group and displaying it as such. The question also remains if younger workers feel the same way about mixed groups than their older counterparts. Do they also prefer a heterogeneous age group? What about the pace of the training? In this respect it is important to note that age management policies not only focus on what is beneficial for one particular group, but for all groups present in the organisation. Even young colleagues need a tailored approach to training, because they are in danger of being generalists with their limited and mostly scattered experiences. A holistic approach to this matter is thus necessary.

Public policy needs to set the external context for companies, in which they can create their own age-conscious policies. Existing policies need to be scrutinized for their effectiveness; possible new initiatives need to be based on extensive studies. On the employer side, the focus needs to shift from replacing staff to retaining them longer. Changes are needed amongst others in education for older employees to improve their employability. This study has proven this: the Belgian older workforce is more than willing.

7. References


Towards a New Model for Learning Behaviour with Streaming Video

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Abstract

Improving the effectiveness of learning when students observe video lectures becomes urgent with the rising advent of (web-based) video materials. Vital questions are how students differ in their learning preferences and which patterns can be detected when viewing video.

In recent theory, we cannot find evidence that learning and management behaviour is a pervasive personal trait. Also, we cannot find evidence in our own research, that viewing behaviour is a pervasive personal trait. However, we did find that the viewing behaviour of some students showed strategic and metacognitive elements and incorporated this in a new model about viewing behaviour.

We propose to classify viewing behaviours, based on metacognition and recent theories about learning and management behaviour, in the following model. The ordering in this model ranges from low to high on a metacognitive scale.

• a student can exhibit only one specific viewing behaviour and not a strategic viewing behaviour
• a student can exhibit several viewing behaviours but not a strategic viewing behaviour
• a student can exhibit several viewing behaviours and also a strategic viewing behaviour

This model will be used in our future research when we will analyze a dataset of about 100 students. We want to investigate in a pre-post test whether the learning outcomes are increased when students use more strategic-based viewing behaviours depending on their prior knowledge level.

Keywords: learning style, viewing style, learning strategy, streaming video, awareness

1. Introduction

The challenge to improve the effectiveness of learning by using video lessons has become urgent as web-based materials contain more and more video and control tools for the learner. Earlier research into the ideal length of video fragments was based upon interactive video such as those via video discs when the zapping user was still an unknown phenomenon. The internet has created a much more autonomous and flexible student attitude. If we want to improve any aspect of students’ learning from video, it is inevitable to typify and understand how they differ in their learning preferences (Yang & Tsai, 2008). The question arises what patterns in viewing video can be detected in log files.

Video is being used increasingly as an instructional tool in education and therefore it becomes more important to optimize the learning process of students from video lessons. Furthermore, students are instructed to enhance their learning skills from text but not from video. Finally, interacting with the control buttons of a media player gives students only standard tools to interact (start and stop) with video, hardly supporting the learning processes of students.

Streaming video servers are frequently used to distribute video to students nowadays. These servers are logging event queues (pausing, rewinding, etc) in so called log files. Just as in e-business, log files can be used for personalization and evaluation. In educational settings, however, the use of log files for mining purposes has not yet been employed to a large extent (Hewitt et al., 2003). Log files are mostly used for detecting errors in the infrastructure and will be deleted when they reduce overall system performance. Shih, Feng, & Tsai (2008) have observed a clear trend that more and more studies were utilizing learner’s log files as data sources for analysis.

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If the viewing behaviour of a student potentially influences his or her learning outcomes, we can also use these loggings for delivering individual feedback to the student. More adaptive and more effective learning management systems may be applied in the coming years.

A recent experiment by De Boer, Kommers, & de Brock (2011) showed that viewing behaviour with streaming video of students is not strongly correlated to the more pervasive personal traits like short-term memory capacity and learning styles (style-oriented). Students were flexible in changing their viewing behaviour (strategic-oriented). In the current paper we will propose a model that addresses both style and strategic behaviours.

The rest of this paper is organized as follows. In Section 2 the relevant literature is reviewed on the use of streaming video and the collection of log files. In Section 3 the theory about learning styles and strategies is presented. In Section 4 the viewing behaviour with streaming video is discussed. In Section 5 the literature about management styles is presented. Section 6 contains a new model for the learning behaviour with streaming video. Finally, the discussion is given in Section 7.

2. Relevant work

The topic discussed in this paper is part of a research project. The experiments in this project investigate the possibilities of making learning management systems more adaptive at run-time, based on log files from streaming media servers. In a first experiment (De Boer & Tolboom, 2008), four viewing scenarios were defined based on anonymous entries in log files from streaming media servers. One of those scenarios was ‘viewing by zapping’ where a student seems to zap through a video episode. According to earlier research (Blijleven, 2005), a broken link between the learning task and the learning process could be the cause of this. Also, the zapping viewing scenario shows patterns of the ‘undirected’ learning style as distinguished by Vermunt (1992).

In a second experiment (De Boer, 2010), learning processes and learning styles were investigated further. It demonstrated that students’ learning processes (constituting a learning task) could be monitored through the use of log files. However, there was no clear link between viewing scenarios of students and their learning style. Vermunts learning style model includes not only a cognitive perspective but also a self-regulating and motivation perspective.

The third experiment focused on the cognitive perspective and investigated whether the students’ viewing behaviour was determined by pervasive personality traits. The theoretical underpinning was based upon earlier work by Huai (2000), who found a correlation between the learning style and the short-term memory of a student. We could not reproduce this correlation. However, we did find that an awareness instruction about their viewing behaviour increased the learning outcomes of students. Furthermore, in interviews some students showed some strategic–based reasons about their viewing behaviour. One of those students said: I first watch the movie, and then I try to guess which questions will be asked and then I watch those specific fragments again. Up to now, no model on viewing behaviour is able to explain the viewing behaviour with streaming video that incorporates both style and strategic elements.

The interaction moments of students in these previous experiments were explored in the context of their navigation while learning from video segments. Navigation is carried out with the control buttons of the media player and may have several purposes. For instance, students may pause a video in order to explore a complicated still frame with a high information density. Students can also return to a specific segment of the video or watch the complete video again. Interacting with the control buttons of the currently standard Windows Media Player allows the student only basic tools to interact with the video resources.

Each interaction with the control buttons of the media player results in a separate entry in a log file from the streaming media server. Specific combinations of these entries from one student in a log file can be conceived as a “viewing scenario”. De Boer and colleagues (2008) observed students’ viewing scenarios while watching instructional videos. The logged interaction events have in common that students prefer to escape from the default viewing sequence for a variety of reasons. For instance, students may want to improve their understanding of a specific segment before continuing with the next segment or he wants to memorize the contents.
In the early nineties Verhagen (1992) investigated the optimum video segment length. He defined the total amount of information elements in a video segment as the maximum number of questions about that video segment. His goal was to formulate design rules for learning from video material.

In this paper we will propose a model that will address both style and strategic behaviours. Firstly, the literature about learning styles and strategies will be discussed. Secondly, our own work about viewing styles and viewing strategies will be presented. Finally, after discussing the literature about management styles and strategies, we will propose a new model about viewing behaviour, based on metacognition and awareness.

3. Learning behaviour: learning style or learning strategy?

Learning styles and learning strategies are often proposed as a basis for constructing more adaptive learning systems. Abell (2006) has described a model guided by learning styles and emerging digital media to individualize learning with the help of intelligent agents. Tseng, Chu, Hwang, & Tsai (2008) have proposed an innovative adaptive learning approach based upon two main sources of personalization, that is, learning behaviour and personal learning style.

Schiaffino, Garcia, & Amandi (2008) identify two main research directions: adaptive educational systems and intelligent tutor systems. The latter ones are characterized by their continuous efforts to optimize both the system responsiveness and the learners’ meta-cognitive awareness. Instead of the opportunism to adapt the medium to the latent learner traits, it provokes the learner to become more active and cope with his/her unbalanced mental trend or even mental repertoire. Adaptive educational systems accommodate the variety in the presentation of content and navigation through the student’s profile. Intelligent tutor systems recommend educational activities and deliver individual feedback according to the student’s profile. Schiaffino, Garcia, & Amandi proposed an agent (eTeacher) that can be considered as an intelligent tutor who unobtrusively observes the student’s behaviour and builds the profile.

In order to detect a student’s learning style, Garcia, Schiaffino, & Amandi (2008) explored a Bayesian network representation. During the course, this network is filled with information. Chen (2008) uses a genetic-based e-learning system with personalized learning path guidance on the basis of incorrect test responses of a pre-test. Özpolat & Akar (2009) proposed an automated model to detect the learning style of a student. All prior examples make use of the Felder & Silverman model (Felder & Silverman, 1988) to classify learning styles.

A recent survey (Peterson et al., 2009) on learning styles shows considerable consistency among the researchers on the potential impact of learning style in educational settings. One of them is the use of awareness about learning styles of students and teachers.

The British agency Becta (2005) researched the literature on learning styles and considered some definitions and elements of learning style – information processing, instructional preferences, and learning strategies. Although they found it difficult to draw together such a diverse and complex area of theory and research, the following seemed to be relatively consistent messages:
- Despite the many opinions on learning styles there are few generally agreed facts. Some theories are more influential than others, but no model of learning styles is universally accepted, for in this complex area reliable studies are lacking.
- Any theory or model of learning styles is necessarily a simplification of the complexity of how students learn.
- Learning styles are at best one of a range of factors determining how learners react to learning opportunities – environment, culture (of both learner and institution), teaching methods and curriculum requirements are all part of a complex pattern of interactions.
- There is a danger inherent in learning styles of labelling students as particular kinds of learners – given the lack of robust evidence in the field, labelling strategies seems safer than labelling learners.
- An awareness of learning styles theories may help to develop metacognition and the ability to learn how to learn.

Becta (2005) concluded that the fundamental difference between those who believe in fixed learning styles and those who believe in flexible learning strategies lies in the following approach: instead of adapting teaching and content to the learner, the learner needs to choose the approach which is most appropriate to the requirements of the task at hand.

4. Viewing behaviour with streaming video: viewing style or viewing strategy?

Following Craik & Lockhart (1972) and De Boer (2010) we use the term viewing style. We introduce the next four terms for the viewing behaviour of students: elaboration viewing style, maintenance-rehearsal viewing style, linear viewing style, and zapping viewing style. In Table 1 we list these viewing styles.

<table>
<thead>
<tr>
<th>Viewing behaviour</th>
<th>Viewing style</th>
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<tbody>
<tr>
<td>a student watches a video in one pass</td>
<td>Linear</td>
</tr>
<tr>
<td>(uninterruptedly) from the beginning to the end</td>
<td></td>
</tr>
<tr>
<td>a student watches a video again after</td>
<td>Elaboration</td>
</tr>
<tr>
<td>finishing the first time in one-pass</td>
<td></td>
</tr>
<tr>
<td>a student watches parts of a video repeatedly</td>
<td>Maintenance Rehearsal</td>
</tr>
<tr>
<td>a student skips through the instructional</td>
<td>Zapping</td>
</tr>
<tr>
<td>video at intervals of relatively short viewing times</td>
<td></td>
</tr>
</tbody>
</table>

Earlier experiments of De Boer and colleagues (2008) did not show any relationship between manifest sequential preferences and its underlying personality traits. In the second experiment (De Boer, 2010), learning processes and learning styles were investigated further. It demonstrated that students’ learning processes (constituting a learning task) could be monitored through the use of log files. However, there was no clear link between viewing scenarios of students and their learning style.

The link between short-term memory and learning styles could not be reproduced as Huai did (de Boer et al., 2011). There are also no strong correlations between (preferred) viewing styles and personal traits like learning styles and short-term memory. Huai did use another test (Pask’s Smugglers test) in order to score the dimension serial – global. Possibly the conclusion of Graf, Lin and Kinshuk (2008), about the use of the Felder test instead of the Smugglers test is not correct, which was the basis of our change in tests. However, the Smuggler test is more time consuming to use than the real-time use of log files, so this would inhibit the use of adaptive learning management systems in real-time.

Not all students showed a preferred viewing style while watching instructional videos. Some students even seem to switch their viewing style based upon their cognitive need and this did not lower their test score.
This flexibility of the student in adapting his viewing behaviour is in line with the missing correlation between pervasive personality traits and learning styles found earlier in this experiment.

The term *viewing strategy* was proposed by De Boer and his colleagues (2011) instead of *viewing style* to account for the flexible and strategic changing of the viewing behaviour of students. Interviewing students about their viewing behaviour showed some strategy-oriented reasons. One of those students said: *I first watch the movie, and then I try to guess which questions will be asked and then I watch those specific fragments again.* This example also shows that students indeed can switch flexible between viewing styles.

5. Style and strategy in management

Examples of different styles of behaviour can also be found in management. Tannenbaum and Schmidt (1973) distinguished seven types of leadership behaviour. These behaviours range from boss-centered leadership to subordinate-centered leadership and reflect how managers treat their workers.

Tannenbaum and Schmidt (1973) also argued that the style of leadership is dependent of the existing circumstances. Managers should find the management style that best suits their personality, the business needs, and the circumstances. In practice it may be sensible to combine elements of all styles, or at least a few of the styles, depending on the circumstances.

6. Towards a new model for learning behaviour with streaming video

Cook (1991) examined learners’ learning style awareness among a group of 78 college students in order to determine to what extent learning style awareness can be regarded in isolation of teaching styles and whether these students would benefit from this awareness in terms of academic achievement. She found a significant difference in academic achievement in favour of the learning style awareness group. The concept of learning style awareness was adopted in our experiment in order to enhance learning outcomes from tests.

Awareness and metacognition are examples of the ability of students to monitor and control their learning behaviour. Metacognition is classified (Efklides, 2006) into three components:

- Metacognitive knowledge (monitoring learning behaviour) is what individuals know about themselves and others as cognitive processors.
- Metacognitive experiences (monitoring learning behaviour) are those experiences that have something to do with the current, on-going cognitive endeavour.
- Metacognitive regulation (controlling learning behaviour) is the regulation of cognition and learning experiences through a set of activities that help people control their learning.

Metacognition refers to a level of thinking that involves active control over the process of thinking that is used in learning situations (Efklides, 2006). Examples of metacognitive skills are: planning the way how to approach a learning task, monitoring understanding, and evaluating the progress at the end of a learning task. Students who are able to use a wide range of metacognitive skills score higher on exams and complete learning tasks more efficiently (Efklides, 2006).

Becta (2005) also concluded that encouraging metacognition (being aware of one’s own thought and learning processes) is perhaps the most important advantage that can be claimed for applying learning styles theory to learning and teaching.

De Boer (de Boer et al., 2011) introduces the term viewing strategy when a student shows signs of strategic viewing behaviour. We can apply this to the earlier given example of such a typical student: *I first watch the movie, and then I try to guess which questions will be asked and then I watch those specific fragments again.* This viewing behaviour is not only strategic in the sense that the student plans to list the fragments to be watched again at the end of the video. He is also monitoring his learning behaviour (metacognition). We add this viewing behaviour to our four earlier defined viewing styles: *zapping, linear, maintenance rehearsal, elaboration, and strategic viewing behaviour.*

We propose to classify viewing behaviours, based on the previous metacognition model and the conclusions about learning and management behaviour in the earlier sections in the following model. The ordering in this model ranges from low to high on a metacognitive scale.

- a student can exhibit only one specific viewing behaviour and not a *strategic* viewing behaviour
a student can exhibit several viewing behaviours but not a strategic viewing behaviour

a student can exhibit several viewing behaviours as part of a strategic viewing behaviour

7. Discussion

Designing adaptive learning environments on the basis of learning/viewing styles is based on the idea that student’s learning/viewing style is stable along time and across learning task periods. In recent theory, we cannot find evidence that learning and management behaviour is a pervasive personal trait. Also, we cannot find evidence in our own research that viewing behaviour is a pervasive personal trait.

However, we did find that the viewing behaviour of some students showed strategic and metacognitive elements and incorporated this in a new model about viewing behaviour. This model will be used in our future research when we will analyze a dataset of about 100 students. Half of these students will be given an awareness instruction to use more and other (strategic) viewing behaviours. We want to investigate in a pre-post test whether the learning outcomes are increased when students use more strategic-based viewing behaviours depending on their prior knowledge level.

8. References


Commitment to Change Unravelled: an Individual Differences Perspective

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Abstract

Globalisation, intensified competition, and the introduction of learning organisations made continuous improvements and change a prerequisite for the survival and growth of every organisation. However, the successful implementation of change initiatives still remains challenging, with a high number of change processes not reaching their goal due to ‘people problems’. Hence, the aim of this study was to provide further insights into the role individual differences in change processes. More specifically, we focussed on gender differences as this was a crucial issue within the organisation we studied. Data were collected through an (e-)survey, using validated scales, from a Belgian automotive company (N= 77, 71% response rate). Our research suggests that differences between demographic groups indeed exists. Women experienced more support from their supervisor, more informational justice, less interpersonal justice, and more trust in the organisation than men. Looking at commitment to change, differences were found between men and women for continuance commitment. Increased insights into the role of gender differences in the perception of change processes can be one important way to stimulate successful change management.

Keywords: commitment to change, individual differences, gender, change management

1. Introduction

In this era of rising turbulence and demands, change is increasingly seen as unavoidable for the maintenance and growth of organisations. It is believed that the pace and the complexity of change initiatives is greater now than ever before. Anticipating and responding to opportunities or challenges, both internal and external ones, may be the key differentiator between organisational success and failure and is vital for competitiveness (Wiersema & Bantel, 1992). Even though change is widespread, its implementation remains challenging. Literature indicates that over 70 per cent of change projects do not reach their goals or fail (Beer & Nohria, 2000; Clegg & Wash, 2004). One of the reasons why so many change initiatives fail, might be related to a lack of support from employees, despite the criticalness of this support for the successful implementation of change initiatives (Armenakis, Harris, & Mossholder, 1993; Piderit, 2000). Or as Schneider, Brief, and Guzzo (1996, p. 7) have put it: “If people don’t change, there is no organisational change”. Previous research indicates that the negative consequences of employee resistance are widespread (Miller, Johnson, & Grau, 1994; Piderit, 2000), including decreased employee morale, psychological well-being, satisfaction, and productivity, and increased turnover, absenteeism, and theft (Bordia, Hunt, Paulsen, Tourish, & DiFonso, 2004; Eby, Adams, Russell, & Gaby, 2000; Osterman, 2000). Hence, the success of change depends heavily on the support or resistance employees feel towards change initiatives (Armenakis & Bedeian, 1999; Pettigrew, Woodman, & Cameron, 2001). Successfully managing organisational change thus boils down to the successful management of human resources and closer supervision of change by the human resources department to ensure the focus on the individual (Antila, 2006).

Due to the clear importance of the individual in the success of change projects, many scholars are calling for a shift towards a more person-centred focus in the analysis of change (Bray, 1994). Only in the last decade, this ‘personalisation trend’ is increasing in importance as organisational behaviour (OB) and human
resources (HR) scholars start to explore employees’ psychological reactions to and their critical role in determining successfulness and effectiveness of organisational change implementation on a larger scale (e.g., Caldwell, Herold, & Fedor, 2004; Fedor, Caldwell, & Herold, 2006; Herold, Fedor, & Caldwell, 2007; Herscovitch, & Meyer, 2002; Meyer, Srinivas, Lal, & Topolnytsky, 2007).

In this paper, we aim to contribute to this person-centred tradition by investigating individual factors that influence the organisational change success and the willingness to change, using demographic information. Demography theory is defined by Pfeffer (1983, p. 350) as “an important, causal variable that affects a number of intervening variables and processes, and through them, a number of organisational outcomes”. Previous change research found a link between demographic characteristics and specific beliefs, values, and abilities, thus building on a demographic approach (Wiersema & Bantel, 1992). In the past, age, tenure, and educational background have been mostly studied in the context of individual change (e.g., Wiersema & Bantel, 1992). We will focus on a demographic factor that has been less studied in past change research, but which is easily identifiable and hence appropriate to build change policy initiatives upon, this is gender. Thus far, gender has been mostly studied from a minority perspective. Traditionally, a group is seen as a minority if it consists of less than 15 per cent of the total group (Kanter, 1977). Accumulated evidence has shown that being a minority can be disadvantageous for women, with consequences such as negative organisational and career attitudes (Ragins & Cotton, 1996), a pay gap (Jacobs, 1992), or inequalities in hiring and promotion (Cohen, Broschak, & Haveman, 1998; Powell, 1993). However, empirical evidence from the field of change management remains scarce (Karrasch, 2003). In order to investigate this gap, we selected a Belgian automotive company where women are a minority group. We investigated gender differences in relation to change outcomes, context, and process.

2. Literature

We first discuss factors that influence organisational change success and then move to commitment to change as a measure of change success.

2.1 Factors influencing organisational change success

Armenakis and Bedeian (1999) indicated that three factors are crucial for the success of organisational change: content, context, and process. Content, in this regard, refers to the “what” or the type of change implemented, denoting for instance fundamental, episodic (actions that alter the very character of the organisation) or incremental, continuous changes (step by step movement towards an ideal solution) (Weick & Quinn, 1999). Secondly, context points towards forces that explain why a change initiative is (not) successful (Johns, 2001, 2006), independent of the content of the change. It consists of pre-existing forces in an organisation’s environment, such as the organisational culture, that direct and motivate employee effort (Chonko, Jones, Roberts, & Dubinsky, 2002; Eby et al., 2000). The last factor is the process or the way in which change is implemented throughout the different change phases. As change often comes across as threatening and might create uncertainty and fear (Callan, Terry, & Schweitzer, 1995), a fair process is important to ensure a better acceptance of change in organisations (Kotter, 1995; Wanberg & Banas, 2000).

As the content of the organisational change is assumed to be least influenced by individual perceptions (Armenakis & Bedeian, 1999), we will focus solely on the individual perceptions of employees regarding the process and the context. We will start our literature overview by looking at the process factors.

2.1.1 Process

Currently it is globally acknowledged that the way in which a change process is implemented, has an effect on the reaction of the employees. Employee acceptance of change in this regard can be enhanced by the characteristics of the change process. Factors such as timely and accurate provision of information (Johnson, Bernhagen, Miller, & Allen, 1996; Stanley, Meyer, & Topolnytsky, 2005) and opportunities for employee participation (Strauss, 1998; Wanberg & Banas, 2000) are found to be of great importance. In this part, we will investigate the importance of two process factors: the perception of fairness of the change initiative and the perceived support of the direct supervisor during the change process.

Change fairness. Over the last three decades, the notion of justice or fairness in decision making and change initiatives has been the focus of numerous studies (e.g., Bies & Moag, 1986; Cropanzano & Ambrose, 2001; Greenberg, 1993; Leventhal, 1976). Initially, a two-factor model of organisational justice, including
distributive and procedural justice was proposed (Greenberg, 1990). Distributive justice on the one hand refers to the extent that the allocation of an outcome is consistent with goals (Deutsch, 1975), in which equality and equity are key. Procedural justice on the other hand is linked to participation and voice during decision processes. Decision criteria should be consistent, correctible and ethical, and biases should be controlled (Leventhal, 1980).

However, in the 1980s, the two factor model was expanded with two additional factors: informational and interpersonal justice (Bies & Moag, 1986). Both factors are distinctly independent forms of interactional justice, with informational justice linked to justification (e.g., explaining the basis for decisions) and truthfulness (e.g., being candid, not deceiving), and interpersonal justice consisting of respect (e.g., being polite, not rude) and propriety (e.g., refraining from prejudicial statements and other improper remarks).

Perceived supervisor support. Conventional wisdom indicates that people do not like to change. Literature also found support for this idea, but added some nuance. Dent and Goldberg (1999), for example, stated that employees do not resist change per se, but experience aversion towards the uncertainty and stress that emerges from the potential loss of status, autonomy, or economic security. Up to date, change is still considered a major source of employee strain (Bordia et al., 2004), which – like other stressors – might cause depression and other psychological disorders (Leventhal, 1980). Stress coping mechanisms might play an important role in preventing these negative outcomes (Dormann & Zapf, 2002). One of the best researched coping mechanisms, for instance, is social support. This mechanism can be defined as a ‘social fund’, such as family, friends, and co-workers, from which people may draw when dealing with stressors. During change initiatives, decisions are often cascaded downwards, making supervisors act as change agents, and most important point of contact and support, of their team of employees (Bommer, Rich, & Rubin, 2005).

2.1.2 Context

Irrespective of what is being changed and how, contextual factors are found to provide a big part of the explanation of why a change initiative failed (Johns, 2001). Different authors have indicated the importance of culture and climate (Schneider et al., 1996), and organisational policies and practices (Arménakas et al., 1993; Eby et al., 2000) in understanding employees’ openness towards change.

However, one of the most important context variables is the quality of the relationship with management (Albrecht, 2002; Oreg, 2006) and the supervisor (Edmondson & Woolley, 1999), which together form the relational capital of an organisation. In this part, we will investigate the importance of this relational capital in the organisation.

Relational capital. Congruent with the definition of De Clercq and Sapienza (2006, p. 331), we define relational capital as “the extent to which exchange involves trust, social interaction, and shared norms or goals”. These factors could also be labelled as the quality of a relationship (Yli-Renko, Autio, & Sapienza, 2001). All three factors can serve as a substitute for more formal, hard rewards in the work context, and they are proven to increase the amount and the quality of communication, and create more understanding between parties (Cohen & Levinthal, 1990; Lane & Lubaktin, 1998).

The first factor, trust, has been discussed and studied for decades. Blau (1964), for example, views trust as an essential determinant of the performance of relationships. Others defined it as the confidence in the goodwill of the other party and its perceived predictability (Zaheer, McEvily, & Perrone, 1998). Goodwill in this regard is the conviction that the other party will act fairly, while predictability is the extent to which one is confident to predict the other’s behaviour. The existence of a climate of trust has been generally found to be of great importance for the success of change initiatives (Caldwell & Clapham, 2003; Kotter, 1995; Oreg, 2006). The impact of trust in change is vital for two reasons. First, in a trusting relationship, there will be a smaller need for monitoring mechanisms (Scheper & Zacharakis, 2000), thus enabling extensive communication (Zaheer et al., 1998). Second, not only will the communication increase, also the nature of the communication will change. Yli-Renko et al. (2001) for example, observed a larger exchange of more personal and confidential information. Thanks to extensive previous research (e.g., Stanley et al., 2005), it is now generally acknowledged that when going through a change process, communication should come sooner rather than later. However, companies often still fail to do so. Increased mutual trust will thus enhance communication, causing better change implementation results (Mayer, Davis, & Schoorman, 1995).

The second factor of relational capital is social interaction, which refers to the (informal) contact between parties that goes beyond mere instrumental reasons (De Clercq & Sapienza, 2006). A relationship that has
high social interaction is thought to diminish distinctions between parties and encourage close cooperation (Tsai & Ghoshal, 1998), which will have the same positive effects on communication as indicated before in relation to trust (Nonaka, 1994).

A shared goal, or goal congruence, is the last factor. Organisational goals can greatly differ from individuals goals (Campbell, 1983). Goal congruence refers to the extent or similarity of goals, either between an employee and its organisation or between an employee and his supervisor, who often takes on the role of change agent (Giangreco & Peccei, 2005). Larsson, Bengtson, Henriksson, and Sparks (1998) indicate that when parties have high goal congruence, they will have more contact, once again increasing the amount and quality of information shared.

### 2.2 Commitment to change as an outcome measure

Commitment to change has received numerous definitions. According to Conner and Patterson (1982, p. 18), “the most prevalent factor contributing to failed change projects is a lack of commitment by people”. Connor (1992, p. 147) defined it as: “the glue that provides the vital bond between people and change goals”. Allen and Meyer (1990) conceptualised it as a psychological state or mind-set, which increases the likelihood that an employee will remain part of the organisation. A more recent definition of Herscovitch and Meyer (2002, p. 475) indicated that “commitment can be defined as a force (mind-set) that binds an individual to a course of action of relevance to one or more targets”.

Based on the work of Meyer and Allen (1991), it is now widely accepted that commitment is a three component model, consisting of an affective, continuance, and normative part. These three components all reduce the likelihood that an employee will leave an organisation, but they allow more specific predictions of the commitment experience and on the job behaviour (Meyer, Stanley, Herscovitch, & Topolnytsky, 2002). First, affective commitment refers to the employee’s emotional attachment to the change, based on a belief in the inherent benefits of the change initiative. People who score high on affective commitment are likely to perform tasks to the best of their abilities and even put in extra effort to ensure a successful deliverance. Secondly, continuance commitment to change is linked with the costs amounted with failure to provide support for the change. People who score high on this form of commitment stay because they perceive the costs of leaving as being greater than the benefits. These people generally get the job done, but do little more then what is necessary to maintain their employment. Finally, normative commitment to change refers to a sense of obligation to support the change. These people remain due to a sense of obligation or duty, or as a means for reciprocity in the light of received benefits.

As there is little to no empirical evidence of gender differences on the factors that influence organisational change success and willingness to change, we will perform some exploratory analyses.

### 3. Methodology

#### 3.1 Sample and procedure

In December 2010, we collected data in a Belgian automotive company through a digital self-report questionnaire. This organisation was chosen because it was undergoing a major change project, this is the implementation of a new structure. All participants were white collar employees who had a computer in their workplace. It was clearly explained to the participants that the survey was for research purposes only and that their participation was voluntary. Anonymity towards the organisation and external parties was guaranteed. However, as an incentive, the organisation received an aggregated feedback report on the general trends in their organisation and trends across different departments.

In total 77 participants took part in this research, which represents a 71 per cent response rate. The mean age was 42.5, ranging from 25 to 64 (SD = 9.15). Tenure follows a similar trend with a mean of 16.5 years, ranging from 3 to 47 years (SD = 10.88). Typical for the automotive sector, gender was not equally distributed with 87 percent male and 13 percent female participants.

#### 3.2 Measures

Validated scales were used to measure each of the concepts. The response format of each of the scales was a five-point likert scale from 1 (totally disagree) to 5 (totally agree).
Change fairness. The measure of Colquitt (2001) was used to assess the level of fairness, consisting of four subscales: distributive justice (5 items; $\alpha = .94$; e.g., ‘I have been fairly rewarded, considering the responsibilities I had during the change’), procedural justice (7 items; $\alpha = .82$; e.g., ‘To what extent have change procedures been applied consistently’), interpersonal justice (4 items; $\alpha = .91$; e.g., ‘To what extent has your supervisor treated you with respect’), and informational justice (5 items; $\alpha = .92$; e.g., ‘To what extent has your supervisor communicated details in a timely manner’).

Perceived supervisor support. A four-item measure from the ‘Organisational Change Questionnaire’ (Bouckenooghe, Devos, & Van den Broeck, 2009) was adapted to assess support provided by change agents during the change process. (4 items; $\alpha = .80$; e.g., ‘My supervisor does not seem very keen to help me find a solution if I have a problem with this change’).

Relational capital. This was measured with a scale of De Clercq and Sapienza (2006), consisting of three subscales: trust (5 items; $\alpha = .91$; e.g., ‘My supervisor can always be trusted to do what is right for me’), social interaction (4 items; $\alpha = .71$; e.g., ‘I maintain close social relationships with my supervisor’), and goal congruence (4 items; $\alpha = .85$; e.g., ‘My supervisor’s work-related goals are fully aligned with mine’).

Commitment to change. Attitude toward change here is measured by the three subscales developed by Herscovitch and Meyer (2002): affective commitment (6 items; $\alpha = .91$; e.g., ‘I believe in the value of this change’), continuance commitment (6 items; $\alpha = .72$; e.g., ‘It would be too costly for me to resist this change’), and normative commitment (6 items, $\alpha = .66$, e.g., ‘I would feel guilty about opposing this change’).

3.3 Analyses
We conducted a range of $t$-tests to gain further insights into potential gender differences with regard to the aforementioned factors that influence organisational change success and commitment to change. We used a significance level of .05 to test the difference in variance. None of scales had variances that were significantly different, so we used the $t$-test results for equality of means with assumed equal variances.

4. Results
Means, standard deviations, and $t$-tests for each scale are reported in Table 1. The results indicate significant gender differences for interpersonal fairness ($t = -2.88, p < .01$), informational fairness ($t = -2.41, p < .05$), perceived supervisor support ($t = -2.90, p < .01$), trust ($t = -2.65, p < .05$), and continuance commitment ($t = 1.71, p < .1$).

5. Conclusion
5.1 Discussion of findings
With regard to the factors influencing organisational change success, we found significant gender differences for change fairness, perceived supervisor support, and relational capital. In all cases, women scored higher than men. These results seem to be contradictory to the finding that minorities often perceive their work environment as less satisfying and supportive (Burke & McKeen, 1995; Konrad, Winter, & Gutek 1992; Niemann & Dovidio, 1998; Simpson, 2000), although these previous studies have not been conducted in the context of change per se. Further research particularly needs to look at reasons for these differing findings in a change context.

Looking at the commitment to change as an important change outcome, we found that affective and normative commitment did not vary significantly according to gender. However, a $t$-test revealed that men ($M = 3.15$) scored significantly higher on continuance commitment than women ($M = 2.81$). Tokenism has been found to facilitate this form of commitment, which is related to lower performance, and to inhibit both other forms of commitment, which are an indicator of higher performance. This finding is congruent with the fact that minorities often isolate themselves and decrease their commitment to buffer their self-esteem (Steele, 1997). To the best of our knowledge, the only other study to investigate this link with the three types of commitment has been Karrasch (2003), whose findings concur with ours.
Table 1: Means, standard deviations and t-tests

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall (n = 77)</th>
<th>Male (n = 67)</th>
<th>Female (n = 10)</th>
<th>t</th>
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<tbody>
<tr>
<td><strong>Process</strong></td>
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<tr>
<td>Change Fairness</td>
<td></td>
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</tr>
<tr>
<td>Distributive Fairness</td>
<td>3.04 (1.01)</td>
<td>3.04 (0.98)</td>
<td>3.50 (1.03)</td>
<td>-1.25</td>
</tr>
<tr>
<td>Procedural Fairness</td>
<td>2.57 (0.74)</td>
<td>2.61 (0.75)</td>
<td>2.39 (0.54)</td>
<td>0.78</td>
</tr>
<tr>
<td>Interpersonal Fairness</td>
<td>3.72 (0.87)</td>
<td>3.65 (0.85)</td>
<td>4.53 (0.45)</td>
<td>-2.88**</td>
</tr>
<tr>
<td>Informational Fairness</td>
<td>3.28 (0.96)</td>
<td>3.17 (0.95)</td>
<td>4.03 (0.90)</td>
<td>-2.41*</td>
</tr>
<tr>
<td>Perceived Supervisor Support</td>
<td>3.51 (0.80)</td>
<td>3.43 (0.80)</td>
<td>4.28 (0.62)</td>
<td>-2.90**</td>
</tr>
<tr>
<td><strong>Context</strong></td>
<td></td>
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<tr>
<td>Relational Capital</td>
<td></td>
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<tr>
<td>Trust</td>
<td>3.56 (0.84)</td>
<td>3.48 (0.85)</td>
<td>4.30 (0.56)</td>
<td>-2.65**</td>
</tr>
<tr>
<td>Social Interaction</td>
<td>2.70 (0.74)</td>
<td>2.73 (0.71)</td>
<td>2.88 (0.87)</td>
<td>-0.52</td>
</tr>
<tr>
<td>Goal Congruence</td>
<td>3.55 (0.81)</td>
<td>3.53 (0.82)</td>
<td>4.03 (0.77)</td>
<td>-1.66</td>
</tr>
<tr>
<td><strong>Outcomes</strong></td>
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<tr>
<td>Commitment to Change</td>
<td></td>
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</tr>
<tr>
<td>Affective Commitment</td>
<td>3.57 (0.74)</td>
<td>3.63 (0.75)</td>
<td>3.54 (0.98)</td>
<td>0.29</td>
</tr>
<tr>
<td>Continuance Commitment</td>
<td>3.11 (0.52)</td>
<td>3.15 (0.53)</td>
<td>2.81 (0.51)</td>
<td>1.71†</td>
</tr>
<tr>
<td>Normative Commitment</td>
<td>3.55 (0.62)</td>
<td>3.58 (0.66)</td>
<td>3.60 (0.33)</td>
<td>-0.12</td>
</tr>
</tbody>
</table>

† p < .1; * p < .05; ** p < .01; *** p < .001

5.2 Further research

In this article we started to explore the impact of gender on perception of change processes and change success. Given the newness of this type of research, no specific hypotheses were examined in this particular study. However, an exploratory examination indicates that men and women do behave differently towards change processes. Furthermore, women in a minority setting seem to behave differently during a change process than they would in a normal setting. Of course, further research is needed to strengthen these findings as this is only a first small step towards enhanced understanding about the impact of gender differences in the context of change processes.

6. References


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Basic Need Support, Achievement Goals, Life Satisfaction and Academic Achievement in the Transition between Final Elementary School and High School

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Abstract

Achievement goals are motivational constructs defined in terms of the students’ standard of excellence (mastery vs. performance) and valence (approach vs. avoidance) in an achievement setting. These achievement goals may have a foundation in basic need satisfaction (competence, autonomy, and relatedness), and students may experience different levels of need support from their teachers. Finally, both achievement goals and need support may be predictors of important outcomes, such as life satisfaction and academic achievement. This study had two primary aims. Firstly, to investigate the relation between basic need support, achievement goals, and life satisfaction among students. Secondly, to compare the scores on these variables in two groups of students, namely last year elementary school students and first year high school students in order to investigate these student characteristics in the transition between elementary school and high school.

The sample consisted of 1423 elementary school students and 1510 first year high school students.

Basic psychological needs were measured by means of items based on the learning climate questionnaire (Black & Deci, 2000). In addition, items reflecting competence were added to form a scale of 18 items. A principal component analysis showed that items measuring competence and autonomy loaded on one factor, while relatedness loaded on a separate factor.

Achievement goals were measured by means of items describing personal achievement goals from the Patterns of Adaptive Learning Scale - PALS (Midgley et al., 2000). A principal component analysis produced the expected three factors of mastery, performance approach, and performance avoidance achievement goals.

Life satisfaction was measured by means of a nine-item version of Students’ Life Satisfaction Scale (SLSS) that measures students’ internal, reflective appraisals of reality (Huebner, 1991).

Academic achievement was measured by means of a single items, asking the student to indicate what s/he thinks the contact teacher feels about his/her academic achievement on a scale from 1 to 4 (1 = very well, 2 = quite well, 3 = adequate, 4 = less than average performance)

A path analysis showed that perceived support of relatedness predicted life satisfaction and mastery goals, while support of competence and autonomy predicted academic achievement both directly and indirectly via mastery goals. In addition, support of competence and autonomy predicted performance approach and performance avoidance. All of these relations were positive. In addition, several mean level differences between elementary and high school students were observed.

These results show how the teachers’ need support, as perceived by the students, are important predictors of achievement goals, in particular support of autonomy and competence. However, support of relatedness needs is also an important predictor of life satisfaction. Hence, life satisfaction appears to have a foundation in relatedness support rather than support of autonomy and competence, while the latter needs appear more important for school motivation and achievement. These results are relevant for teachers and researchers who want to identify relevant factors for life satisfaction and achievement among students in order to improve these important outcomes in a school setting.

Keywords: Basic need support, achievement goals, life satisfaction, academic achievement

References


Study Time and Academic Performance: A Conditional Relation?

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Abstract

Study results depend on many interacting factors, including students’ and teachers’ personal characteristics, their conceptions, preferences and strategies with respect to learning and teaching, and contextual variables (e.g., Biggs, 2001; Broekkamp & Van Hout-Wolters, 2007). The current study aims to specify the role and place of study time (ST) in this complex set of variables and relationships in a self-regulated learning environment. Although, intuitively, more ST is expected to result in higher performance, research results have been inconsistent (Stinebrickner & Stinebrickner, 2004). In some cases, ST has been shown to predict academic performance beyond a myriad of intellective (e.g., high school GPA, SAT scores) and non-intellective student characteristics (e.g., gender, health; Brint & Cantwell, 2010). In other cases, no significant association was obtained (e.g., Gortner & Zulauf, 2000). This pattern of findings suggests that the role of ST depends on other factors. Aim of the current study was to explore interactions between ST and the quality of learning activities involved. Consistent with the work of Vermunt (1992) and Masui and De Corte (2005), the focus will be on the affective-motivational, cognitive, and metacognitive processing of course content. Moreover, based on Biggs’ (2001) model of learning, the predictive value of (quantitative and qualitative) features of the learning process will be evaluated within the context of relevant student characteristics and for different courses.

In the period 2008-2010, data of 398 first-year students of the Faculty of Business Economics of Hasselt University (Belgium) were gathered. Key variables (academic performance, study time, and quality of learning activities) were measured at the course-level. Each student was assigned to complete measures about one particular course (i.e., Macro-Economics, Micro-Economics, Mathematics, or Financial Accounting). Course grades and student characteristics (gender, prior knowledge,...) were obtained from academic records. Students recorded their study time for a particular course at least weekly for the entire duration of the term by means of a web-based application. Qualitative aspects of the learning activities deployed for the courses concerned were measured by means of a student questionnaire. The included affective-motivational learning processes were self-efficacy, causal attribution of success/failure, volition, and learning orientation regarding the course. Cognitive processes referred to activities such as structuring, analyzing, and relating course content. Finally, metacognitive processes referred to, for example, the degree of monitoring and evaluating one’s comprehension for a particular course.

Preliminary analyses show adequate internal consistencies for all questionnaires involved (i.e., above .70). First, a general model will be evaluated (including data from all courses) in order to determine which factors are important overall. Second, key variables will also be evaluated at the course-level. Interactions between ST and quality of learning activities are expected: We hypothesize that a minimum amount of ST is required before highly qualitative learning activities may affect academic performance, and vice versa.

Theory and research on self-regulated learning primarily includes the quality of learning activities in models of student learning. The current study aims to add to this literature by identifying complex interplays with study time invested.

Keywords: study time, quality of learning activities, academic performance, higher education

References

Brint, S., Cantwell, A. M., (2010), Undergraduate time use and academic outcomes: Results from the University of California Undergraduate Experience Survey 2006, Teachers College Record, 112, 2441-2470.


Validation of a Thai Version of Vermunt’s Inventory of Learning Styles

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Abstract

This paper presents the preliminary findings of a study to test a Thai language version of Vermunt’s (1994) Inventory of Learning Styles (ILS) instrument. The original English language version of the instrument consists of 120 statements measuring four learning components: cognitive processing strategies, regulation of learning strategies, conceptions of learning, and learning motivation orientations (Vermunt, 1994, 1998). It was developed in the Netherlands based on phenomenographic analyses of interviews of Dutch students about learning and translated into Thai using a rigorous process. Home language versions of Vermunt’s ILS have also been developed for use in other Asian countries, including Indonesia and Sri Lanka. The Asian language versions have been found to broadly support the original model but also to share certain differences, raising the question of whether a cultural basis underlies the common divergence from the original model that was based on Dutch students.

An opportunity sample of 545 Thai first year degree students from seven different major programs at a Thai university was used. The findings based on principal components analysis employing a varimax rotation show that Thai learning approaches closely resemble Indonesian patterns found by Ajisuksmo & Vermunt (1999) and to a lesser extent, Sri Lankan patterns (Marambe, 2007) but differ in certain areas from Dutch patterns (Vermunt, 1998), when compared to other findings based on Vermunt’s (1994) ILS. Cronbach’s alpha scores for each scale suggest that the Thai version inventory has satisfactory internal consistencies for all but one scale (personally interested). The findings are presented and discussed within a framework of psychometric, learning styles and cultural issues.

Keywords: Learning styles; Vermunt; Thai students

1. Introduction

A strong argument for the use of learning styles in education is to develop an understanding of students’ learning preferences, which in turn can be applied to inform teaching and learner support strategies (Sadler-Smith & Smith, 2004). Conversely, a lack of objective information concerning learning behaviour and its diversity can lead to stereotyping and misunderstanding, especially in the rapidly growing areas of multicultural and international education (Ballard and Clanchy, 1991; Biggs, 1996; Ramburuth, 2000; Samuelowicz, 1987a; 1987b).

In the West, learning styles are considered to be ‘a relatively new idea [that] is now very popular among teachers, is widely applied and is thus becoming part of the everyday language of the classroom’ (Hargreaves et al., 2005, p. 10). Contrastingly, in Thailand very few learning styles measures have been developed and used in education and these tend to be based on small-scale studies. As a result, learning styles are generally not assessed in Thai education resulting in very little objective information available on Thai learning styles.

1.1. Vermunt’s Inventory of Learning Styles (ILS)

Vermunt’s (1994) Inventory of Learning Styles (ILS) has been described as based on ‘a rich model, validated for use in UK HE contexts’ (Coffield et al., 2004, p. 109). Based on phenomenographic analyses of Dutch first year university students’ interviews, Vermunt’s (1994) ILS comprises 20 subscales and scales, and 120 items using a 5 point likert scale. It measures students’ learning strategies (‘Processing Strategies’), level of internal, external or problematic regulation of their learning processes and results (‘Regulation Strategies’), motivation for studying (‘Learning Orientations’) and their conceptions of learning aims and processes (‘Mental Models of Learning’). Using factor analysis, Vermunt (1996) found that these strategies and conceptions conformed to a typology of four different learning approaches or directions (see Appendix 2).

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'Meaning-directed learning’ refers to a critical thinking approach to relating, structuring and processing information, self-regulated learning processes and material, learning viewed as the construction of knowledge, and a learning orientation of personal interest. ‘Application-directed learning’ is associated with concrete (or application-oriented) processing of information, learning conceptualised by the learner as having applicable or usable qualities and a vocational learning orientation. ‘Reproduction-directed learning’ is typified by the use of memorizing, rehearsing and analysing strategies to process information; learning viewed as the intake of knowledge, and certificate and self-test directed learning orientations. ‘Undirected learning’ is associated with a lack of regulation over learning, a higher concern for cooperation with other students and stimulating education, and an ‘ambivalent’ learning orientation. Ambivalent, in this sense, refers to students’ concerns and doubts over their ability to study and cope with the course demands.

Modified versions of Vermunt’s (1994) ILS have also been developed in local languages in Indonesia (Ajisuksmo and Vermunt, 1999), and in Sri Lanka by Marambe (2007).

1.2. Thai Education

Structurally, the education context of Thailand is similar to the tertiary education system found in many Western countries, with 9 years of compulsory education from the age of 6 years and 12 years of free education guaranteed for all Thai children by the constitution (Thai Ministry of Education, 2008). The Thai Ministry of Education (MOE) (2008) recently reported that out of a Thai population of approximately 63 million people, nearly 20 million students were enrolled in early years to higher education programs with 2.2 million in higher education alone, which represents 56% of the university age cohort. However, the learning processes in Thailand have been presented in numerous studies as differing from the student-centred learning processes commonly found in Western education contexts.

A number of Western and Thai researchers have consistently described Thai students’ learning behaviour as strongly conforming to the Thai school environment and its traditional Thai values that students should passively receive knowledge from the teacher and should only speak out in class if requested (Burnard, 2006; Charoenwongsak, 2002; Deveney, 2005; Komin, 1991; Knee, 1999; Nachiengmai, 1998; Techavijit, 2007). According to Charoenwongsak (2002, p. 4):

“The Thai education system does not facilitate an individual’s thinking ability, but focuses on rote learning. Submissive students who do not ask questions are seen as well behaved. In contrast, students who are creative, critical and analytical and who reason with their teachers are often viewed as aggressive and disobedient, and have trouble fitting into the Thai education system.”

The former Advisor to the Prime Minister of Thailand, Dr. Virichai Techavijit concurred with this view in his address at the University of Oxford in March 2007:

“Teaching tends to be centred around the teacher...Students have little or no opportunity to express themselves openly; rather they have to follow what the teachers say or instruct them to do. Students’ individuality, initiative and creativity expressed through critical, constructive questioning are not generally welcomed by the teacher and are often regarded as offensive” (Techavijit, 2007 p. 20).

Recent changes in the Thai education system have been welcomed in a report by the United Nations Educational Scientific and Cultural Organization (UNESCO) (2006, p. 6, online) that described the 1999 Thai National Education Act as:

“an unprecedented and long overdue break from traditional Thai educational norms such as lecturing and rote-learning, as it sets the foundation for a more creative, questioning approach to study.”

However, a note of caution should be made here that cultural analyses should be regarded as essentially subjective at some level by their very nature and their use runs the risk of stereotyping and reifying behaviour, even with a high level of consensus amongst researchers. For example, the changes in the Thai education system in moving from being teacher-centred to student-centred could lead to changes in both teaching and learning styles.

These descriptions of Thai learning processes and behaviour would suggest that meaning-directed learning based on a self-regulated, constructivist and critical approach may be less evident in Thai learning patterns
than reproductive-directed learning in ILS scores such as memorizing information and being externally regulated due to the teacher-centred style of Thai education, although Vermunt does not necessarily see these approaches as mutually exclusive, commenting:

“It is tempting, but in our opinion incorrect, to regard the distinction between constructive and reproductive learning as equal to the distinction between meaningful and rote learning. Constructive learning and reproductive learning, as operationalised in many questionnaires (e.g., Vermunt’s ILS, Biggs’ SPQ and Entwistle’s ATI) are certainly not negatively correlated, but turn out to be independent from each other or sometimes slightly positively correlated” (Wierstra et al., 2003, p. 506).

Therefore, the aims of this study are:

i) To test the psychometric properties of a Thai version of Vermunt’s (1994) Inventory of Learning Styles (ILS) in order to ascertain its suitability for use plus any limitations.

ii) To compare the principal components analyses and learning patterns of the Thai ILS with those of Vermunt’s Dutch findings (as the origin of the ILS) and the other two Asian ILS based studies in Indonesia (Ajisuksmo and Vermunt, 1999) and Sri-Lanka (Marambe (2007).

2. Method

2.1. Instrument

Prior to this study, a Thai version of Vermunt’s (1994) Inventory of Learning Styles was developed using a backwards translation procedure and was modified further following a pilot study that tested participants using both English and Thai versions of the ILS. A committee method process was employed using the first two translators plus myself to discuss the meaning and accuracy of every item of the first translation plus any differences in the versions highlighted by the data analysis (correlations and t-tests) of the pilot study. A third translator translated the modified Thai version back into English and this version was found to be almost identical to Vermunt’s (1994) original English language ILS. The three translators were unknown to each other and had no contact with each other except for the meetings to analyse the translation.

The final Thai version closely resembled Vermunt’s original ILS, based on the same 120 questions or items, written instructions, 5 point likert scale, format and scoring key. It also measured the cognitive processing strategies, regulation of learning strategies, conceptions of learning, and learning motivation orientations using 20 different scales and subscales. The scales and number of items per scale are listed in Appendix 1 according to the four learning domains (Processing strategies, Regulation strategies, Conceptions of Learning and Learning Orientations), and Appendix 2 sorted into the learning approaches (Meaning-directed, Reproduction-directed, Application-directed and Undirected) according to the factor loadings found by Vermunt (1998).

2.2. Sample

Questionnaires were completed by 545 first year bachelor degree students during their English language classes at a Thai university using an opportunity sampling design. Their degree programs included dentistry, health science, medicine, pharmacy, engineering, social communication innovation and tourism & sustainability studies.

2.3. Procedure

Students were asked to complete the Thai language version of the Inventory of Learning Styles during their English language classes at the university language centre in Bangkok, Thailand, following consent obtained from the language centre personnel. This was within the third month of the first year of a degree course. They were not given a time limit and the instructions were written on the questionnaire as the questionnaires were distributed by the English language teachers unfamiliar with the measure. For each question, students were required to read a statement and then circle a number from 1 to 5 accompanied with a short description of the score’s meaning. The questionnaires were then collected by the class teacher and returned for data analysis. No reward was given for participation in the study.
3. Data Analysis and Results

Although 559 questionnaires were originally distributed, 14 were discarded due to incomplete responses (two or more missing responses in any scale). The remaining 545 questionnaires were processed by firstly calculating the mean scores per scale (or subscale) per participant. Next, descriptive statistics, cronebach’s alpha coefficients per scale and subscale, and a principal components analysis (PCA) were conducted on the data.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Mean (SD) Thai version of ILS N=545 (present study)</th>
<th>Mean (SD) Dutch ILS N=795 (Vermunt, 1992, 1998)</th>
<th>Mean (SD) Indonesian ICB-1 N=888 (Ajisuksmo and Vermunt, 1999)</th>
<th>Mean (SD) Sri-Lankan ARPM2 N=144 (Marambe, 2007)</th>
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<tr>
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<td>Relating and structuring</td>
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<td></td>
<td></td>
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<tr>
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<td>2.83 (1.30)</td>
<td>3.33 (1.69)</td>
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<td>2.92 (1.57)</td>
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<tr>
<td></td>
<td>Mean</td>
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<td>2.81 (1.17)</td>
<td>2.99 (1.37)</td>
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<td>2.54 (1.28)</td>
<td>2.97 (1.83)</td>
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<tr>
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<td>Mean</td>
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<tr>
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<td>Mean</td>
<td>3.03 (0.56)</td>
<td>3.08 (1.21)</td>
<td>3.15 (1.53)</td>
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<td>Mean</td>
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<td>3.38 (1.23)</td>
<td>3.25 (1.52)</td>
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<td>2.40 (1.17)</td>
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<td>Mean</td>
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<td>3.17 (1.04)</td>
<td>3.33 (1.30)</td>
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<td>3.96 (1.23)</td>
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<td>4.12 (1.09)</td>
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<td>Mean</td>
<td>3.73 (0.67)</td>
<td>3.01 (1.20)</td>
<td>3.82 (1.12)</td>
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Table 2: Cronbach’s alpha coefficients for the Thai and other ILS-based studies

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<td>Self-regulation of learning content</td>
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<td>.73</td>
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<td>External regulation</td>
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<td>.89</td>
<td>.67</td>
<td>.78</td>
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</table>

Table 1 shows that the mean scores of each scale (based on a 5 point scale) are generally similar except for shaded scores showing .5 or more variation from the other samples’ scale means. It can be seen at a glance that Vermunt’s (1992, 1998) Dutch-based data shows the highest level of variation between the scale means for 6 scales, followed by Ajisuksmo and Vermunt’s (1999) Indonesian-based data for 2 scales. The Thai and Sri-Lankan scale means found in the present study and Marambe’s (2007) data, respectively, appear the most similar at this basic level of analysis.
The Thai ILS’s cronbach’s alpha coefficients compare well with other studies and are satisfactory to good for most scales except for two. The alpha coefficient for Scale 7: Personally interested is very low ($\alpha = .34$) and is moderately low for scale 5b: External regulation of learning results ($\alpha = .56$).

A quick eyeball analysis of the factor loadings for all four studies suggests that the Thai data more closely resembles Indonesian and, to a lesser extent, the Sri Lankan factor loadings compared to the Dutch data, indicative of a possible underlying cultural pattern. The eigenvalues and variance scores show that the Thai factors explain more of the overall variance but are less equally distributed, with the first two factors being much higher compared to these values from the other studies.

4. Discussion

The cronbach’s alpha coefficient analyses suggest that the Thai version of the Inventory of Learning Styles (ILS) has satisfactory to good internal consistency for all scales except scale 7: personally interested. The statements in this scale include studying for sheer interest, sheer relaxation, for self enrichment, choosing a course for personal interests and studying because of liking to study and learn. Whilst such personal interest may be an influential factor in choosing course programs in Western countries such as the Netherlands, Ajisuksmo and Vermunt (1999) point out that Indonesian students are more likely to have their course chosen by family members or parents. This is similar in Thailand as well where parents play a relatively important role in choosing study areas compared to the West. The Thai Ministry of Education (2008) is working towards a target of 50% of all graduates to be in Science and Technology areas by 2011, consistent with the strongly vocational orientation of Thai education over personal interest courses such as arts and humanities. Ajisuksmo and Vermunt (1999) reported that adding 7 new items to the ‘personally interested’ scale improved its internal consistency ($\alpha = .62$) and it appears that this is also necessary with the Thai version of the ILS for scale 7 (Personally interested) in order to adapt it to Thai cultural and study motivation contexts.

Marambe (2007) concluded that the results of principal components analysis (PCA) for the Indonesian and Sri-Lankan data sets broadly supported three out of four of Vermunt’s Dutch factor-based approaches. The application directed approach was not supported by the Indonesian and Sri-Lankan factor loadings “pointing towards the influence of culture in shaping the learning activities” (Marambe, 2007, p. 174). Ajisuksmo and Vermunt (1999, p. 53) and Marambe (2007, p. 174) regard the conceptions of learning scales loadings associated with factor 3 of the Indonesian and Sri-Lankan data sets as representing a “passive-idealistic learning style”. The results of the Thai PCA factor loadings for factor 2 differ slightly from this and include a loading of .44 for vocation directed (scale 10) and a lower loading of .36 for self-test directed (scale 9), suggesting a link between all conceptions of learning and a vocational direction, consistent with the strongly vocational orientation of Thai higher education discussed earlier. Therefore, the Thai factor 2 could be interpreted as a vocation-directed learning approach, rather than simply application-directed.

Factor 1 for both the Thai and Indonesian data sets combines different types of processing strategies with self-regulation, challenging Marton and Sälljö’s (1976) model of deep and surface learning processes that distinguish between surface processing (rote learning, extrinsic motivation) and deep processing (meaning-based learning, intrinsic motivation) as mutually exclusive approaches. Rather, the Thai and Indonesian factor 1 combination of relating & structuring, critical processing, memorizing & rehearsing, analysing and concrete processing strategies with self-regulation lends support for Vermunt’s caution that constructive and reproductive learning could be positively correlated in some measures (cited in Wierstra et al., 2003). It is also consistent with recent studies on Chinese learning patterns that have found Chinese students can combine the processes of understanding and memorization, which tend to be conceptualised as distinct processes in Western students (Biggs, 1996; Gow et al., 1996; Marton et al., 1996; Watkins, 1996; Kember, 2000). Therefore, the learning patterns associated with the Thai factor 1 appear consistent with recent research findings on other Asian students and can be interpreted as a ‘learning directed’ approach rather than a meaning directed approach.
Table 3: Factor loadings of a principal components analysis with a varimax rotation for the Thai and other ILS-based studies

<table>
<thead>
<tr>
<th>Scale</th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 3</th>
<th>Factor 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NL</td>
<td>TH</td>
<td>SL</td>
<td>IN</td>
</tr>
<tr>
<td>1 Deep processing</td>
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<td></td>
</tr>
<tr>
<td>1a Relating &amp; structuring</td>
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<tr>
<td>1b Critical processing</td>
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<tr>
<td>2 Stepwise processing</td>
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<tr>
<td>2a Memorization &amp; rehearsing</td>
<td></td>
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<tr>
<td>2b Analysing</td>
<td></td>
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<tr>
<td>3 Concrete processing</td>
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<tr>
<td>4 Self-regulation</td>
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<tr>
<td>4a Self-regul.- learn proc &amp; res</td>
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<tr>
<td>4b Self-regulation of learn content</td>
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<td></td>
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</tr>
<tr>
<td>5 External regulation</td>
<td></td>
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<tr>
<td>5a External reg- learn processes</td>
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<tr>
<td>5b External reg- learning results</td>
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<tr>
<td>6 Lack of regulation</td>
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<tr>
<td>7 Personally interested</td>
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<tr>
<td>8 Certificate directed</td>
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<tr>
<td>9 Self-test directed</td>
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<tr>
<td>10 Vocation directed</td>
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<tr>
<td>11 Ambivalent</td>
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<tr>
<td>12 Construction- knowledge</td>
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<tr>
<td>13 Intake of knowledge</td>
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<tr>
<td>14 Use of knowledge</td>
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<tr>
<td>15 Stimulating education</td>
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<tr>
<td>16 Cooperation</td>
<td></td>
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</tr>
</tbody>
</table>

Eigenvalues

| 4.3 | 6.4 | 3.9 | 5.5 | 3.0 | 4.1 | 2.5 | 2.6 | 1.9 | 1.7 | 2.3 | 1.4 | 1.3 | 1.1 | 2.1 | 1.3 |

% of Variance

| 21.3 | 32.3 | 19.9 | 27.4 | 15.2 | 20.6 | 12.7 | 12.8 | 9.6 | 8.5 | 11.6 | 7.0 | 6.4 | 5.5 | 10.5 | 6.4 |

Cumulative %

| 21.3 | 32.3 | 19.9 | 27.4 | 36.5 | 52.9 | 32.6 | 40.3 | 46.1 | 61.4 | 44.2 | 47.2 | 52.5 | 66.9 | 54.7 | 53.7 |

Note: 1. Principal component analysis: factor loadings between -.25 and .25 omitted; 2. Table adapted from Ajisuksmo & Vermunt (1999, p. 52 & 54) and Marambe (2007, p. 116); 3. Please see Appendix 1 for full scale descriptions where abbreviated; 4. The data for this study (on Thai students) is indicated in bold font.
The Thai factor 3 consists of large loadings for all the learning orientations scales except for ambivalent (scale 11). This can be interpreted as a motivation directed learning approach since it is characterised by different types of motivation together with the conceptions of learning as the intake and use of knowledge. Finally, the Thai factor 4 appears to be an undirected approach since the loadings include the ambivalent and lack of regulation scores but also a certificate-directed loading. This could suggest that exam results oriented learning motivation is also associated with lower confidence and more doubts about study and learning processes in the Thai students who were assessed. Unlike the Dutch undirected approach, the three Asian types are not associated with cooperation and stimulating education issues.

Further investigation would be useful to explore the tentative links made in the study between learning approaches and culture. More research is needed into the effect of other possible variables such as age, gender and study discipline areas on the ILS scores, and to isolate any possible effects from cultural factors. Nonetheless, this study has raised a number of interesting issues and comparisons about culture and learning approaches that would benefit from further exploration.

5. Conclusion
Overall, the results of the Thai version of the ILS are fairly consistent with the Indonesian and Sri Lanka versions. Together, they can be taken to provide broad support for Vermunt’s (1994) ILS model of learning components although the learning directions show some differences that could be cultural in origin. The results suggest that the Thai version of the ILS shows promise for slight modification and use in Thai higher education on the basis of its psychometric qualities demonstrated in this study.

6. References


### Appendix 1: Vermunt’s Model of Learning Components or Domains

<table>
<thead>
<tr>
<th>Component/ Learning Domain</th>
<th>Scale No.</th>
<th>Subscale No.</th>
<th>Scale or Subscale Name</th>
<th>No. of items</th>
</tr>
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<tbody>
<tr>
<td><strong>Deep processing</strong></td>
<td>1</td>
<td>1a</td>
<td>Relating &amp; structuring</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1b</td>
<td>Critical processing</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2a</td>
<td>Memorizing &amp; rehearsing</td>
<td>5</td>
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<tr>
<td></td>
<td></td>
<td>2b</td>
<td>Analysing</td>
<td>6</td>
</tr>
<tr>
<td><strong>Stepwise processing</strong></td>
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<td>4</td>
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<td>Self-regulation of learning processes &amp; results</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>4b</td>
<td>Self-regulation of learning content</td>
<td>4</td>
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<td>5b</td>
<td>External regulation of learning results</td>
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### Appendix 2: Vermunt’s Model of Learning Approaches

<table>
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<th>No. of items</th>
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<td>Self-regulation of learning content</td>
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<td><strong>Construction of knowledge</strong></td>
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<td>Construction of knowledge</td>
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<td><strong>Cooperation</strong></td>
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<td>Cooperation</td>
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<td><strong>Ambivalent</strong></td>
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<tr>
<td><strong>Cooperation</strong></td>
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<td>Cooperation</td>
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</table>
An Emerging Framework on Student Teachers’ Learning Orientations in School-Based Teacher Education Programmes: The Influence of Personal, Contextual and Time-Related Factors

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Vincent DONCHE (University of Antwerp, Belgium)

Abstract

One of the key tasks of teacher education is to support student teachers to develop a learning orientation necessary for lifelong learning (Hagger et al., 2008). In order to design teacher education programmes for stimulating this development, scientific knowledge is needed about the influencing factors, and how these learning orientations develop over time. Studies on academic learning have shown that learning orientations are influenced by several personal and contextual factors (Vermunt & Vermetten, 2004) and are variable across time (Donche, Coertjens, & Van Petegem, 2010). Oosterheert (2001) has established a framework for studying individual differences in learning to teach during internships. She makes a distinction between open meaning-oriented; closed meaning-oriented; reproduction-oriented; and survival-oriented learners, as measured by the Inventory Learning to Teach (ILTP). In the last five years, multiple cross-sectional and longitudinal studies have been carried out using the ILTP, including several personal, contextual and time-related variables. Drawing on the results of these studies as well as presenting cross-validated research results, we aim to present an emerging framework on student teachers’ learning orientations. The main research question is: How are student teachers’ learning orientations related to various personal and contextual variables and how do these orientations develop over time?

The ILTP questionnaire consists of 10 scales, including learning conceptions, learning and regulation activities and emotion regulation. Data is collected about personal variables such as age, teaching experience, gender, teaching efficacy, self-determination and contextual variables such as type of teacher education, perception of learning environment, and time investment. Six cross-sectional and longitudinal datasets are included in this study, including 81 to 253 student teachers per study. To cross-validate results from separate studies, new data analyses were carried out: longitudinal multilevel analysis for discovering changes over time, multivariate analyses to find relations between groups of students and structural equation modelling to find relationships between multiple background variables and scale scores.

Across the studies, the open meaning oriented way of learning could not always be identified as a distinct orientation. Several personal variables turned out to be related to the learning orientations. Older and more experienced student teachers were found to have more often a meaning-oriented learning orientation. Learning orientations were related to differences in motivation. Looking at changes over time, in both longitudinal data sets it turns out that overall student teachers’ orientations to learning to teach change during time in the direction of more meaning-oriented learning. It appeared that changes with respect to student teacher learning are found predominantly among survival-oriented students.

Regarding curriculum development, the results suggest that introducing longer teaching practice placements in different schools may be a lever for changing student teachers’ orientation to learning to teach. The emerging framework that will be presented, will provide an intricate view on how learning orientations, time-related factors and personal and contextual variables are interrelated. It will provide more insights in the factors that can stimulate the development of student teachers’ learning orientations.

Keywords: Teacher education, learning orientation, longitudinal study, development, student teachers

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University Students’ Learning Styles and Academic Performance: A Case of Languages Learners

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Jean-Claude RÉGNIER (University of Lyon, France) – jean-claude.regnier@univ-lyon2.fr

Abstract

The aim of this descriptive, correlational investigation was to identify the preferred learning styles of university level language students studying in six different fields through utilizing survey questionnaire and Kolb’s learning style inventory. The correlation between students’ learning styles, and their academic performance; and differences in students’ learning styles on the basis of their demographic profile were also explored. Data were collected from 218 Master level language students from the University of the Punjab, Pakistan. Data analysis showed that majority of the sample students had a Diverger learning style followed by Accommodator learning style. Department-wise position of respondents for their preferred learning styles illustrated that most of the respondents from all the departments prefer a Diverger learning styles. Learner’s gender and nature of house affected the preference for learning styles. Other variables showed no association with learning styles in our sample. Learning styles of language students have no correlation with the marks obtained in their previous examinations. This study recommended that teachers should be provided the awareness of learning styles so that they may adapt their teaching to accommodate all the learning needs of students and the study should be replicated on a large sample to get more insight about the learning styles of language learners.

Keywords: Learning styles, Academic performance, student’s demographic profile, learning style preference

1. Introduction

Education serves as a torch bearer leading to bring a healthy and positive change in society. This uprising mechanism affects one’s physical, social, psychological, mental spiritual and economic development. It ensures consciousness about the right and wrong that not only scaffolds individual’s personality and dignity but also nation’s wellbeing and prosperity. This process of knowing and learning continues from an individual’s birth to death through formal and informal ways. Learning is associated not only with children but it is a lifelong task necessary for personal and career development for all individuals of all age groups. It equips the youth with civic norms, societal values, ethical maturity, and technological competencies for a purposeful living. Particularly, higher education plays a fundamental role in the socio-economic uplift of a country. It helps young people in understanding the principles of life, socializing for momentous roles, making future decisions, and advancement to prestigious careers. It not only embarks for pursuit of one’s goals through broadening experience, exposing to diversity of views, arousing critical thinking, and inculcating analytical skills but also provides leadership to society in all spheres of life. It provides professional and skilled labour force to cope with the needs of society.

One of the most significant processes of one’s life is learning. It is a multifaceted phenomenon in nature. Learning experiences are being manifest in the form of new approaches, theories, philosophies and metacognition. In formal academic settings along with the learners’ emotional contentment, behavioral adaptation, and attitudinal wellbeing, better academic performance in the form of high achievement scores and better grades are also the key objectives (Dunn, 1990; Hannafin, 1991; Keefe, 1990; Rowland & Stuessy, 1988). It is a fact that all individuals have a set of unique characteristics. This diversity may be the cause of differences in their performance at work and conduct.

Behaviourists view learning as observable and measurable changes in behaviour. These theorists are influenced by Thorndike (1913), Pavlov (1927), and Skinner (1974). They conceptualized learning as a

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change in overt behaviour caused by external environmental stimuli. It is the exhibited behaviour which indicates that the learner has learnt something or not. According to this school of thought, a mind is like a ‘black box’ and responses to external stimuli are observed quantitatively. In response to the external environmental stimuli, the indicators of learning are not only observable but also measureable from the overt behaviour (Good & Brophy, 1990). In early years behaviorists used animals for the study of responses to external stimuli, nowadays human volunteers are used for this purpose (Mergel, 1998). They have been provided the stimulus and the changes in their behaviour are observed. This process is repeated up to the time that learner respond automatically to the external stimuli or question without any help. The proper use of reward or punishment as a reinforcement is crucial in the success of this method.

Cognitivists consider see learning not as an overt change in behaviour but as a process of mental activity. This school of thought focused on mechanism of information processing which involves the role of thinking processes, meta-cognition, memory, internal motivation and brain functioning for the construction and acquisition of new knowledge. According to some educators not all types of learning are observable, therefore the dominant paradigm on learning shifted from behaviorism to cognitivism (Ally, 2004; Mergel, 1998).

Constructivists see learning as a construction of new knowledge rather than the reproduction of existing information and facts. These theorists believe that learners construct new knowledge through developing consensus among their fellows working in collaborative environment. They share their ideas, perceptions, experiences, interpretations and understanding of facts. Learning occurs when learners interact socially in the exploration of realities, the identification of deficiencies and in the inconsistencies in the existing body of knowledge (Dalgarano, 2001; Murphy, 2003). Learners are considered as an active party rather than a passive recipient in the learning process. They should be allowed to construct knowledge instead of passing them knowledge through instruction. Learning is moving from instruction to construction and discovery of knowledge (Duffy & Cunningham, 1996; Tapscott, 1998).

A close analysis of behaviorist, cognitivist and constructivist theories indicate that there are a number of overlaps in their ideas and principles. These overarching principles are used for designing learning materials. These three schools of thoughts are considered as taxonomy for learning (Ertmer & Newby, 1993). According to Ally (2004) “Behaviorists’ strategies can be used to teach the “what” (facts), Cognitivists’ strategies can be used to teach the “how” (processes and principles), and Constructivists’ strategies can be used to teach the “why” (higher level thinking that promotes personal meaning and situated and contextual learning)” (p.7).

A Chinese philosopher Lao-Tse 5th-century BC, cited in Hutt (2007) said that “If you tell me, I will listen. If you show me, I will see. But if you let me experience, I will learn” (p.70). “Learning is defined as a continuous cycle that starts with experience, continues with reflection and leads to action, which, in turn, becomes a concrete experience for reflection” (Kolb, 1984). The history of experiential learning goes back to the work of John Dewey, Kurt Lewin, Carl Jung, Jean Piaget and Lev Vygotsky (Hainer, Fagan, Bratt, Baker, & Arnold, 1990). Dewey (1922) believed in “learning by doing” and knowledge acquisition through engagement in active experiences. Therefore a learner is an active part in the learning process, where he applies his prior experiences in new situations and constructs new knowledge (Dewey, 1933). This philosophy provides the foundations to Kolb’s experiential learning theory. Kolb views learning styles as a result of “hereditary equipment, past experience, and the demands of the present environment” (Kolb, 1999). He proposed learning as an active process based on constructivist approach, to engage a person in, not a something done to anybody (Kolb, 1984). His theory suggests a “constructivist theory of learning whereby social knowledge is created and recreated in the personal knowledge of the learner” (A. Kolb & D. Kolb, 2005). It is a “holistic integrative perspective on learning that combines experience, perception, cognition and behavior” (Kopsovich, 2001, p.25).

This concept of styles originates from two dimensions in educational and vocational psychological research circles. Learners’ different characteristics were explored because different individuals retain and organize information in different fashions. Some researchers applied cognitive styles in educational settings for observing the differences in academic performance of students whereas others focus on various other domains like teaching and learning processes, and introduced theories of learning styles (Dunn & Dunn, 1978; Gregorc, 1985). Learning styles identification helps educators in understanding how their students perceive and process information in different manners and patterns (Shih & Gamon, 2001).
According to Smith and Blake (2005) the concept of learning styles gained considerable attention in teaching-learning process since the 1960s. Different theories were developed to elaborate the phenomenon of learning. Some theorists used the term ‘learning styles’ and others were motivated to use the terms such as ‘learning preferences’ or ‘learning strategies’ (p.9). Reissman (1964) defined learning style as a “more holistic (molar) or global dimension of learning operative at the phenomenal level” (p. 485). It is a set of biological traits that make teaching ineffective for some and effective for others (Dunn, Beadry & Klavas, 1989). “Learning styles are influenced by personality type, educational specialization, career choice, and current job role and tasks” (A. Kolb & D. Kolb, 2005, p.195).

Without considering the learning styles of learners, it is not possible to provide them healthy learning experiences. If the main objective of education is to develop mastery among the learners about the information being provided, then it is only possible by delivering instruction in such a way that optimally it matches each learner’s way of processing information. The instruction must be designed with preferred pedagogical practices and processes which can accelerate the information processing mechanism of learners (Dunn & Bruno, 1985; Rowland & Stuessy, 1988). Students vary in their learning preferences and they use different learning tools for learning. Some process information by relying on text but others requires visual cues. Some learners prefer to work independently while others prefer to work in groups. Some process information intuitively while others need time to reflect on the situations. It is a crucial prerequisite to know how students learn before education will be able to address their needs (Berquist & Phillips 1975).

It is a common observation in the classroom that some students prefer learning through interactive activities like games, simulation, problem solving, and critical thinking activities in a multifaceted motivated learning environment. Some enjoy the experience of workbooks and handouts to be completed under structured instructions. Others prefer individual study or working in a group by benefiting through peer interactions. They prefer teaching which fulfills their needs in information processing. Students prefer different teaching styles for different reasons ranging from their previous experiences for acquiring good grades. The secret behind their choice of instruction is the typical way of their information processing mechanism (Claxton & Murrell, 1987). According to Rita Dunn (1998) as cited in Yeh (2004), “Learning style is the way that he or she concentrates on, processes, internalizes, and remembers new and difficult academic information or skills varying with age, achievement, culture, global versus analytical processing preference and gender” (p.6).

Significant relationships among learner’s learning styles, gender, and personality, field of study, study habits, careers ambition, and academic performance have been identified in many researches. These studies led towards the improvement in the teaching learning environment, empowering learners for better performance. Students show better performance when their learning styles coincide with the learning style of their teacher. Students’ preferences for learning styles differ for different subjects of study, so they should be proficient in all types of learning styles (Franzoni & Assar, 2009; Tucker, 2009; Tzu-Chien & Graf, 2009). Male students have different learning styles form their female counterparts. Also high achievers differ in learning styles from low achieving fellows (Honigsfeld & Dunn, 2006). Cognitive styles of students and teachers affect the efficacy of learning process (Drummond & Stoddard, 1992; Gregorc & Butler, 1984; Nelson, Dunn, Griggs, Primavera, Fitzpatrick, Bacilios & Miller, 1993; O’Brien, 1990; Zhang & Sternberg, 2006).

David Kolb (1984) developed a model based on the experiential learning theory. This model consists of four stages: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE), representing two dimensions: concrete experience/abstract conceptualization and active experimentation/reflective observation. The combination of these dimensions leads to four learning styles: Convergers, Divergers, Assimilators, and Accommodators (Kolb, 1984). All these dimensions are needed for effective learning. The individual’s information processing patterns on specified dimensions are developed through heredity and nature of socialization (Kolb, 1986).

Kolb's experiential learning model has both practical and conceptual values. He developed his Experiential Learning Theory (ELT) based on “Dewey’s pragmatism, Lewin’s social psychology, Piaget’s cognitive-development, Ruger’s client-centered therapy, Maslow’s humanism and Perls’ Gestalt therapy” (Demirbas & Demirkan, 2007). Pask (1976) described two main learning styles: Serialist and Holist. Serialists intend to learn sequentially, whereas holists prefer to learn hierarchically that is from top to down. Dunn and Dunn (1978) developed a theory of cognitive styles based on 18 different styles. These styles were clustered in four basic groups: emotional (motivation, responsibility, persistence, and structure), environmental (design, sound, light, and temperature), physical (perceptual, mobility, intake, and time) and sociological (self, peers, team, pair, adult, and varied). They focused much on the elements that affects learner’s ability of learning rather than the ways to learn. D. Kolb and A. Kolb (2005) explained that
Early educational experiences shape people’s individual learning styles by instilling positive attitudes toward specific sets of learning skills and by teaching students how to learn. Although elementary education is generalized, an increasing process of specialization begins in high school and becomes sharper during the college years. This specialization in the realms of social knowledge influences individuals’ orientations toward learning, resulting in particular relations between learning styles and early training in an educational specialty or discipline (p.6).

This theory comprises of four type of learning styles: converging, diverging, assimilating and accommodating. Kolb (1984) put forward his theory of experiential learning comprised of four stages such as Concrete experiences (CE), Reflective observation (RO), Abstract conceptualization (AC), and Active experimentation (AE). Kolb’s learning cycle consists of four stages of learning such as learning by feeling, watching and listening, thinking, and by doing. He introduced opposite polar dimension: CE/AC and AE/RO. He labeled four types of learners such as Divergers, Convergers, Assimilators and Accommodators (Kolb, 1984). Experiential learning theory describes the cognitive process of learning and emphasizes on the significance of critical reflections in learning. Kolb’s model is based on various information processing models such as Lewin’s model of active participation in learning process, Piaget’s theory that intelligence is environment dependent rather than so much innate, and Dewey’s belief of learning by doing (Teixeira, 2002).

This model shows that there are four modes of learning which constitute a learning cycle. These modes are; learning by experience (CE), learning by reflecting (RO), learning by thinking (AC), and learning by doing (AE) (Smith & Kolb, 1996; Kolb, 1984). Learners with concrete experience (CE) aptitude utilize the sense of feeling. They seem very sensitive towards others’ values and emotions. They show good performance in professions such as education and social work. Learners with reflective observation ability (RO) depend on auditory/visual modalities. They use their observation in problem-solving. Learners with abstract conceptualization (AC) prefer to be logical and to critically focus on basic ideas. They rely on models. Learners with active experimentation (AE) ability are usually very social and prefer to work in high positions in social organizations. They trust in people over concepts and ideas. They prefer practical things and seem to be pragmatists. This theory represents two dialectically related modes such as grasping experience (Concrete Experience (CE) and Abstract Conceptualization (AC)) and transforming experience (Reflective Observation (RO) and Active Experimentation (AE)). In the Kolb’s learning cycle (Figure 1), concrete experiences provide basis for reflections and observations and these reflections pass through assimilative process and breeds abstract concepts which in turn provide implications to testify able actions (Kolb, Boyatzis & Mainemelis, 1999).

Figure 1: Kolb’s Experiential Learning Cycle and Basic Learning Styles

Kolb (1984) explains that concrete experience (CE) is a preference for being involved in experiencing a situation. It gives a sense of feeling over thinking. It focuses on the artistic approach rather than the systematic and scientific approach to problem solving. These individuals are good decision makers and open minded because they perform well in unstructured circumstances in life. The reflective observation (RO) is an orientation directed towards understanding the meaning of a situation by careful observation. This dimension prefers reflection over action. Learners with this dimension emphasize understanding more than
application. They have the ability to look things or situations from different points of view. They are usually equipped with characteristics such as impartiality, patience, and smart decision making (Kolb, 1984). Individuals with abstract conceptualization (AC) orientation rely on logic, ideas, and concepts. They prefer thinking over feeling. They emphasize on systematic and scientific approach rather than artistic approach to problem solving. The abstract conceptualization (AC) is an opposite polar preference to concrete experience (CE). The abstract conceptualizers are excellent in management, planning and quantitative analysis (Kolb, 1984). The active experimentation (AE) is a learning style dimension oriented towards actively manipulation of people and life situations. These learners prefer practical application over abstract understandings. They rely on action rather than on reflection. They take risks for the attainment of their goals. The active experimentation dimension is a polar opposite to the reflective observation dimension of learning style cycle (Kolb, 1984). Many researches showed that in the learning cycle there is all phases are equally important and that various learners exhibit different preferences for each of the phases in the cycle. Differences between learner’s in preferences for phases does not make not good or bad learners but has an impact on how well they perform in certain tasks (Kolb, 1984; Smith & Kolb, 1996; Willcoxson & Prosser, 1996). Students from different field of study show their different learning styles (Figure 2). Their academic performance varies with the learning style quadrants because their styles are subject area sensitive (Jones, Reichard & Mokhtari, 2003).

Figure 2: Distribution of disciplines on learning style grid (Kolb & Kolb, 2005, p.27)

In recent years the field of learning styles gathered much research-attention. Learning styles are given proper consideration to address the learning difficulties by the teachers in a timely fashion (Zhang & Sternberg, 2009). To date there has been no study conducted in Pakistan to provide the details of language students’ learning styles. This study therefore strives to explore and analyze the differences of learning styles of language learners at university level in different fields. It was an attempt to determine the relationship of students’ learning styles with their academic performance. This will be an aid in addressing the important concerns relating to the learning of students in different fields of study to meet the future challenges. It will enable the higher educators in encouraging the right persons to be in their right discipline. This study evaluated different learning styles to determine the fact that which of them are the good predictors for the better academic performance in specific fields of study.
2. Objectives of the Study

The main objectives of this study were to:

- explore the most preferred learning styles of language students’ studying at university level.
- explore the relationship between language students’ learning styles and their demographic profile.
- correlate language students’ learning styles and their academic performance.

3. Research Questions

This study answered the following questions:

- What are the most preferred learning styles of language students studying at university level?
- Does any relationship exist between language students’ learning styles and their demographic profile?
- Do language students’ learning style preferences affect their academic performance?

4. Method and Procedure

The samples of this survey study comprised of the all 218 on-campus students currently enrolled in final year of regular master degree programs of six languages present in the class at the time of data collection belonging to six departments at University of the Punjab, Pakistan. The learning styles were measured by using Kolb’s Learning Style Inventory based on Kolb’s Experiential Learning Theory. The academic performance was conceptualized as the achievement scores obtained by students in previous examinations conducted by various Boards of Intermediate and Secondary Education, and Universities.

Data were collected from the sample of 218 university students through survey by using Demographic Profile Questionnaire, and the Learning Style Inventory. Demographic Profile Questionnaire collected information such as: gender, age, family size, academic background, field of specialization, residential region, marital status, and academic scores in the previous examinations.

The Learning Style Inventory (LSI) was a self-descriptive inventory and consisted of 12 questions, each followed by four answers. The respondents were asked to rank their answers from one to four by describing their preferences to the four poles; Concrete experience (CE), Abstract conceptualization (AC), Active experimentation (AE) and Reflective observation (RO). These four poles constituted four quadrants relating to four learning styles Convergers, Divergers, Assimilators, and Accommodators. The scores of AC-CE and AE-RO show the learners’ preferences for the abstract dimension over the reflective dimension and for the active dimension over the reflective dimension respectively (Kolb, 2005). The specific learning style of students were measured by plotting the scores of AC-CE and AE-RO on a grid. The values for AC-CE are placed on vertical axis and on the horizontal axis score AE-RO are plotted to identify Diverger, Accommoder, Converger and Assimilator learning styles.

Data were tabulated and analyzed by using descriptive and inferential statistical measures through SPSS 16 and Excel 2007. Cross Tabulation and Chi-square tests were used to study the differences/relationships of learning style preferences with different independent demographic variables. Pearson Correlation were calculated to study the relationship between learning styles and students’ academic performance at secondary school, higher secondary school and university level.

5. Results

5.1 Descriptive statistics of demographics

The sample of 218 students for this study consisted of 26% students of Urdu language, 18% students of English language, 17% students of Arabic language, 15% students of Persian language, 13% students of French language and 11% students of Punjabi language (Figure 3).
Figure 3: Department-wise distribution of sample

Table 1: Distribution of Sample of Different Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>58</td>
<td>26.6</td>
</tr>
<tr>
<td>Female</td>
<td>160</td>
<td>73.4</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>201</td>
<td>92.2</td>
</tr>
<tr>
<td>Married</td>
<td>15</td>
<td>6.9</td>
</tr>
<tr>
<td>Widow</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Separated</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Domicile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>140</td>
<td>64.2</td>
</tr>
<tr>
<td>Rural</td>
<td>56</td>
<td>25.7</td>
</tr>
<tr>
<td>Sub-urban</td>
<td>22</td>
<td>10.1</td>
</tr>
<tr>
<td>Medium of instruction at school level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urdu</td>
<td>159</td>
<td>72.9</td>
</tr>
<tr>
<td>English</td>
<td>59</td>
<td>27.1</td>
</tr>
<tr>
<td>Gender of head of household</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>189</td>
<td>86.7</td>
</tr>
<tr>
<td>Female</td>
<td>29</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Table 1 shows that majority of the language students (73.4%) in sample were females and also unmarried (92.2%). The majority (64.2%) belonged to urban areas, and 72.9% were with Urdu (National language) as their medium of instruction at school level. The head of households (86.7%) of respondents were male and only 13.3% were female. It is due to the fact that in Pakistani society male is considered more responsible for the family as compared to the female family members. It is therefore concluded that in Pakistani culture, females are more inclined to take language courses than males. Further the marital status statistics also reflects the societal trend that mostly young students are not married during their education. The distribution of students based on their domicile shows that in higher language education, urban students are more participating than students belonging to rural or suburban areas.
Figure 4 represents that most of the students were with six (18.8%), seven (20.6%) or eight (19.3%) family members.

Table 2 shows that 80.3% respondents have own houses and 42.2% live in house with area of 5-17 Marla (1361.25sq ft – 2722.5 sq ft). The nature and size of house show that the language students belonged to families with reasonable socio economic status.

It is obvious from Table 3 that the language students mostly possess grade C by obtaining marks 50-60% at all the three levels: Secondary School Level (31.2%), Higher Secondary School Level (35.3%) and University Level (44.5%). The overall comparison shows that sample students with Grades A1, A, and B are more in number at all the three levels than the other grades. It may be concluded that the field of languages is the choice of students with high academic performance throughout their career.

<table>
<thead>
<tr>
<th>Nature of housing</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owned</td>
<td>175</td>
<td>80.3</td>
</tr>
<tr>
<td>Rented</td>
<td>33</td>
<td>15.1</td>
</tr>
<tr>
<td>Others</td>
<td>10</td>
<td>4.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area of housing</th>
<th>Nature and Area</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5 Marla</td>
<td>(Less than 1361.25 sq ft.)</td>
<td>60</td>
<td>27.5</td>
</tr>
<tr>
<td>5-17 Marla</td>
<td>(1361.25sq ft – 2722.5 sq ft)</td>
<td>92</td>
<td>42.2</td>
</tr>
<tr>
<td>11-15 Marla</td>
<td>(2994.75sq ft – 4083.75 sq ft)</td>
<td>22</td>
<td>10.1</td>
</tr>
<tr>
<td>16-27 Marla</td>
<td>(4356.00 sq ft – 7350.75 sq ft)</td>
<td>21</td>
<td>9.6</td>
</tr>
<tr>
<td>21-25 Marla</td>
<td>(5717.25 sq ft – 6806.25 sq ft)</td>
<td>14</td>
<td>6.4</td>
</tr>
<tr>
<td>Above 25 Marla</td>
<td>(More than 6806.25 sq ft)</td>
<td>9</td>
<td>4.1</td>
</tr>
</tbody>
</table>

(Marla is a unit of land measurement in Pakistan; 1 Marla = 272.25 sq ft)
Table 3: Distribution of Sample Students on the basis of their Grades in Academic Performance

<table>
<thead>
<tr>
<th>Grades &amp; % Marks Obtained</th>
<th>Secondary School Level</th>
<th>Higher Secondary School Level</th>
<th>University level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>%</td>
<td>Frequency</td>
</tr>
<tr>
<td>A1 [Excellent (80 and above)]</td>
<td>25</td>
<td>11.5</td>
<td>4</td>
</tr>
<tr>
<td>A  [very good (70-80)]</td>
<td>51</td>
<td>23.4</td>
<td>32</td>
</tr>
<tr>
<td>B  [Good (60-70)]</td>
<td>51</td>
<td>23.4</td>
<td>70</td>
</tr>
<tr>
<td>C  [Fair (50-60)]</td>
<td>68</td>
<td>31.2</td>
<td>77</td>
</tr>
<tr>
<td>D  [Acceptable (40-50)]</td>
<td>23</td>
<td>10.6</td>
<td>32</td>
</tr>
<tr>
<td>E  [Just passed (33-40)]</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>218</td>
<td>100</td>
<td>218</td>
</tr>
</tbody>
</table>

5.2. Analysis of Learning Styles

Data obtained from respondents on Kolb’s Learning Style Inventory (LSI) 3.1 was transformed on four dimensions CE (Concrete Experience), RO (Reflective Observation), AC (Abstract Conceptualization), and AE (Active Experimentation). It was done by using the coding key as provided with the LSI. With the help of these four dimensions, AC-CE and AE-RO were calculated for all the respondents. The values of AC-CE and AE-RO varied from -24 to 30. These values were plotted on the Learning Style Type Grid by using the cut-off points given in The Kolb Learning Style Inventory. This whole process was done with the help of Excel 2007.

The cut-off point for the AC-CE scale was +7, and the cut point for the AE-RO scale was +6. The Accommodating type would be defined by an AC-CE raw score <=7 and an AE-RO score >=7, the Diverging type by AC-CE <=7 and AE-RO <=6, the Converging type by AC-CE >=8 and AE-RO >=7, and the Assimilating type by AC-CE >=8 and AE-RO <=6 (A. Kolb & D. Kolb, 2005, p.14). Students’ learning styles were identified using these cut-off points.

Table 4: Learning Styles of Sample Students

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Learning Style</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Diverger</td>
<td>140</td>
<td>64.2</td>
</tr>
<tr>
<td>2.</td>
<td>Accommodator</td>
<td>42</td>
<td>19.3</td>
</tr>
<tr>
<td>3.</td>
<td>Converger</td>
<td>05</td>
<td>2.3</td>
</tr>
<tr>
<td>4.</td>
<td>Assimilator</td>
<td>31</td>
<td>14.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>218</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 4 shows that majority of the sample students (64.2%) had a Diverger learning style. An Accommodator learning style was characteristic for 19.3% of respondents. Only 2.3% of students had Converger learning style. Figure 5 visually represents students’ learning styles on Kolb’s quadrants.
Table 5 relates the department-wise position of respondents to their preferred learning styles. Results show that most of the respondents from all the departments have a Diverger learning style. There were no students from Arabic language, Persian language and Punjabi language students with Converger learning styles. Also none of the Persian language group exhibited an Assimilator learning styles. Figure 6 shows the graphical presentation of department position of students on Kolb’s learning styles quadrants.

Table 5: Learning Style of Students from Different Fields of Study

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Field of Study</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Converger</th>
<th>Assimilator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>French Language (N=28)</td>
<td>14 (50.0%)</td>
<td>4 (14.3%)</td>
<td>2 (7.1%)</td>
<td>8 (28.6%)</td>
</tr>
<tr>
<td>2.</td>
<td>English Language and Literature (N=40)</td>
<td>24 (60.0%)</td>
<td>8 (20.0%)</td>
<td>2 (5.0%)</td>
<td>6 (15.0)</td>
</tr>
<tr>
<td>3.</td>
<td>Arabic Language (N=36)</td>
<td>23 (63.9%)</td>
<td>8 (22.2%)</td>
<td>0 (0.0%)</td>
<td>5 (13.9%)</td>
</tr>
<tr>
<td>4.</td>
<td>Urdu Language (N=57)</td>
<td>38 (66.7%)</td>
<td>8 (14.0%)</td>
<td>1 (1.8%)</td>
<td>10 (17.5%)</td>
</tr>
<tr>
<td>5.</td>
<td>Persian Language (N=32)</td>
<td>23 (71.9%)</td>
<td>9 (28.1%)</td>
<td>0 (0.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>6.</td>
<td>Punjabi Language (N=25)</td>
<td>18 (72.0%)</td>
<td>5 (20.0%)</td>
<td>0 (0.0%)</td>
<td>2 (8.0%)</td>
</tr>
</tbody>
</table>
### Table 6: Cross Tabulation of Students’ Gender and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Learning Styles</th>
<th>Observed Count</th>
<th>Expected Count</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Diverger</td>
<td>39</td>
<td>37.2</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Accommodator</td>
<td>5</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Converger</td>
<td>3</td>
<td>1.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assimilator</td>
<td>11</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Observed Count</td>
<td>101</td>
<td>102.8</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>37</td>
<td>30.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>22.8</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Diverger</td>
<td>140</td>
<td>140</td>
<td>218</td>
</tr>
<tr>
<td></td>
<td>Accommodator</td>
<td>42</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Converger</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assimilator</td>
<td>31</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

\[ \chi^2 = 8.868, \text{df}=3, P\text{-value} = .031 \]

The chi square test indicates that there is a significant association between students’ gender and learning styles, \((\chi^2 = 8.868, \text{P} = .031)\). In other words learner’s gender affects the preference for learning styles. A comparison between observed values and the expected values shows that female students have more association on all learning styles than male students (Table 6). Further it is concluded that females have more association on Diverger learning styles as compared to other styles.

### Table 7: Cross Tabulation of Students’ Age Group and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Observed Count</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Converger</th>
<th>Assimilator</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 to 23.5 years</td>
<td>95</td>
<td>97.6</td>
<td>31</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Expected Count</td>
<td>129.1</td>
<td>29.3</td>
<td>3.5</td>
<td>21.6</td>
<td></td>
</tr>
<tr>
<td>23.6 to 27.5 years</td>
<td>43</td>
<td>11</td>
<td>2</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Expected Count</td>
<td>40.5</td>
<td>12.1</td>
<td>1.4</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>27.6 to 30 years</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Expected Count</td>
<td>1.9</td>
<td>.6</td>
<td>.1</td>
<td>.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>42</td>
<td>5</td>
<td>31</td>
<td></td>
</tr>
</tbody>
</table>

\[ \chi^2 = 2.655, \text{df}=6, P\text{-value} = .851 \]

### Table 8: Cross Tabulation of Students’ marital Status and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Observed Count</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Converger</th>
<th>Assimilator</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>131</td>
<td>38</td>
<td>3</td>
<td>29</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>Expected Count</td>
<td>129.1</td>
<td>38.7</td>
<td>4.6</td>
<td>28.6</td>
<td>201</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Expected Count</td>
<td>9.6</td>
<td>2.9</td>
<td>.3</td>
<td>2.1</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Widow</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Expected Count</td>
<td>.6</td>
<td>.2</td>
<td>.0</td>
<td>.1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Expected Count</td>
<td>.6</td>
<td>.2</td>
<td>.0</td>
<td>.1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>42</td>
<td>5</td>
<td>31</td>
<td>218</td>
<td></td>
</tr>
</tbody>
</table>

\[ \chi^2 = 10.850, \text{df}=9, P\text{-value} = .286 \]
The cross tabulation indicates that there is no significant association between students’ age group and learning styles, ($\chi^2=2.655, P=.851$). In other words students’ age does not affect their learning styles (Table 7).

Table 8 shows that there is no significant association ($\chi^2=10.850, P=.286$) between marital status and language students preferred learning styles.
It is evident from Table 9 that language learners’ learning styles have no significant association ($\chi^2=6.081, P = .414$) with their urban, rural, and sub-urban belongings.

Table 10 shows that language students’ medium of instruction at school level has no significant association ($\chi^2=7.115, P = .068$) with their preferred learning styles.

It is evident from Table 11 that learning styles of Master level language students from six fields have no significant relationship with their previous academic performance at secondary school, higher secondary school and university level.
Table 12 shows that language students’ nature of house has significant association ($\chi^2=14.679, P= .023$) with their learning styles. It is also concluded that the students with their owned houses show more association than the other two categories.

The housing space of Master level language learners has no significant association ($\chi^2=15.017, P= .450$) with their learning styles. It means that the size of house does not matter for the preference of learning styles for learning language (Table 13).

Table 12: Cross Tabulation of Students’ Nature of House and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Nature of house</th>
<th>Learning Style</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Others</td>
<td>Observed Count</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>6.4</td>
<td>1.9</td>
<td>0.2</td>
<td>1.4</td>
<td>10</td>
</tr>
<tr>
<td>Owned</td>
<td>Observed Count</td>
<td>110</td>
<td>37</td>
<td>5</td>
<td>23</td>
<td>175</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>112.4</td>
<td>33.7</td>
<td>4.0</td>
<td>24.9</td>
<td>175</td>
</tr>
<tr>
<td>Rented</td>
<td>Observed Count</td>
<td>26</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>21.2</td>
<td>6.4</td>
<td>0.8</td>
<td>4.7</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>140</td>
<td>42</td>
<td>5</td>
<td>31</td>
<td>218</td>
</tr>
</tbody>
</table>

$\chi^2=14.679, df =6, P-value= .023$

Table 13: Cross Tabulation of Students’ amount of housing space and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Space</th>
<th>Learning Style</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5 Marla</td>
<td>Observed Count</td>
<td>42</td>
<td>11</td>
<td>0</td>
<td>7</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>38.5</td>
<td>11.6</td>
<td>1.4</td>
<td>8.5</td>
<td>60.0</td>
</tr>
<tr>
<td>5-17 Marla</td>
<td>Observed Count</td>
<td>53</td>
<td>20</td>
<td>3</td>
<td>16</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>59.1</td>
<td>17.7</td>
<td>2.1</td>
<td>13.1</td>
<td>92.0</td>
</tr>
<tr>
<td>11-15 Marla</td>
<td>Observed Count</td>
<td>15</td>
<td>4</td>
<td>0</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>14.1</td>
<td>4.2</td>
<td>.5</td>
<td>3.1</td>
<td>22.0</td>
</tr>
<tr>
<td>16-27 Marla</td>
<td>Observed Count</td>
<td>14</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>13.5</td>
<td>4.0</td>
<td>.5</td>
<td>3.0</td>
<td>21.0</td>
</tr>
<tr>
<td>21-25 Marla</td>
<td>Observed Count</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>9.0</td>
<td>2.7</td>
<td>.3</td>
<td>2.0</td>
<td>14.0</td>
</tr>
<tr>
<td>Above 25 Marla</td>
<td>Observed Count</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>5.8</td>
<td>1.7</td>
<td>.2</td>
<td>1.3</td>
<td>9.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>140</td>
<td>42</td>
<td>5</td>
<td>31</td>
<td>218</td>
</tr>
</tbody>
</table>

$\chi^2=15.017, df =15, P-value= .450$
Table 14: Cross Tabulation of Students’ Family Size and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Family size (No. of family members)</th>
<th>Learning Style</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diverger</td>
<td>Accommodator</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Expected Count</td>
<td>5.8</td>
<td>1.7</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Expected Count</td>
<td>4.5</td>
<td>1.3</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Expected Count</td>
<td>12.2</td>
<td>3.7</td>
</tr>
<tr>
<td>6</td>
<td>29</td>
<td>6</td>
</tr>
<tr>
<td>Expected Count</td>
<td>26.3</td>
<td>7.9</td>
</tr>
<tr>
<td>7</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>Expected Count</td>
<td>28.9</td>
<td>8.7</td>
</tr>
<tr>
<td>8</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Expected Count</td>
<td>27.0</td>
<td>8.1</td>
</tr>
<tr>
<td>9</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Expected Count</td>
<td>13.5</td>
<td>4.0</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Expected Count</td>
<td>9.0</td>
<td>2.7</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>Expected Count</td>
<td>9.6</td>
<td>2.9</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Expected Count</td>
<td>3.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>42</td>
</tr>
</tbody>
</table>

$\chi^2=19.239$, df =27, P-value= .861

It is clear from Table 14 that family size of the language learners has no significant association ($\chi^2=19.239$, df =27, P = .861) with their learning styles. It can be concluded that family size does influence for language learners in their learning styles.

Table 15 shows that gender of head of household of language learners has no significant association ($\chi^2=5.567$, df =3, P = .135) with the learning styles of the university level students.

6. Conclusion

Learning has been a serious concern for educators and psychologists throughout the history. Different experts have taken it from different viewpoints. In the last century Carl Jung (1921) focused on learning from human personality perspective. In 1956 Benjamin Bloom (1956) explained the mechanism of learning based on cognitive, affective and psychomotor skills. Later it was proposed by Anthony Gregorc (1978) that learning is based on learners’ perceptual, concrete, abstract, and sequential preferences. In addition to this, David Kolb (1984) presented the viewpoint that learning is a result of feeling and thinking. He said that learning is process by which knowledge is produced through transformation of experiences. Kolb based his model and learning style inventory on Experiential Learning Theory. This theory explained learning as a result of acquisition, specialization, and integration (Kolb, 1984).
### Table 15: Cross Tabulation of Students’ head of household’s gender and Learning Styles (N=218)

<table>
<thead>
<tr>
<th>Head of household</th>
<th>Learning Style</th>
<th>Diverger</th>
<th>Accommodator</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Observed Count</td>
<td>124</td>
<td>32</td>
<td>189</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>121.4</td>
<td>36.4</td>
<td>189</td>
</tr>
<tr>
<td>Female</td>
<td>Observed Count</td>
<td>16</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Expected Count</td>
<td>18.6</td>
<td>5.6</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>140</td>
<td>42</td>
<td>218</td>
</tr>
</tbody>
</table>

$\chi^2=5.567$, df =3, P-value = .135

Learning Style analysis showed that majority of the sample students (64.2%) had a Diverger learning style. Accommodator learning style constituted 19.3% of respondents and 14.2% had an Assimilator learning style. Only 2.37% of students had Converger learning style as their most preferred learning style. The field of study-wise comparison of students for preferred learning style highlighted that most of the respondents from all the departments such as French Language (50.0%), English Language (60.0%), Arabic Language (63.9%), Urdu Language (66.7%), Persian Language (71.9%), and Punjabi Language (72.0%) preferred Diverger learning style. Students of Arabic, Persian and Punjabi language contained no students with a preference for Converger learning styles. Moreover, None of the Persian students had a preference for assimilator learning styles.

Students’ gender and the nature of their housing were found to have a significant association with their learning styles. Female students and students who owned their own house show more association with a Diverger learning style than the other categories. On the other hand students’ age, marital status, domicile, medium of instruction, area of house, family size and gender of head of household has no significant association with learning styles.

This study covered six departments for extending its scope to a wide range of language learners from diverse fields of specialization. The gender proportion in the sample reflected the true picture of the university because generally female students were more in number than male counterparts. Their age level was almost same because they were in a same level of education. The majority of the higher education students across all the specialization fields attended their school with Urdu as medium of instruction. Marital status statistics indicated a tendency to marry after the completion of education. Since the students were in their regular education discourse, the majority was not yet married and generally the parents do not prefer to marry their children during education because mostly parents made arrangements for the marriage of their kids. In the higher education level students were predominantly belonging to urban areas. This may be due to a higher awareness of the value of higher education in urban areas than the rural areas. Alternatively, this may also be due to the affordability of the cost of education away from their houses. Mostly respondents were living in reasonable owned houses which shows that they almost belong to the same socioeconomic level as their male head of household. This was also in accordance with the societal norms and a tradition of Pakistan in which males have more responsibility to look after the house than the female.

It is also concluded from filed wise comparison of learning styles that most of the respondents from all the departments preferred Diverger learning styles. If learner’s preferred learning style is not addressed properly and courses do not match with the preferences then it creates problems in learning (Kinshuk & Graf, 2007; Régnier, 1995). Learning styles may change with the increase in age, but sometimes and in some cases these remain unchanged for the whole life (Dunn & Dunn, 1999; Dunn & Griggs, 1995; Honigsfeld & Dunn, 2006). If individuals are aware of their learning styles, they can excel in their academic career by using multiple sources of information to optimize their learning (Honigsfeld & Dunn, 2006).
7. Recommendations

The following recommendations are offered for further research on learning styles.

- This study should be replicated on a larger sample at national level to get more insight in the relationship of learning styles and academic achievement.
- More studies should be designed to investigate the relationship of educators’ and learners’ learning styles.
- A study should be conducted to explore the relationship between learner’s learning styles and educator’s teaching styles.
- Professional development of secondary, higher secondary and university teachers should embrace the training about identification of learning styles and enables them to adapt instructional strategies in accordance with the needs of their learners.
- Identification of learning styles of students should be done at the time of admission at higher education level to help students for selection of proper field of study.
- Training sessions should be arranged by higher authorities of universities for teachers and students to provide awareness about learning styles and their importance for academic performance.

8. References


Dysfunctional vs. Functional Difficulties: A New Perspective on Learning Disabilities.

Maria GONÇALVES∗ (University of Lisbon, Portugal) – mdgoncalves@fp.ul.pt

Abstract

This study was developed as part of an exploratory work on concepts and common sense beliefs about learning difficulties in the Portuguese educational community. Lay conceptions of college students were analyzed in a qualitative study in order to identify different ways of understanding learning difficulties. Students from different courses and levels of training, without specific information in this field of educational psychology, responded by writing to four open questions about learning and learning disabilities. Data were analyzed to identify the range of personal conceptions. Written responses were subjected to content analysis. Multiple categories emerged and were grouped into four main perspectives, incorporating nine different lay conceptions of learning difficulties. These common sense conceptions corresponded in a very precise way to the scientific conceptions of “learning disabilities” which were successively developed in recent decades (Poplin, 1988). Besides, more than distinguish between two types of students, with and without LD, results suggest a new distinction between two kinds of difficulties, dysfunctional versus functional difficulties. Functional difficulties are needed and should be promoted to enhance the quality of learning.

Keywords: Learning Disabilities; Alternative Assessment; Epistemology; Folk Psychology; Individual Differences

1. Introduction

Since the emergence of the concept of learning disabilities in 1963, there remains an intense scientific debate around issues of definition, classification and differential diagnosis: which students have or have not a specific learning disability, that is the question (Adelman, 1992; Kavale & Forness, 2000; Kavale, Spaulding & Beam, 2009; Stanovich & Stanovich, 1996; Siegel, 1988; Sternberg & Grigorenko, 1999). More radically, some authors even claim that learning disabilities do not actually exist as a separate category due to lack of definition, insufficient grounds and inconsistency of results (Coles, 1987; Finlan, 1994). Even the most accepted definitions seem to place specific learning disabilities in a class almost residual, defined more by the systematic exclusion of other types of problems, rather than by an objective and insightful characterization (Hammill, 1990).

With the development of models of metacognition and self-regulation in recent decades (e.g. Flavell, 1987; Zimmerman & Schunk, 1989), the study of learning difficulties received very significant contributions that may have an impact to radically change models, taxonomies, and research methods (Dockrell & McShane, 1992; Poplin & Cousin, 1996; Reid, Hresko & Sawson, 1996; Wong, Graham, Hoskyn & Berman, 2008). The latest proposals are centred more and more on the study of intrapersonal variables, cognitive, metacognitive and motivational factors. The assessment and diagnosis can be based on an ever-wider set of variables (Lyon, 1994; Shapiro, 2011). Problems are subject to functional analysis in context. Quality of teaching, instructional effort, developmental aspects and personal learning objectives, are considered. Learning difficulties are defined not as specific and intrinsic to the student, more like the result of the interaction between learner and his context of learning. In view of that, it is important to identify attitudes, values, beliefs, personal conceptions and “habits of the mind” (Bernard, 1997, p.126-145) which may influence dysfunctional thinking, inappropriate behaviour and the prevalence of adjustment problems in each learning situation (Ashman & Conway, 1997; Bandura, 1986; Bard & Fisher, 1983; Blankstein, 2010; Dweck, 2006; Harris, Graham & Deshler, 1998; Thomas, 2000).

The study of intrapersonal thinking aiming at a better understanding of learning difficulties, can be summarized in three lines of research: (1) the development of theories of mind in childhood (Astington, Harris & Olson, 1988; Bartsch & Wellman, 1995); (2) the study of personal thought on psychological concepts, including the psychology of common sense (e.g. Ferguson, 1989), implicit theories (e.g. Faria & Fontaine, 1997; Sternberg, 1985), lay beliefs (e.g. Furham, 1992; Furnham & Henley, 1988), inert knowledge (Bereiter & Scardamalia, 1996), learning conceptions (e.g. Klatter, Lodewijks & Aarnoutse, 1994).

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Moreover, student interaction with learning tasks is influenced by intuitive theories about the learner, about his mental functioning, about learning and teaching (Hofer & Pintrich, 1997; Jehng, Johnson & Anderson, 1993; Schommer-Aikins & Easter, 2006; Pramling 1996). From the perspective of the teacher "the general point is clear: Assumptions about the mind of the learner underlie attempts at teaching. (...) teacher's conception of the learner shapes the instruction." (Bruner, 1996, p. 48). The concept of "folk pedagogy", emphasized by Bruner (1996), extends this effort of self-reflection to new areas. It is not sufficient that teachers know what kids do (or should do) to learn better. They also need to reflect on what students think they do, be in the student's perspective, and try to understand as much as possible the source, potential and limits of their own conceptions (Gardner, 1991). Students can take more responsibility for their thoughts, for their learning, if they are helped to evolve from a naive realism to a greater understanding of the role of beliefs and conceptions, about themselves and about the world.

In summary, learning difficulties have been studied in many ways and using very different theoretical frameworks. In this case, the author tries a slightly different perspective, which evolves from the study of student epistemological beliefs about knowledge and learning, and from previous qualitative studies of personal conceptions about learning. The way scientists, educators and students think about learning difficulties, influences how they study, intervene or cope when it becomes more difficult... Every person has some kind of personal ideas regarding learning and education, about what to teach and what to learn (or not!). Those notions influence how they respond when facing problems and failures. For a better assessment and intervention, to better teach all, we need to better understand how people think and perceive both learning and difficulties. Folk psychology can be a new and insightful approach to this field of research, towards interventions focused on cognitive restructuring and conceptual change.

1.1 Objectives and research questions

The present study is part of a broader work intended to describe personal views, intuitive or common sense perspectives about “learning disabilities”. How do students, parents and teachers think about the obstacles in the learning process? How do they define and explain the difficulties? How do they establish a connection between difficulties and success? What does it mean for a student to feel some difficulty in learning? What do they believe about the origin, the persistence and expected evolution of a learning difficulty?

2. Methods

Four open questions were initially placed to a sample of college students from different backgrounds, for an exploratory analysis of concepts and beliefs about learning difficulties.

The set of open questions originally formulated was based on previous studies with university students (e.g. Berry & Sahlberg, 1996; Lonka, Joram & Brysom, 1996). Results show that even college training in a particular subject does not always modify previous ideas and naive conceptions.

These questions were translated and applied in a similar manner to a small sample of Portuguese college students for a pre-test examination. The extent of written responses obtained suggested a focus just on a central question: “If you had to explain to someone what is a learning difficulty, what would you say?” Other three additional questions were retained to a better characterization and a cross-responses attempt: a personal reflection on the concept of learning, “I think that learning is...”; on individual differences in learning, “why some people learn better than others?” and on coping personal strategies, “what is necessary for a student to overcome his difficulties?".

The final sample of responses was collected in the University of Lisbon, including 252 undergraduate students of History, Literature, Psychology, Medicine, and Science Education. All responses were obtained in class, with teacher collaboration. Students were informed of the purpose of the study, confidentiality was assured and participation was always voluntary. Given the nature of the study, it was necessary to ensure motivation and honesty in the answers.

Table 1: Open Questions used for an exploratory analysis of concepts about learning difficulties

| Q1 | “I think that learning is…” |
| Q2 | “In your opinion, why some people learn better than others?" |
| Q3 | “If you had to explain to someone what is a learning difficulty, what would you say?” |
| Q4 | “In your opinion, what is necessary for a student to overcome his difficulties?” |
All responses were transcribed and analyzed with WinMax. Since this is a program specifically prepared for qualitative analysis of open questions, the analysis procedures developed following the guidelines proposed by the author (Kuckartz, 1998). All responses were transcribed, read and reread, analyzed text-by-text, to a first extraction of excerpts (units) integrated into a set of categories that would account for the diversity and range of all the perspectives observed in this sample. A first exploratory analysis resulted in over fifty categories and subcategories. What is now reported is the result of multiple subsequent analyses in search of a classification system more intelligible and useful, by finding meaning clusters and common denominators. This preliminary analysis was successively reviewed for more precise criteria (interrater reliability of .83) until the formulation of a hierarchical scheme of categories that could describe clearly the full range of responses analyzed.

3. Results

By analyzing the set of responses and personal testimonies, four ways of approaching the concept of learning difficulties were identified. They act as four different perspectives, four different personal views, ranging from a focus on the learner, to a focus on learning.

In a dysfunctional perspective, the difficulty is conceived as a structural feature of the learner, as an intrinsic problem or a permanent limitation. The difficulty is conceived as a disease, disorder or disability, which characterizes the student permanently.

In a procedural perspective, the student continues to be the main focus of analysis. But in this case, the difficulty is not perceived as a personal characteristic, rather as something that interferes with or intervenes in the learning process, preventing the student from achieving the results that he could otherwise obtain.

In an interdependent perspective, the difficulties are no longer defined according to the particular characteristics of the learner or how the learning proceeds, rather as something that depends on the interaction of each student with the context of learning. In this case, every difficulty is described in terms of at least two orders of variables (personal and situational). The individual process of learning influences and is influenced by the context of learning. We go from a perspective of linear causality to one of reciprocal determinism. In this perspective, the difficulty characterizes not the student himself, rather the way the learner interacts with a specific learning situation, which is not always successful.

In a functional perspective, difficulties are not seen as the result of unsuccessful interaction between learner and learning process or learning environment. Instead, the difficulties are understood as a natural feature of the learning process itself. From this perspective, difficulties are considered common, frequent, normal or even necessary. They are the rule, not the exception. Difficulties are not seen as mistakes or failures, not as something strange or unusual, because they are part of almost every learning process. They can happen to anyone, anywhere and anyway. They are inherent to learn, as they are inherent to life. From this perspective, experiencing difficulties may also contribute to discovery, encouraging personal development and even increase the quality of learning.

Each one of these perspectives can be further subdivided into different conceptions as shown in Table 2.

<table>
<thead>
<tr>
<th>Major perspectives</th>
<th>Conceptions about learning difficulties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dysfunctional perspective (focus on the learner)</td>
<td>1.a. Deficiency</td>
</tr>
<tr>
<td>2. Procedural perspective (focus on the learning process)</td>
<td>1.b. Pathology</td>
</tr>
<tr>
<td>3. Interdependent perspective (focus on the interaction between learning process and learning context)</td>
<td>2.a. Impediment or obstacle</td>
</tr>
<tr>
<td>4. Functional perspective (focus on the outcome, on everything into which it can lead, in the context of the learning process or in the context of life itself.)</td>
<td>2.b. Insufficiency</td>
</tr>
<tr>
<td></td>
<td>2.c. Interference</td>
</tr>
<tr>
<td></td>
<td>3.a. Difference or discrepancy</td>
</tr>
<tr>
<td></td>
<td>3.b. Maladjustment</td>
</tr>
<tr>
<td></td>
<td>4.a. Inherent to learning and life</td>
</tr>
<tr>
<td></td>
<td>4.b. Challenge or opportunity</td>
</tr>
</tbody>
</table>
Table 3 provides a more detailed analysis of some excerpts of the categorized responses to illustrate each one of the conceptions of learning difficulty suggested.

<table>
<thead>
<tr>
<th>Conceptions about learning difficulties</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.a. Deficiency</strong>&lt;br&gt;Assumes the existence of deficits or developmental delays, bounds or limitations on basic skills.</td>
<td>“I think some students are unable to overcome certain difficulties because they have innate problems (deficiencies) of learning.” (TEXT: univ.CE12)</td>
</tr>
<tr>
<td><strong>1.b. Pathology</strong>&lt;br&gt;Learning difficulty is understood as a disorder, problem or pathology of mental or physical nature.</td>
<td>“… I identify learning difficulties in the field of physical problems or when there are in fact disorders such as in a dyslexic child.” (TEXT: univ.CE20)</td>
</tr>
<tr>
<td><strong>2.a. Impediment or obstacle</strong>&lt;br&gt;Learning is a journey. Sometimes, the student “stops” or is forced to move more slowly and in effort. Learning difficulties are described as impediments along the way, obstacles, barriers or blocks.</td>
<td>“The student is unable to proceed” (TEXT: univ.CE11)</td>
</tr>
<tr>
<td><strong>2.b. Insufficiency</strong>&lt;br&gt;Assumes that learning process is disrupted by several factors insufficiently developed or acquired. It is considered that the process may be adversely affected by failure or lack of very specific aspects.</td>
<td>“Difficulty is: - a lack of logical reasoning - not to understand the main purpose of the issue - lack of attention - not to understand what it is taught” (TEXT: univ.H98-10)</td>
</tr>
<tr>
<td><strong>2.c. Interference</strong>&lt;br&gt;Learning process can be affected by factors that are interposed and interfere. Learning difficulties can arise due to interference of a multiplicity of factors internal or external to the learning process.</td>
<td>“A learning difficulty occurs when there is the intervention of some factor (inside or outside the individual) that interferes with the learning process.” (TEXT: univ.L20)</td>
</tr>
<tr>
<td><strong>3.a. Difference or discrepancy</strong>&lt;br&gt;Difficulties are viewed as individual differences among students (rhythm of work or learning, skills and interests) or as differences between the performance of each student and current legislation (objectives, evaluation criteria).</td>
<td>“Learning difficulty is an inappropriate behaviour compared to what is required as a standard.” (TEXT: univ.CE3)</td>
</tr>
<tr>
<td><strong>3.b. Maladjustment</strong>&lt;br&gt;Conceived as personal adjustment difficulties (to the group, the educational system, to the requirements of each task and teaching methods) or as problems of reorganization of conceptual frameworks (schemas and preconceptions, assumptions and beliefs of the student).</td>
<td>“Not being able to learn to the pace considered normal (of course what is considered normal is largely conventional, varying in space and time).” (TEXT: univ.L38)</td>
</tr>
<tr>
<td><strong>4.a. Inherent to learning and life</strong>&lt;br&gt;Assumes that difficulties can occur in all situations.</td>
<td>“…a lack of direction, a lack of guidance, a &quot;disorientation&quot;.” (TEXT: univ.L17)</td>
</tr>
<tr>
<td><strong>4.b. Challenge or opportunity</strong>&lt;br&gt;Assumes that difficulties can be privileged moments of discovery and learning.</td>
<td>“A great learning disability can be the departure of a reality we are experiencing, from what we already know, when things deviate greatly from our realm of experience.” (TEXT: univ.L25)</td>
</tr>
<tr>
<td></td>
<td>“…the difficulty arises because the new character of matter to acquire, compared to our mental picture.” (TEXT: univ.H1-13)</td>
</tr>
<tr>
<td></td>
<td>“…the difficulty is part of learning, it would probably be very boring if it was instant understanding; or we’d all be little genius, or what was learned it was certainly very poor.” (TEXT: univ.H1-21)</td>
</tr>
<tr>
<td></td>
<td>“But the difficulties can be important in order to force us to devote more deeply, more intensely and reflectively (although it might cost). It is imperative that we constantly surpass ourselves. Learning difficulties are so constant challenges that are part of our growth as people.” (TEXT: univ.H1-9)</td>
</tr>
</tbody>
</table>
The conceptual categories identified are merely an attempt to a systematic analysis of the personal views expressed by each subject. Each small excerpt can be associated with a particular conception, but does not identify the conceptual perspective of each person. In reality, these perspectives and conceptions are linked or merged. Nothing prevents a person to include in the same answer, statements that appear to correspond to different conceptions, eventually to explain the same learning situation. The same problem can be analyzed by the same person from different perspectives. For example, a learning difficulty can be conceived as having its origin in a psycho-neurological impairment, a disorder or pathology, and still be regarded as an opportunity and a personal challenge. Meaning that a person may conceive a learning disorder (in a dysfunctional perspective) and even so, understand such a problem as an opportunity to learn and grow, with more or less functional adaptation and effectiveness (in a functional perspective). Therefore, these categories are not absolute or exclusive and do not seek the determination of individual types. Instead, they can help professionals to obtain a comprehensive assessment of individuals or groups (classes or institutions), providing a better understanding, communication and work.

Although it is huge, and almost surprising the variety of perspectives here observed, it is possible that other perspectives and commonsense conceptions about learning difficulties can still be considered in future studies.

4. Conclusion

When speaking of teaching and learning, researchers, teachers, parents, can be referring to very different ideas, based on different concepts and different epistemological principles. For example, the same curriculum reform can be understood and implemented very differently. Likewise some teachers expect students to learn as they teach, as the legislator believes in prescribing curricular reforms, as they are given. However, people are neither naive nor passive; learning is a personal construction, which involves beliefs, concepts, expectations and values. In classroom or in the educational system, if specialists, teachers or students do not make explicit their own way of thinking, if they do not share epistemological assumptions and core concepts, they can never be aware of different personal conceptions about learning, about assessment, what is a good student, what means to have difficulties, and so on... When so, everything can change in education, without really change almost anything. As so often seems to happen.

In this study, it was possible to identify different personal views on learning difficulties, suggesting a structure of multiple categories, hierarchical and non-exclusive. In this sample of college student responses, it was possible to identify multiple ways of conceiving and describing learning difficulties, which correspond roughly to the range of scientific conceptions developed in recent decades (Poplin, 1988): the medical model, the model of psychological processing, the model of the cognitive strategies, even the notion of interference present in the definition of DSM-IV, and the notion of discrepancy as diagnostic criteria. Unexpectedly, we observed in the educational community almost everything that has been successively proposed by the scientific community on learning disabilities: from the traditional concepts of classification and separation of two kinds of students (with or without disabilities) to more recent conceptions, focusing on learning processes, assessment of the problems in context, mobility, functionality or modifiability of the student performance.

For decades, psychological research has attempted to distinguish between students with and without learning disabilities. Hundreds of studies and publications later, we have nothing concrete and specific that can be considered consensual, simple and useful. None of the current criteria or instruments, standards or procedures, can help us clearly to distinguish between students with (and without) intrinsic difficulties in specific areas. Many researchers agree that we will never reach a consensus, that a better definition may never be possible. And yet the search continues. Even recognizing how difficult it is to obtain an operational definition of learning disability, all efforts continue to focus on differential diagnosis. In my country, there are hundreds of children newly diagnosed every day. Children are classified, almost all problems considered intrinsic and permanent, determined by neurological factors. What is the purpose of such a diagnosis? We really do not know. Much too often, people believe that diagnose is a necessary (and sufficient) condition to help a learner in difficulty. In Portugal, diagnose is rarely use to really intervene. It seems to be just something necessary to do lots of paperwork, a label to explain failure, an administrative process that in some cases appears to pacify worries. “Too often, labelling is used in place of understanding” (Sternberg & Grigorenko, 2001, p.336). Too often, labelling is used in place of intervention, instead of helping the learner with different resources, changing educational strategies and practices. In some cases, diagnosis can even
create a heightened concern that surrounds the student in a sphere of overprotection and lower demand about his results. When the child takes on board the difficulty, it is even less likely that he will continue to invest time and effort in learning.

Sometimes science can offer understanding and solutions. Or it can give us just a label. LD is an old label, waiting for a profound revision.

Some of the students surveyed in this study revealed personal conceptions ultimately modern, interdependent and more constructive than can be find in some members of the scientific community, which persist in defending previous positions. Some of these student’s responses even suggested a new possibility on defining the concept of learning disabilities. Seems possible to consider, not two types of students (with or without disability), but two types of difficulties: (1) Dysfunctional Difficulties, when difficulties lead to a maladjustment towards learning, diminishing efforts and results, undermining the learning process, creating, for example, reactions of denying or avoidance; (2) Functional Difficulties, when difficulties are experienced as a personal challenge or an opportunity, when they can help student growth while encouraging coping, resilience, persistence, greater effort or even more quality in learning processes and results.

This seems even more interesting because in a constructivist framework, there is no such thing as learning without difficulties, as suggested by some student responses (functional perspective). Learning is difficult. People can enjoy learning, but they should also expect difficulties as something natural and inherent to learning and to life. Difficulties can be more or less persistent, more or less extensive or severe, as well as students can be more or less prepared to confront them. But difficulties should be considered the rule, rather than the exception. Because learning is always a time for change, an opportunity of growth and discovery, difficulties should be expected as a normal element in any learning enterprise. Difficulties may even bring new insights to the student, and increase the quality of learning. Or they can be considered in a more classical, detrimental and pathological perspective. From a differential perspective, difficulties (often also labelled as “disabilities”) tend to occur only in a few unsuccessful cases, when students need specific and specialized help. On the contrary, from a functional perspective, difficulties can happen to anyone, they can be useful and helpful throughout the learning process. Difficulties can be understood as challenge, opportunity, stimuli to learning and development. The motivational and epistemological role of questions, doubts, problems and complexities, can be use in a more or less positive and functional mode, in every context of learning. All students and all teachers can learn how to use and understand difficulties in a more functional and constructive way. Psychological assessment and teaching methods must be reviewed. And because all learning is potentially difficult, most cases of learning difficulty should not be seen as caused by permanent features intrinsic to the student, more like something evolving from a specific interaction between a student and a learning context.

5. References


Experiential Learning Styles in Branches of Engineering: Similarities and Differences between Different Degrees

Rosa María GONZÁLEZ-TIRADOS* (Universidad Politécnica de Madrid, España) - rosa.gonzalez@upm.es

Abstract

This work is the continuation of others we have done previously, although its origin is D. Kolb’s model. At present we wanted to analyse the different learning styles of engineers working in private companies and its relation to problem solving. For this we have used the model validated by R.M. González Tirados (1983-1985) and a descriptive method. We have analysed the results concerning the learning process and its strong and weak points. We have observed that the Convergent learning style, traditionally assigned to engineers, is confirmed.

Keywords: Experiential Learning, learning styles engineering, methodological model in Education

1. Introduction

Among the various changes that have had to be applied to university teaching as a result of the “Bologna Process”, is a new concept of teaching and learning regarding students. Teaching is not only the transmission of knowledge but there must also be an interaction with the student where the student ceases to be a passive element who learns just by listening, to become a person who interacts and “learns by doing”. So, methodologies have become active to achieve more active and experience-based cooperative learning. A part of this model has a certain relationship with D. Kolb’s experiential learning, whose Learning Styles Inventory (LSI) and model was created in 1974. Subsequently, different publications by this author and others who conducted research in the MIT in Massachusetts began to appear. It was with this model that we began our work in Spain in an attempt to validate D. Kolb’s original model by using samples of the Spanish population.

I began the first research work in 1978, which culminated in a degree Dissertation in 1981 under the title of “Study of a Learning-by-Experience Model using Spanish Population Samples”. Then, in the Doctoral Thesis using the same D. Kolb Model, I continued looking more deeply into learning styles with students from different degree courses. They were primarily the subjects of a study in the reliability and the subsequent validity of the author’s Inventory, and I also went on to do research into whether students choose to study a particular degree because of their own learning style, or to the contrary whether it is the university degree that changes learning styles. The work was completed in 1983 and was published in 1985 under the title of “The Influence of the Nature of University Studies on the Learning Styles of the Subjects”.

We then continued with the research and obtained more data in subsequent works (González Tirados, 1988,1989), by introducing the learning style together with other variables to analyse the failure rate of students taking engineering degrees. This theory has also served us a methodology model for Training and has enabled us to obtain further results about different engineering degrees and so expand a large amount of data related to the previous data.

All the works undertaken with engineering students or with engineers from different working areas bring out objective data on the experiential learning model. We have detected a certain similarity between the learning style and the way of approaching problems. In organisations we have also seen how prior academic training can affect the learning style, as this differs according to the course taken or in some other way. Data similar to the lines of work opened up at the time by D. Kolb are corroborated and evidence of those lines that numerous authors worldwide have tried to analyse and explain in a like manner can be found in the many works that have been produced over the last three decades.

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2. What is D. Kolb’s Learning Model?

In previous publications the author of this work stated that until quite recently Psychology focused more attention on experimental and cognitive learning than on “experiential learning” issues. That is, it was less concerned with discovering the laws governing this other learning that occurs subconsciously and involuntarily in many varying circumstances of life, which is nothing other than “learning from experience”. Much research describes the diversity of the laws that shape learning or how people reorganise their own thoughts, but does not describe the actual “process” when it comes to learning, etc.

We can also state that that until a few years ago we were more concerned with “how to teach” than with how students learn, namely, the “learning process”. So, for this reason and taking D. Kolb’s model, we decided to pose the following questions - How do we learn? How can we use the information in order to make decisions, choose models, establish priorities and solve problems? What is our “process” when it comes to learning? Can we learn from our mistakes?

The experiential learning to which we have referred in our previous works and research is adult learning. We abandon academic circles and penetrate the spheres of action of people or leaders. We point out that a successful executive stands out nowadays not so much for their individual set of knowledge or skills, but for their ability to adapt to the changing demands of their job and their career, that is to say, for their learning ability, which will enable them to adapt to change and new solutions, etc. This same theory is also applicable to successful organisations.

Moreover, if each person were to know their strong and weak points regarding learning, they could equip themselves with useful life-long tools. This theory confirms people’s diversity for learning and, as a result, their diversity for solving problems.

The Model lets us study, describe and analyse “the way we learn” while showing us that this learning style bears a certain relationship with prior academic training and subsequent professional practice: hence its influence in decision-making and problem-solving. We are dealing with a “learning process” where the fundamental role is given to life experience. This is a differentiating factor in respect of other more cognizant or affective theories or theories based on physiological traits, etc.

The Experience-based Learning Model, created by D. Kolb and which we emphasise was validated by the author of this work by means of samples of the Spanish population, is characterised by a four-stage “cyclical and iterative” cycle where the different activities developed by a person when learning, gradually form the different phases or stages of the model, as shown in the figure (1)

![Experience-based Learning Model](image-url)
3. Experiential Learning Abilities described by the Model

D. Kolb’s Learning Style Inventory (LSI) is an instrument that provides us with a self-diagnosis by giving us four values that refer to the abilities that every person has developed to a greater or lesser extent. It comprises thirty-six terms grouped into four word blocks that form 9 items.

3.1. Concrete Experience (CE)

This is the voluntary and involuntary involvement in situations that force us to interact with the outside world. It is related to “feeling”, accompanied by an evaluation of what is concrete.

3.2. Reflexive Observation (RO)

This refers to life experiences that enable us to collect data and ideas and reflect so that we can then incorporate them into new experiences. It is related to “observation”.

3.3. Abstract Conceptualisation (AC)

The data and ideas received in an earlier stage let us build new, abstract concepts and models. This ability is related to “thinking”.

3.4. Active Experimentation (AE)

This ability consists in having concepts that can be applied to new situations. It is related to “action”.

For D. Kolb each of these four abilities have their opposites and we must identify with them when learning.

4. Learning Styles

A graphic representation of these four abilities is done on two coordinate axes that have two dimensions – concretion-abstraction and reflection-activity.

These four abilities are developed unequally. From the predominance of two abilities over their opposites, we get the coordinate axes in each of the quadrants, the so-called “Learning styles”, as can be seen in the figure (2), which are named after Piaget and Guilford’s learning characteristics.
4.1. Divergent Learning Style
This is typical of people whose Concrete Experience (CE) and Reflexive Observation (RO) abilities predominate over their opposites. They are people who are characterised by their greater imagination.

4.2. Assimilative Learning Style
This is the style of subjects who have a marked ability for Abstract Conceptualisation (AC) and Reflexive Observation (RO) compared to their opposites. People with this style would appear to have the ability to plan and create theoretical models: their reasoning ability is inductive and they define problems and develop theories.

4.3. Convergent Learning Style
This is typical of subjects whose ability for Abstract Conceptualisation (AC) and Active Experimentation (AE) is more highly developed compared to their opposites. The most marked characteristic of this style resides in the practical application of ideas, seeking solutions to every problem and an ability for deductive reasoning.

4.4. Accommodative Learning Style
Typical of subjects whose ability for Concrete Experience (CE) AND Active experimentation (AE) predominates over their opposites. People possessing this style are constantly active, put their projects and experiments into practice and have even produced others. They adapt easily and take risks.

Each person is characterised by a way of learning under the influence that other variables have on each person, as we have pointed out.

5. Aims of this work
1. To find the values pertaining to the learning abilities in the different samples
2. To analyse learning styles in different branches of engineering.
3. To compare any differences in styles according to the type of engineering studied and analyse them
4. To analyse the influence of experiential learning on problem-solving in Organisations.
5. To draw conclusions in order to apply the model to training methodologies for learning by experience.

6. Methodology
The results of 211 postgraduate engineers have been used who worked in different companies and who took a seminar-workshop in Human Resources as part of a Master’s in Advanced Technologies. They had different roles and responsibilities in the company. The D. Kolb Inventory, validated by (González Tirados, 1985), was applied to them. The data were tabulated with abilities and styles being analysed as percentages and mean values. Also analysed was the relationship between previous academic titles and Learning Styles by years and by degree, as was their responsibility in executive posts and problem-solving.

7. Findings
Results of abilities by years are included.
Table 1 - Results of abilities by years

<table>
<thead>
<tr>
<th>Year</th>
<th>No. Subjects</th>
<th>CE</th>
<th>RO</th>
<th>AC</th>
<th>AE</th>
<th>AC-CE</th>
<th>AE-RO</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>18</td>
<td>15.11</td>
<td>14.55</td>
<td>17.5</td>
<td>17.33</td>
<td>2.38</td>
<td>3.22</td>
</tr>
<tr>
<td>2002</td>
<td>14</td>
<td>15</td>
<td>15.85</td>
<td>18.57</td>
<td>15.28</td>
<td>3.57</td>
<td>-0.57</td>
</tr>
<tr>
<td>2003</td>
<td>34</td>
<td>15.55</td>
<td>14.70</td>
<td>17.94</td>
<td>16.35</td>
<td>2.52</td>
<td>1.64</td>
</tr>
<tr>
<td>2004</td>
<td>28</td>
<td>15.03</td>
<td>15.64</td>
<td>17.21</td>
<td>16.03</td>
<td>2.89</td>
<td>0.39</td>
</tr>
<tr>
<td>2005</td>
<td>33</td>
<td>15.30</td>
<td>15.12</td>
<td>17.66</td>
<td>16.21</td>
<td>2.39</td>
<td>1.39</td>
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<tr>
<td>2006</td>
<td>14</td>
<td>16.14</td>
<td>14.5</td>
<td>17.64</td>
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<td>2007</td>
<td>17</td>
<td>15.22</td>
<td>15.64</td>
<td>16.23</td>
<td>16.58</td>
<td>0.35</td>
<td>0.94</td>
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<tr>
<td>2009</td>
<td>24</td>
<td>15.66</td>
<td>14.37</td>
<td>18.95</td>
<td>15.95</td>
<td>2.95</td>
<td>1.20</td>
</tr>
<tr>
<td>2010</td>
<td>18</td>
<td>16.22</td>
<td>19.92</td>
<td>18.38</td>
<td>15.77</td>
<td>2.16</td>
<td>-4.15</td>
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<tr>
<td>2011</td>
<td>21</td>
<td>15</td>
<td>15.90</td>
<td>17.71</td>
<td>16.19</td>
<td>2.71</td>
<td>0.29</td>
</tr>
<tr>
<td>Total</td>
<td>221</td>
<td>154.23</td>
<td>156.19</td>
<td>177.79</td>
<td>161.83</td>
<td>23.42</td>
<td>5.99</td>
</tr>
</tbody>
</table>

Total: 15.42 15.61 17.77 16.18 2.34 0.59

Fig. 3 Learning Profile

Fig. 4: Distribution of the sample of engineers over the axes
Partial results of the last 10 years by degree

**Fig. 5: Higher Industrial Engineer**

![Higher Industrial Engineer Diagram](image1)

**Fig. 6: Technical Industrial Engineer**

![Technical Industrial Engineer Diagram](image2)
Fig. 7: Other branches of Higher Engineering

Fig. 8: Other branches of Technical engineering
8. Results Analysis

- With the model we have found strong and weak points in the “learning process” of each sample of engineers and postgraduates and for the overall sample.

- The majority have a more developed Abstract Conceptualisation and Active Experimentation compared to the opposite abilities.
As a result, all the groups of higher engineers (long cycle degree), technical engineers and postgraduates that work with engineers had a Convergent Learning Style, which according to D. Kolb and other works of ours is typical of an engineering profile.

The results show that the “process” of learning followed by some people when they learn is related to their university academic training and their way of solving problems in Organisations.

We also found a correlation between the kind of degree taken and the learning style, as we also did between the work developed in companies and learning styles.

There is a connection on the Course through the case study method between learning style and problem-solving.

Most engineers have a Convergent Learning style and there are no differences between the branches of engineering analysed. All are convergent.

9. References


Alkhateeb, H.M. & Miji, A. (2009).”Learning styles and approaches to learning mathematics of students majoring in elementary education: A three year study”. Psychological Reports. 105 (2) (pp. 500-508)


Abstract

This research applies two scales of Motivation Scale for Career as a Teacher (MSCT) and Motivation Scale for Doing Job (MSDJ). According to paired sample test (N=448), intrinsic motivation of teachers has decreased slightly, introjected regulation has changed negatively to an extremely significant level, and external regulation has increased to an extremely significant level. Furthermore, the results indicate that four dimensions of motivation for doing job related to three burnout dimensions significantly. Among them, intrinsic motivation and identified regulation are negatively related to teacher burnout, amotivation and external regulation are positively related to teacher burnout, and introjected regulation is not significantly related to burnout. Regression analyses show that teacher motivations and their changes of motivation account for the variances of dependent variables of teacher burnout. With some important demographics and contextual variables entered, the variances accounted for has increased.

Keywords: Motivation Scale for Career as a Teacher (MSCT); Motivation Scale for Doing Job (MSDJ); Changes of motivations; Teacher burnout

1. Introduction

Some researchers have studied the relationship between personal motivation and teacher burnout. Earlier research by Maslach (1976) found that emotional stress at work had relationship with personal motivation. But there are some inconsistent results regarding the relationship between personal motivation and teacher burnout. For example, some researches found that the teachers who choose the profession on their own will or love the profession are less likely to suffer from teacher burnout (Baysal, 1995). Other studies found that differently motivated teachers show different symptoms of the dimensions of teacher burnout in great detail (Schaufeli & Salanova, 2007).

Although many previous studies have made good advancement, various scales have been used for measuring teachers’ personal motivations. One problem that existed in previous studies was that it often didn't differentiate teachers' personal motivation for choosing teaching as a profession and their motivation to stay in the current job. Some items in the existing scales sometimes can measure both of the motivations. Thus the respondents can answer the questions according to their perception of either type of motivations. As a matter of fact, teachers' motivations can be changeable during their career. If researchers don't distinguish the two kinds of motivations, the correlation between personal motivation and teacher burnout cannot be studied clearly.

In this study, we clearly distinguish and measure teachers’ two kinds of personal motivations, motivation for choosing teaching as a career and motivation for doing the current job. This research focuses on the following two research questions: Do different teacher motivations lead to different symptoms of teacher burnout? What's the relationship between motivation for career as a teacher, motivation for doing the job and teacher burnout?
2. Theoretical base

2.1. Personal motivation

Motivation is always understood based on two theories, namely self-efficacy theory (Bandura, 1986) and self-determination theory (Deci & Ryan, 1985, 1991). Two theories share a common postulation: both predict that perceptions of individual competence have a causal influence on motivation. Self-efficacy theory proposes that competence beliefs are a sufficient cause of motivation; and self-determination theory postulates that, in addition to competence beliefs, autonomy, and relatedness beliefs are essential to the understanding of motivation (Guay et al., 2000).

Motivation is typically defined as the forces that account for the arousal, selection, direction, and continuation of behavior (Biehler, 1997). Negative or positive forces can act as actuators. Negative and positive motivational forces can include coercion, desire, fear, influence and need. Motivation has been examined from many perspectives (Barbuto, et. al., 2004), including psychosocial need-based, intrinsic, social identity, value-based, goal setting, self concept-based, and to some extent, developmental perspectives.

The two motivation scales (MSCT and MSDJ) used in this research are based on the Work Tasks Motivation Scale for Teachers (WTMST) (Fernet et al., 2008) as this instrument has been well validated in previous studies. From high to low self-determination in WTMST, there are three kinds of motivation, namely intrinsic motivation, extrinsic motivation, and amotivation. Both intrinsic and extrinsic motivations are further distinguished into two kinds of motivation: introjected and identified regulations based on the Self-Determination Theory (SDT). Thus five dimensions of motivations are included in the MSCT and MSDJ, namely intrinsic motivation, introjected regulation, identified regulation, external regulation and amotivation.

Many factors influence motivation. DeCharms (1968) compared different motivational orientations and people’s work, indicating that extrinsically motivated persons often feel like pawns to the authority or work towards rewards, but intrinsically motivated persons feel themselves as the energy source and behave out of autonomy and self-investment. Personal motivations are often related to their own value, interests and beliefs. Some previous research indicates that the influence of demographic factors on personal motivation is very small. Some other research found that there were no significant correlations between demographic factors and motivational sources of career teachers (e.g. Bell, 2010).

Some tendencies of motivation change have been observed and explained in previous studies. According to Guay et al. (2000), across measurement times, intrinsic motivation was somewhat stable, external regulation and identified regulation were quite stable, and amotivation was not very stable.

There are many causes leading to the change of motivation, including self-perceptions of individual and collective competence, autonomy, and relatedness (Guay et al., 2000), and teachers’ practical teaching experience (Watt & Richardson, 2008). The practical experience is very important to teachers’ motivation. As for teachers’ motivation of doing the job, it is related to how a teacher’s teaching experience matches with his or her expectations, values and beliefs (Watt & Richardson, 2008).

2.2. Teacher burnout

Maslach and Jackson (1981) define burnout as a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment. And the three dimensions were applied to measure burnout. In further studies, Maslach, Schaufeli and Leiter (2001) describe job burnout as a psychological syndrome that occurs in response to chronic interpersonal stressors on the job. So teacher burnout is often defined in this framework. In fact, teacher burnout stems from the inability to adequately cope with stresses of work and personal lives (Huberman & Vandenberge, 1999).

Previous studies examined the relationship among the three dimensions. The research of Byrne (1994) indicates that the three dimensions of burnout cannot be added up to a single measure. Lee and Ashforth (1996) found that personal accomplishment was weakly correlated with the other two dimensions. Some researchers regard emotional exhaustion and depersonalization as the central elements of burnout (e.g., Schaufeli & Salanova, 2007).
2.3. The relationship between personal motivation and teacher burnout

In the literature, there are some unanimous findings regarding the relationship between personal motivation and teacher burnout. With regard to the three dimensions of teacher burnout, differently motivated teachers showed different symptoms of teacher burnout in great detail. Some studies found that teachers who chose the profession on their own will or like the profession from the beginning were less likely to experience teacher burnout (Schaufeli & Salanova, 2007). Other studies found that teachers who chose and stayed in the profession for other reasons were more likely to experience burnout in the emotional exhaustion and personal accomplishment dimensions (Ozan, 2009).

Some interpretations have been utilized to analyze the relationship between personal motivation and teacher burnout. Intrinsic motivated teachers reported an interest in teaching due to its intrinsic rewards, and also expressed strong enthusiasm for working with children and adolescents (Watt & Richardson, 2008). In addition, when teachers' satisfaction is regarded as mediating variable, the motivations which relate most strongly to high initial satisfaction levels including the altruistic-type motivations (reflected in our social utility value constructs) most frequently emphasized in the teacher education literature. What's more, the intrinsic valued individuals attach to teaching and self-evaluations of their teaching-related skills (Watt & Richardson, 2007). So the highly engaged persisters performed highest and lower engaged desisters lowest.

Another phenomenon must be paid attention to is that intrinsic motivated teachers are more likely to experience teacher burnout. The teachers of intrinsic motivation feel that they invest more in relationships with recipients than they receive in return so that they are reported with more burnout symptoms (VanYperen, 1996). Psychoanalytic theory has similar explanations to explain career burnout (Fischer, 1983). Freudenberger (1980) believed that the most overly committed and excessively dedicated professionals who use their job as a substitute for social life and believe that they are indispensably are most likely to burn out. The reason is that these people attribute an inordinate sense of importance to their work, which they then take to be a demonstration of their own importance. When they are subject to extraordinarily demanding situations, they burn out (Pines, 2002). To some extent, the more passion one teacher has for teaching, the more likely to experience teacher burnout (Pines, 1993).

Based on the literature review presented above, we predict that the relationship between the motivation for doing the job and teacher burnout would be the most significant when we analyze the relationship between personal motivation and teacher burnout. In addition, we also predict that changes of motivation may be related to teacher burnout.

3. Methods

3.1. Samples

Participants included 448 teachers from nine schools in China. 31.7% were from primary schools and 68.3% from secondary schools. Among the schools, 70.3% were from rural districts and 29.7% urban ones. As to the school social-economic context according to GDP per capita (National Bureau of Statistics of China, 2011), 70.3%, 12.7% and 17.0% of schools located in under-developed, middle level and developed areas respectively. Among the respondents, 36.2% (n=434) of them were male, and 68.2% female. And 14.1% of teachers had been teaching for less than 3 years, 10.1% for 3-5 years, 30.9% for 6-10 years, 34.3% for 11-20 years, 8.5% for 21-30 years and 0.7% for more than 30 years. In addition, 79.8% were full time teacher and the rest were part time teachers. Therefore, most of teachers belong to career teachers who were familiar with teaching.

In the context of China, both academic positions and titles of teachers are important indicators of teachers' status (Zhao & Bi, 2003). Among them, position means a role or duty one teacher performs, such as headteacher, the head of a grade, the head of a subject and so on. In our sample, the percentages of headteachers, deputy headteachers and other teachers were 0.7%, 24.1% and 75.2% respectively. The title of teachers refers to their academic ranking that one teacher has obtained. There are usually three types of titles, namely, junior, middle and senior. In addition, some young teachers were student teachers who haven't attained any title yet and were categorized as "no title" in this research. As such four ranks of teacher titles were used in this research. Among the participants, 10.7% had no academic position title, 55.8% junior academic title, 31.2% middle and 2.3% senior academic title.
3.2. Instruments

Personal Motivation. Two instruments, Motivation Scale for Career as a Teacher (MSCT) and Motivation Scale for Doing Job (MSDJ), were used. The MSDJ was developed based on the Work Tasks Motivation Scale for teachers (WTMST) (Fernet et al., 2008). The MSCT scales were designed based on the items of the MSDJ. Each scale includes fifteen items that represented three items per motivational construct. Each item was rated on a 7-point scale ranging from 1 (does not correspond at all) to 7 (corresponds completely).

Maslach Burnout Inventory (MBI). Maslach, Schaufeli and Leiter (2001) describe job burnout as a psychological syndrome that occurs in response to chronic interpersonal stressors on the job. Maslach Burnout Inventory has 22 items reflecting three key dimensions. The inventory has nine items on Emotional Exhaustion (EE), five on Depersonalization (DP), and eight on Personal Accomplishment (PA). It should be pointed out that PA followed the reverse scoring rules. That is to say, we have to treat the coefficient of correlation and regression related to PA in an opposite manner.

Teacher demographics. The following teacher demographic information was collected: gender, age, years of teaching, marital status, education level, teaching grade, teaching subject, and position of the school (functions of a teacher in the school), title (academic ranking).

3.3. Data analysis

Data analyses were conducted using SPSS-16.0. Firstly, the coefficients were calculated by reliability analysis and exploratory factor analysis was conducted. Secondly, descriptive statistics were computed regarding sample demographics and the variables. Then, paired sample test were conducted to judge whether the two motivations revealed significant differences or not. After that, correlation of dimensions of MSCT, MSDJ and MBI were analyzed. Finally, regression analyses were conducted to predict how personal motivation as independent variables influence teacher burnout. The independent variables were the five dimensions of MSDJ and the differences of five dimensions between two motivations and dependent variable were three dimensions of teacher burnout.

4. Results

4.1. Reliability and validity of the instruments

The reliability coefficients of the scales for MSCT were .681~.874 (see Table 1). Exploratory factor analysis results confirmed the factor structure with factor loadings ranging between .49~.85 for the relevant scales. As for MSDJ, the reliability coefficients of the scales were .687~.747 (see Table 1). Exploratory factor analysis results confirmed the factor structure with factor loadings ranging between .56~.86. As to teacher burnout, reliability of the scales of MBI were satisfactory with Cronbach’s α between .578~.756 (see Table 2). The factor loadings of the relevant items on the corresponding scales were between .44~.78.

| Table 1: Descriptive results and correlations between MSDJ and MSCT |
|---------------------------------|----------------|----------------|----------------|----------------|
|                                | MSDJ |        | MSDJ & MSCT | MSDJ-MSCT |
|                                | α    | Mean  | SD     | α    | Mean  | SD     | Correlation | Sig.  | Mean Difference | Sig.  |
| IM                             | .747 | 3.9018| 1.33846| .874 | 3.9926| 1.55660| .753**      | .000  | -.0908           | .065  |
| IDR                            | .726 | 3.9627| 1.32468| .699 | 3.9643| 1.39286| .694**      | .000  | .0205            | .687  |
| INR                            | .706 | 3.1321| 1.11434| .603 | 3.3393| 1.09570| .677**      | .000  | -.1967**         | .000  |
| ER                             | .687 | 3.5289| 1.13732| .681 | 3.2783| 1.22366| .300**      | .000  | .2506**          | .000  |
| AM                             | .767 | 3.1763| 1.49750| .794 | 3.2507| 1.60842| .476**      | .000  | -.0744           | .323  |

** p<.01.

Note: MSDJ=Motivation Scale for Doing Job; MSCT=Motivation Scale for Career as a Teacher; IM=Intrinsic Motivation; IDR=Identified Regulation; INR=Introjected regulation; ER=External Regulation; AM=Amotivation.
4.2. Descriptive analyses of personal motivation and teacher burnout

The results showed that the personal motivations of teachers were not typically represented by one type of motivations. All five dimensions of the motivations were represented to a middle level (Table 1).

Among demographic variables associated with the two kinds of motivations, gender differences were observed. Female teachers rated intrinsic motivations and external regulation higher than males \((p<.01)\). But female teachers rated amotivation lower than males \((p<.01)\).

The title and academic positions of teachers were found to be not related to teachers' motivation for choosing teacher as a career but related to motivation for doing the current job. For intrinsic motivation of MSDJ, teachers with less than 3 years of teaching experience displayed extremely significantly higher scores \((p<.01)\) than other teachers who have longer teaching experience. With regard to the dimension of amotivation of MSDJ, the results show that the youngest and the oldest group of teachers displayed extremely significantly lower scores. There were no significant differences by position and title across measures of MSDJ.

According to scoring rules by Maslach, Schaufeli & Leiter (2001), the scores (Table 2) showed that emotional exhaustion and personal accomplishment arrived at moderate level and depersonalization at low level according to above scoring rules.

Teacher burnout displayed a few significant differences according to some demographics (Table 2). Regarding emotional exhaustion, male teachers displayed significantly higher scores than females. As for teachers' teaching experiences, teachers with less than 3 years teaching experience burned out less than other teachers who have been teaching for a longer time in the three dimensions of teacher burnout. As for positions in a school, headteachers experienced more emotional exhaustion than other teachers, and headteachers experienced more depersonalization than others. Therefore, the position and academic titles of teachers were significant factors relating to burnout in the Chinese context.

Table 2: Descriptive statistics for teacher burnout

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>0-3 Y</th>
<th>3-5 Y</th>
<th>5-10Y</th>
<th>11-20Y</th>
<th>21-30 Y</th>
<th>30+ Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>.750</td>
<td>34.060</td>
<td>33.656</td>
<td>34.239</td>
<td>.477</td>
<td>35.885</td>
<td>33.856</td>
<td>32.619</td>
<td>34.430</td>
</tr>
</tbody>
</table>

Note: EE=Emotional Exhaustion; DP=Depersonalization; PA=Personal Accomplishment; Y=Years

4.3. The changes between MSCT and MSDJ

Paired sample test (see Table 1) indicated that teachers’ motivation changed between MSCT and MSDJ. Intrinsic motivation and amotivation decreased slightly and introjected regulation decreased to an extremely significant level. However, identified regulation increased slightly, and external regulation increased extremely significantly.

4.4. The correlations among dimensions of MBI

The results show that no significant correlations were found between emotional exhaustion and personal accomplishment, but there was a significant negative correlation between depersonalization and personal accomplishment \((r=-.216, p<.01)\). The correlation between emotional exhaustion and depersonalization was positively significant \((r=.469, p<.01)\).

4.5. The relationship between personal motivation and teacher burnout

Table 3 displays a number of correlations between MBI and teachers' motivation for doing the current job. Intrinsic motivation and identified regulation were positively related to the three dimensions of burnout. Among the three coefficients, two were significant at 0.05 level and one at 0.01 level. Amotivation was negatively related to all the three dimensions at extremely significant level. External regulation had negative correlations with all the dimensions of MBI. Among the three coefficients, two were significant at 0.05 level
and one at 0.01 level. As for introjected regulation, it was significantly related to EE, but the correlations with DP and PA were not significant.

### Table 3: Correlations between MBI and teachers’ motivation for doing current jobs

<table>
<thead>
<tr>
<th></th>
<th>Intrinsic Motivation</th>
<th>Identified Regulation</th>
<th>Introjected regulation</th>
<th>External Regulation</th>
<th>Amotivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE</td>
<td>-.324**</td>
<td>-.096*</td>
<td>.099*</td>
<td>.257**</td>
<td>.396**</td>
</tr>
<tr>
<td>DP</td>
<td>-.154**</td>
<td>-.107*</td>
<td>.040</td>
<td>.095*</td>
<td>.343**</td>
</tr>
<tr>
<td>PA</td>
<td>.239**</td>
<td>.284**</td>
<td>-.012</td>
<td>-.094*</td>
<td>-.243**</td>
</tr>
</tbody>
</table>

*Note: EE=Emotional Exhaustion; DP=Depersonalization; PA=Personal Accomplishment.* p<.05; ** p<.01.

### 4.6. The relationship between motivations for doing the job and teacher burnout

In order to understand the relationship between motivations for doing the job and teacher burnout, regression analyses were conducted. Table 4 displays the result of the regression analyses. The results indicate that the five dimensions of teacher motivations were related to emotional exhaustion. Intrinsic motivation was a negative predictor for emotional exhaustion. Identified regulation, external regulation and amotivation predicted emotional exhaustion positively. Depersonalization was predicted by amotivation significantly. Among the five dimensions of motivations, three motivations predicted personal accomplishment.

### Table 4: Linear regression predicting MBI by teachers’ motivation for doing the job

<table>
<thead>
<tr>
<th></th>
<th>Emotional Exhaustion</th>
<th>Depersonalization</th>
<th>Personal Accomplishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\beta_{\text{Intrinsic Motivation}})</td>
<td>-.342**</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>(\beta_{\text{Identified Regulation}})</td>
<td>.228**</td>
<td>_</td>
<td>.372**</td>
</tr>
<tr>
<td>(\beta_{\text{Introjected regulation}})</td>
<td>_</td>
<td>_</td>
<td>-.234**</td>
</tr>
<tr>
<td>(\beta_{\text{External Regulation}})</td>
<td>.132**</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td>(\beta_{\text{Amotivation}})</td>
<td>.243**</td>
<td>.342**</td>
<td>-.110*</td>
</tr>
</tbody>
</table>

\(R^2\) Motivation .202 .117 .124

\(R^2\) changes of motivations .034 .045 .058

\(R^2\) Motivation+Dem.b+Con.b .258 .190 .171

\(R^2\) Motivation+Dem.b+Con.b 11.409** 7.854** 6.845**

*Changes of motivation refer to mean difference between motivation for career as a teacher and motivation for doing the job; b Dem. means demographics include gender, teaching experience, title, income, school status and school location; Con. means contextual variables include school status (social-economic level) and location (urban or rural).* Note: Forward method of linear regression was used to enter each predictor one after another.

According to the \(R^2\) value, changes of motivation accounted for a certain proportion of variance of the three dimensions of teacher burnout. When some demographics and contextual variables were entered into the linear regression, the \(R^2\) value increased. In other words, the combination of motivation and contextual and demographic factors could explain more variances of teacher burnout. The socio-economic and demographic factors entered into the regression model were decided based on suggestions in previous studies (Bell, 2010; Grayson & Alvarez, 2008). The demographics included gender, teaching experience, title, income and contextual variables included school status and school location.

### 5. Discussion

#### 5.1. Understanding descriptive characteristics of teacher motivations and burnout

According to the mean scores of MSCT and MSDJ, most of the teachers seemed to have a rather high intrinsic motivation, but they displayed also a mixture of other motivations. This might be related to the complex reality
which could have affected their motivation, for example, the required education quality (Brenninkmeijer et al., 2001), the bad behaviour of students, and the negative school organization culture (Grayson & Alvarez, 2008).

The female teachers seemed to be more likely to have chosen teaching as their career and were more inclined to stay at their current school compared to male teachers. As a result, female teachers also scored significantly lower in amotivation than males. The two consistent results indicate that female teachers love the career more and/or work on clearer purpose than male teachers. Therefore, this study shows that male teachers seemed to have more complex motivations to be a teacher or stay in their job.

Young teachers with less than three-year-teaching had more pleasure or satisfaction because they scored extremely significantly higher in intrinsic motivation than other teachers. So they seemed to have behaved out of autonomy and self-investment in that they didn't limit themselves by the education system and the harsh reality (de Charms, 1968). What's more, the results were testified by the scores of amotivation again. The younger teachers and the senior teachers scored significantly lower on amotivation, which indicates that they seemed to have clearer purposes towards their job. On the contrary, other groups of teachers had more conflicting motivations. This might be related to the educational problems they have experienced and difficult realities they have encountered in the teaching career.

In average, teacher burnout was shown to be roughly at the middle level (see Table 2). Due to male teachers’ complex motivations, they were more likely to experience emotional exhaustion. From the relationship between teacher burnout and teachers’ experiences, older teachers seemed to have higher risks of burnout than younger ones. Thus, the reasons why older teachers were more likely to burn out should be paid much attention to. As for teacher positions in a school, headteachers for a class experienced more emotional exhaustion than other teachers and deputy hearteachers often experienced more depersonalization than others. Acting as a headteacher, they play a role as an educator, organizer and manager at the same time (Wang, 2007). As a result, headteachers often had the problem of role confusion which perhaps led to emotional exhaustion. In addition, the no-title-teachers experienced less burnout than the teachers having higher titles. It seemed that the higher the academic position, the higher risks of teacher burnout could occur (Zhao & Bi, 2003). In order to face various tasks and the changeable economic and social context, the deputy headmasters seemed to face more often burnout with depersonalization (Zhang & Li, 2005).

5.2. Motivation and its changes relating to burnout

Among the dimensions of teacher motivations, intrinsic motivation and amotivation should be taken into account importantly because of their extremely significant coefficients of correlation and regression in this study. The results indicate that the teachers who love the profession are less likely to suffer from burnout, and they can often attain personal accomplishment from job. On the contrary, the results reveal that the teachers with motivations other than intrinsic motivation are more likely to suffer from burnout and they seldom perceive personal achievement.

The correlations between five dimensions of motivation of doing the job and three dimensions of teacher burnout were analyzed. For depersonalization, the teachers with higher scores of amotivation often performed a negative, callous or excessively detached response to various aspects of the jobs. In addition, these teachers always experience reduced feelings of efficacy and accomplishment, feelings of incompetence, a lack of achievement and a lack of productivity. As for personal accomplishment, the teachers with higher scores of intrinsic motivation often cared more about their personal achievement.

This research shows the paths of each dimension from motivation choosing the career to motivation staying continuously at current school. In general, the paths showed as follows: 1) the strength of intrinsic motivation decreased slightly. Therefore, the motivation for teaching in the real situation seemed to be less than what they seemed to be, but kept somewhat stable. Thus the teachers with intrinsic motivation were less likely to burnout and sometimes they can obtain personal accomplishment (Schaufeli & Salanova, 2007). 2) Identified and introjected regulation stay stable but sometimes the latter changed in a positive way in that some teachers understand the nature of teaching gradually. Therefore, introjected regulation often conversed to identified direction. 3) External regulation increased to a significant level because the teachers became more realistic facing the real job and situations. Good or ideal teaching is actually hard to achieve. 4) Amotivation must be paid much attention to, specially in that it had significantly positive correlation to emotional exhaustion and depersonalization and significantly negative correlation to personal accomplishment (Baysal, 1995).

In short, the significant differences showed the changing paths of teachers’ motivations. First, the teachers who liked the teacher career seemed to like the profession continuously. As for introjected regulations, the teachers
who chose this career for various reasons seemed to be more possible to have shifted their motivations and understood this profession in a different way during the career.

Some of the results in this study were different from previous studies (e.g. Guay et al., 2000). The different results could probably be explained that the research of Guay et al. measured the same motivation for doing current job twice in an interval, but in this research the two different kinds of motivation were measured at the same time.

5.3. Limitations and Future directions

One of the limitations of this study is that the size of sample was relatively small and should be increased to a larger size in follow-up studies. In addition, the samples in the rural areas were larger than other areas. Future studies could include more middle level and developed areas or urban areas so as to be more representative of the reality in China.

About the measurement, this research measured two motivations at the same time. This could have influenced the findings in this study. However, in practice, it is difficult to measure the motivation of each teacher when they made their choices to enter the teacher profession, except for beginning teachers. Therefore, the two types of motivation were measured with two instruments but not at separate times.

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Measuring Teachers’ Conceptions on Learning and Teaching in Student-Centred Medical Curricula

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Abstract

Literature in higher and secondary education suggests that conceptions of teachers on learning and teaching influence the results of staff development (e.g. Postareff, 2007). However, instruments from higher and secondary education as the Learning Inventory (Bolhuis, 2000), Approaches to Teaching Inventory (Trigwell & Prosser, 2004), Teaching Perspective Inventory (Pratt et al., 2001) and Inventory of Teaching Patterns (Donche & Van Petegem, 2007) do not adequately fit to student-centred education. We therefore developed a new instrument (the COLT-Q) to measure conceptions on learning and teaching, of teachers in student-centred education. Our research questions were: (1) What is the internal validity of this instrument? (2) What is the reliability? (3) Is there any evidence for its external validity?

This study took place at two medical schools in the Netherlands, VU medical centre in Amsterdam and Maastricht University Medical Centre, which have a different tradition in student-centred education. We chose for the conceptual framework of Bolhuis (2000) on teacher’s conceptions, because of its theoretical richness. Bolhuis discerned five underlying factors: (1) regulation of learning, (2) view on knowledge, (3) collaborative learning, (4) view on intelligence and (5) teacher’s tolerance for uncertainty.

In an expert meeting, pilot interviews and a modified Delphi procedure (N = 9) we checked for relevance and wording of the statements in the questionnaire. Subsequently we administered the questionnaire among a large group of teachers (N= 646) in VUmc and MUMC, and conducted a confirmatory factor analysis, a reliability analysis and tested school performance differences.

The Delphi procedure resulted after two rounds in consensus on wording or removal of statements. The questionnaire was completed by 324 teachers (50.2%). In the CFA, the original theoretical model could not be supported, but an alternative model demonstrated a good fit (CMIN/df = 1.689, RMSEA = .046, CFI = .986). Combining the CFA results with the Delphi procedure resulted in a definitive instrument with 18 items and three underlying factors: ‘Teacher-centredness’, ‘Appreciation of active learning’, and ‘Orientation to professional practice’. Cronbach’s α-values were respectively .73, .57 and .63. The first factor ‘Teacher-centredness’ reflects two components frequently described in the literature: (1) ‘ITTF; teacher-centredness / knowledge transmission’ and (2) ‘CCSF; student-centredness / conceptual change’ (e.g. Trigwell and Prosser, 2004). The second and third factor are new elements in current research into conceptions of teachers in higher education and presumably specific for student-centred medical education. Evidence for external validity was provided by a significant expected difference (Student’s t-test) between teachers’ conceptions of the two medical schools.

To conclude, our instrument COLT-Q appears to be a valid and reliable tool to measure conceptions of teachers on learning and teaching, in student-centred medical education.

Though further studies are recommended, we think the COLT-Q might be a promising tool to improve staff development in the medical domain. Our instrument demonstrated three underlying factors, from which two are new and presumably specific for student-centred medical education.

Keywords: conceptions on learning and teaching, student-centred education, staff development, medical education
References


Making Sense of Marketing Students’ Professional Identity Construction through a Multidisciplinary Project Course

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Abstract

The aim of this study is to analyse how marketing students make sense of their professional identity during the multidisciplinary service concept development course. The theoretical discussion on the construction of professional identity is based on social identity theory and identity processes guiding principles of distinctiveness, continuity, self-efficacy, and self-esteem. The qualitative data is gathered from a university level project course, where design and business students work on developing a new festival concept for the city. The data consists of feedback forms from both design and marketing students and learning diaries, in which sixteen Finnish marketing students wrote about their thoughts and feelings about a multidisciplinary learning context. The data is analysed using qualitative content analysis. The results show how students use the principles of identity construction in making sense of their own profession now and in the future. Professional identity evolves in interaction between own profession and other professions and the knowledge and skills needed in own profession become more evident. The practical implications on how educators can enhance the professional identity development among students are presented.

Keywords: professional identity, higher education, marketing students

1. Introduction

The aim of this article is to analyse how marketing students make sense of their professional identity during the multidisciplinary service concept development course. Professional identity is a central theme in career literature (Ibarra, 1999), as career success is often associated with successful professional identity construction (Slay & Smith, 2011). Hence, it is interesting to understand how educators can support the construction of professional identity already during studies.

This study concentrates on university level marketing students’ construction of professional identity. Marketing itself is a complex profession, as different education paths may develop the skills needed in various jobs within multifaceted marketing field. This specific study is focused on the marketing study programme leading to the degree of Master of Science in economics or business administration that can be achieved in one of the twelve Schools of Economics and Business Administration in Finland. This degree allows a person to use a honorary title “economist” in Finland and get a membership in Sefe, The Finnish Association of Business School Graduates. Consequently, this degree also represents something called achieved status (Deaux, 2001).

The business school in the University of Vaasa represents one the oldest business schools in Finland, dating back to the 1960s. It is still one of the biggest business educators in Finland, giving degrees to 186 bachelors, 170 masters, and 3 doctors in economics and business administration (internal statistics 2010) in 2010. The department of marketing is one of the four departments within the business school. In 2010, it gave degrees to 31 bachelors, 37 masters and one doctor.

This article proceeds as follows: first the construction of professional identity is discussed based on social identity theory and identity processes guiding principles of distinctiveness, continuity, self-efficacy, and self-esteem (Breakwell, 1986, 1992). Then, the multidisciplinary course context is described and the feedback forms and learning diaries as well as data are presented. The results describe in what ways students make sense of their professional identity through the principles of identity construction. Finally, practical implications for educators are suggested.

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2. The construction of professional identity

Professional identity is one type of social identity and refers to those aspects of a person that are defined in terms of her group membership (Deaux, 2001; Hogg, 2006). One’s professional identity is a definition that is usually shared with countless other people, many of whom one may not know. In contradiction to other types of social identity, such as ethnicity or gender, professional identity is chosen by a person, and can be considered as an achieved status (Deaux, 2001).

2.1 Definition of professional identity

Professional identity is defined as “the relatively stable and enduring constellation of attributes, beliefs, values, motives, and experiences in terms of which people define themselves in a professional role” (Ibarra, 1999; Slay & Smith, 2011). This constellation is shared by members of professional groups and used to compare and differentiate between other professional groups (Glaser-Secura, Mudge, Bratianu, & Dumitru, 2010). Furthermore, a more constructivist view that understands professional identity as a social, continuously ongoing, dialectical process that is produced in situations involving interaction, learning, and practical professional activity is adopted in this study (Ryynänen, 2001: 22). Hence, professional identity is not something that a person has, but something that is used in order to make sense of oneself as a professional (Beijaard, Meijer & Verloop, 2004).

Indeed, professional identity is defined as an ongoing process of interpretation and re-interpretation of experiences and it can be seen as a process of lifelong learning (Beijaard et al., 2004). The professional identity formation does not only answer the question “Who am I as a professional?” but also “Who do I want to become?” (Beijaard et al., 2004). Cooper and Olson (1996) continue that professional identity is a multifaceted concept that is influenced by historical, sociological, psychological, and cultural factors. Akkerman and Meijer (2011) identify three characterisations of professional identity that are the multiplicity, the discontinuity, and the social nature of identity. These characterisations stress that professional identity is not a stable or fixed entity but on ongoing process, dynamic concept that shifts with time and context.

Professional identity can be seen as a twofold concept. First, the concept refers to what a person himself finds important in his professional development based on his experiences, work, and personal background. At the same time, the concept refers to the influence of the conceptions and expectations of other people, what a person in a particular profession should know and do (Beijaard et al., 2004). Coldron and Smith (1999) point to this tension of personal and socially structured dimensions and argue that, for example, being a teacher is a matter of the teacher being seen as a teacher by himself and by others; it is a matter of arguing and then redefining an identity that is socially legitimated. Thus the person is in the center, but he is socially influenced.

2.2 The construction of professional identity

There has been an increased interest in the process of professional identity construction (Clarke, Brown, & Hailey, 2009; Sutherland, Howard, & Markauskaite, 2010), and there are several suggestions on how the construction of professional identity evolves. Already Erikson (1968) emphasised the constructive nature of identity formation, in which processes of evaluation, selection, and organisation of self-perceptions are essentially involved. Slay and Smith (2011) suggests that professional identity is shaped in three ways. First, it is a result of the socialisation process and rhetorics, where one is provided with information regarding the meanings associated with a profession. Second, individuals adjust and adapt their professional identity during periods of career transition. Third, life as well as work experiences influence professional identity by clarifying one’s priorities and self-understanding. Ibarra (1999) suggests that the process of professional identity construction involves observing role models to identify potential identities, experimenting with provisional selves and evaluating experiments against internal standards and external feedback.

Breakwell (1986: 9) models a social identity process theory that seems promising, also in understanding the formation of professional identity. She treats identity as a dynamic social product that resides in psychological processes but cannot be understood except in relation to its social context and historical perspective. She sees identity as an integrated entity that develops though the processes of a) assimilation and accommodation, and b) evaluation. Assimilation refers to the absorption of new components into the identity structure; accommodation refers to the adjustment which occurs in the existing structure so as to find a place into which to fit new elements. The process of evaluation entails the allocation of meaning and value to identify content of the social world. (Breakwell, 1986: 23).
According to Breakwell, the two identity processes described above are guided by four principles: distinctiveness, continuity across time and situation, self-esteem, (Breakwell, 1986: 24) and self-efficacy (Breakwell, 1992). Distinctiveness means a person’s desire to maintain personal or group based distinctiveness or uniqueness (Breakwell, 1986: 23). Within the professional identity discussion this may refer to a person’s desire to keep the profession distinct from other profession. For example, it may be described how it is to be a marketer and how that differs from other professionals. Continuity refers to a person’s desire to preserve continuity of the self-concept. It is defined as continuity over time and situation between past and present self-concepts (Breakwell, 1986). It is not the same as consistency, as continuity can be associated with growth and change which require inconsistencies between past and present (Breakwell, 1993). Self-esteem refers to a positive evaluation of oneself or the group with which one identifies. It is concerned with a person’s feelings of worth and social value. The desire for self-esteem is argued to be a basic principle of every theory of identity; people will seek to achieve and maintain self-esteem. Indeed, self-esteem could be treated as superordinate of all principles (Breakwell, 1993). Self-efficacy is a person’s belief of his ability to be effective in achieving his goals (Breakwell, 1986). The lack of self-efficacy may appear as feelings of futility, alienation, and “helplessness” (Breakwell, 1993). Expectations about self-efficacy are derived from three major sources, mainly from past performances, from expectations of what is necessary for the task to be completed, and from estimates of one’s capacity made by other people. Self-efficacy may be raised, if some kind of emotional arousal occurs (Breakwell, 1992: 36).

2.3 Earlier studies related to professional identity construction

Research on professional identity emerged in different professions, such as teachers (Beijaard, 1995; Beijaard et al., 2004; Beijaard, Verloop, & Vermunt, 2000; Berry, Clemens, & Kostogriz, 2007; Connelly & Clandinin, 1999), doctors (Niemi, 1997; Pratt, Rockmann, & Kaufman, 2006; Ryynänen, 2001), educational psychologists (Gaskell & Leadbetter, 2009), academics (Archer, 2008), black journalists (Slay & Smith, 2011), and marketers (Bennet, 2011). Teachers’ professional identity, for example, research has grown to a separate research area (Beijaard et al., 2004). Indeed, teachers, lawyers, and doctors represent seemingly coherent professions and as such provide an interesting context for understanding professional identity and its construction.

Even though Becker et al. (1961: 420, cited in: Pratt et al., 2006) argue that students do not take on a professional role while they are students; the time spent in the university more or less acts as a seed for later development. Identity formation consists of exploring the available alternatives and committing to some choices and goals. Indeed, it is essential for the development of professional identity that students develop a realistic view of the challenges and opportunities of the profession. Thus, also students and the time of studies can be active in the process of constructing professional identity (Hallier & Summers, 2011; Niemi, 1997).

Indeed, there are studies that focus on professional identity construction during study time. For example, Dannels (2000) examined how classroom discourse and practice construct professional identities for students as future engineers. Ryynänen (2001) studied the construction of physician’s professional identity through exploring students’ critical experiences in medical education. Pedagogical approaches are thought to enhance professional identity. Gilardi and Lozza (2009), for instance, describe an inquiry-based course that is designed to support psychology student’s professional identity development through reflective practice. Glaser-Secura et al. (2010) analysed the role of different learning activities in the formation of business students’ professional identity. Hallier and Summers (2011) examined how human resource management students construct a sense of professional identity over the course of their degree. Stenberg (2011) studied the use of identity work in order to promote student teachers’ professional development.

It seems that during the study time, answers to questions such as “Who am I?”, “Who do I want to be?”, and “How am I achieving it?”, describe the early development of professional identity. Understanding how the professional identity construction begins, the educators may also enhance its development. In this study, professional identity is thus understood as a constellation of attributes, beliefs, values, motives, experience, and expectations that people use to make sense of themselves as professionals. It is not seen as a stable or fixed entity, but as an ongoing process that evolves through interactions between people, and which is multifaceted, intertwining personal, social, and cultural perspectives.
3. Methodology

The study context for this article is a practical master level concept development course for marketing students in the University of Vaasa, Finland. The course is called “Concept Factory” and aims to give students a creative, multidisciplinary, teamwork experience while tackling a development problem for a certain company or organisation. The course is run every autumn and the students may achieve 5-15 ects depending on the challenge of their development problem. The pedagogical background for the project lies in experiential and inquiry based learning. Autumn 2010 the course was run together with Umeå Design Institute from Sweden, thus the course emphasised both multidisciplinary and international aspects within concept development. Sixteen students from both countries participated in the course. The topic for the concept development was “New festival concepts for a city of Vaasa”. The students started with an intensive workshop week, where they worked in multidisciplinary groups, first in Vaasa (Finland) and then in Umeå (Sweden). After the intensive cooperation week, each group had developed three potential festival concepts. Finnish business students continued working with the concepts, tested them on a market, developed a business plan and presented the concept for professional jury. Altogether six new business concepts were developed and evaluated.

The qualitative data used for this study consists of written feedback collected after intensive working week from 32 students from both countries and sixteen learning diaries written by Finnish marketing students after completing the business plan for the developed concept. This data is analysed using qualitative content analysis (Miles & Huberman, 1994). The data was first read several times. Then I started to categorise the data and kept asking how the students write about different aspects of themselves in relation to marketing profession. While writing the first draft of data description, different themes started to emerge and these themes were compared to different theoretical frameworks. At this time, I familiarised myself with the social identity process theory and the four identity principles presented by G.M. Breakwell. I used these principles to structure my findings. Thus, the data analysis process has been abductive in nature, keeping the eyes open to both the theoretical understanding and the originality and distinctiveness of the data.

The data extracts are translated from Finnish language. They are coded so that the first number refers to number of the learning diary, F or M to the sex of the student, and the following number to a page number in that particular learning diary.

4. Principles in professional identity construction

The course feedback and learning diaries show how students make sense of their professional identities as marketing students and future marketing professionals. The professional identity evolves by making distinction between marketing profession from other professions, by making sense how marketers work now and in the future, by understanding the efficacy within marketing profession, and by understanding how all these aspects result in higher self-esteem as marketer.

4.1 Marketers are distincted from other disciplines and other business students

Marketing students made distinctions between marketing, other business students (such as accounting students), and designers. Most evident, due to the context, was the distinction between marketing and design students. It came evident during the intensive week, where students were asked to organise a workshop for external guests in order to find ideas for the concept ideation phase. Marketers described design students as creative and used to work with open problem definitions. The creative workshops included several steps requiring guests to participate in map construction, mood boards, collage building, word associations, and other creative exercises. However, marketing students described that methods were not always chosen based on their quality for problem solving. As one student described:

“In this phase (workshop planning) the differences between different ways of thinking became apparent, as we marketing students started to plan the workshop based on what results we wanted to gain and design students emphasised free ideation and the creative process itself.” (5F4)

Marketers described themselves feeling awkward in an open problem situation, not having concrete goals set for them. Also the idea of (very) creative workshops made them think about what their expectations towards the workshop are. Indeed, within marketing studies, students are encouraged to interview users or hold focus
group sessions. These different ways of thinking and working were handled differently in different groups. In some groups the difference was described and made explicit, but the difference between professions was accepted and mostly appreciated. In other groups, the diverse way of working was rejected and confronted and the own way of working was argued for. However, in the feedback forms, both professional groups wrote how explaining their own standpoints made them understand more about their own profession and them as professionals.

“While planning workshops, our group drifted to its first contradiction. The students of the design school were used to use workshops in their studies and their experience was helpful. Contradiction was raised, because design students started with the idea that first we decide on pleasant methods for workshop and only then we think what we achieve with them. At least for me this way of thinking feels wrong because I have earlier learnt many times that it is important to start by defining the goal.” (3M2)

4.2 In the future in marketing profession I need these skills...

Continuity in professional identity is mostly described in terms of the skills needed in the future profession, thus continuity in time. It implies that students will hold their student identity while studying, but are preparing themselves for a particular set of skills and knowledge needed when working in marketing profession. The expected skills show how they see that a marketer needs to behave in working environment. Particular skills that this context made them to think were project and teamwork skills, presentation and visualisation skills and working in multidisciplinary contexts. Even though all those skills are needed also in their later studies, they described the use of those skills through their future profession. All these were described as important aspects in their own profession.

“I feel that my presentation skills have developed a great deal during this course because there have been so many presentations. I have always been nervous about presentations and this has meant that I rely on notes and avoid contact with public. As my confidence has grown, I have realised that my speech has become more free and fluent and keeping the eye contact with the public have become more natural. The development of self-confidence and presentation skills is important for future working life. In the field of marketing one cannot avoid presentations and it is important, what kind of impression one delivers through presentations.” (1F12)

4.3 We marketers are goal-oriented, practical and efficient

Self-efficacy became apparent in the multidisciplinary context that challenged the way of working. Business students described how they have been taught to be goal-oriented, effective, and analytical. They felt insecure in the beginning as it was quite open what should be done and how to proceed in the project. They would have liked to have more guidelines and a more direct problem definition. This was discussed in the learning diaries in two ways – firstly describing, how I am used to work and second, by making distinction from design students.

“The difference in the ways of thinking between different disciplines is not just a cliché; we react to different matters in different ways. Design students concentrated on visualisation and abstract ideas, whereas business students are thinking about practical matters, profitability and most of all goal orientation.” (8F11)

“Traditionally we have been taught a realistic and goal-oriented way of thinking in business school, so the unrealistic aspects and uncertainty of results seemed to be insane, something that belongs to art and theatre schools.” (9F4)

Even if later, the open mindset and creative techniques were described as innovative, interesting and worth learning, the effectiveness, business-like approach and customer orientation were described as marketers’ way of working. One of the students described the situation where three of them went to interview potential target group for their business conference concept. The group had severe problems in group work and she explained this:
4.4 Hard work resulted to better self-confidence

Self-esteem came up in writings about beating the demanding challenge of the project work. Students put a lot of effort in the project work, some described the project to become their own, how they lost the track of time and really enjoyed working with the concept development. Someone also described how one becomes very sensitive to all feedback, because the project is so close to you.

“The concept is not just any school work among others, it has a deeper meaning. Once you have worked so long on something, it is difficult to relate to it without any feelings.” (1F10)

This hard work was most often rewarded with a sense of accomplishment, success, and higher self-confidence. Also, they were not only satisfied with themselves or their group, but they were pleased to our groups’ concepts as well. They felt proud of the whole group that succeeded to finalise the demanding project work. This also resulted in the feeling that the students are better prepared for future working life.

“I felt our final presentation was a success and I noticed that we had made our style better during the last eight weeks. It felt great to hold a presentation on something that I knew backwards. Other groups surprised me positively and I felt myself proud that all the groups had created such wonderful concepts.” (6F12).

“Presenting the concepts to the group regularly and eventually presenting the final concepts to the jury gave more self-confidence. One was used to motivate one’s own concept and argument the choices made in the development process. This will be needed in future working life.” (5F10)

Self-confidence was not only based on the project outcome, but also the project process had taught students how to develop themselves not only as professionals but also as persons.

“I have been thinking this for a long time, and eventually in the end of this course I found that confidence inside me, that I don’t need to please the others, if the reality doesn’t give any prerequisites. In group work all should be equal; I don’t want to feel bitter any more after group works. I also learnt about myself that I can push forward and not to give up, even if the other ones do. Because of this course, I found new resources and patience from myself that I didn’t know to exist.” (8F18)

5. Discussion

The aim of this study was to analyse how marketing students make sense of their professional identity and the construction of it. Professional identity is an example of social identity and a part of self-identity that evolves in social context where people negotiate meanings attached to themselves and to some professions in different contexts. The results show how the development of professional identity is not only dependent on identification with one’s own profession (Ibarra, 1999), but is negotiated together and against other professions as social identification suggests (Deaux, 2001; Hogg, 2006). Also, professional identity evolves in some perspectives already during the study time and is thus seen as a lifelong process. The principles of social identity process describe well the construction of professional identity. The different principles guide the negotiation within identity construction.

As professional identity is linked with career success, it is important for educators to understand how the construction of professional identity can be supported both formally and informally. Indeed, educators should help students to engage with professional identity discussions in order to support the challenges that they will face in planning and managing their future careers. Education programmes can support the development of professional identity in several ways. Based on the results presented in this study, I would like to take up three aspects. First, educators can support continuity in understanding marketing profession as
a future career. This can be done for example by offering visiting lectures and in that way presenting different possible professional identities for students. Also training periods, field visits, or interviewing marketing professionals may give insight into the profession and also open eyes for different opportunities that marketing as profession offers to students.

Second, the curriculums may include multidisciplinary working contexts that support distinction by making students understand how different professionals think and work. Distinction should not be understood as restricting professional identity in some category, but as providing opportunities to discuss why we as marketers work in our way and what we can learn from others. This social negotiation practice allows students to make sense of themselves as marketing professionals and how they relate to other disciplines.

Third, experiential and inquiry based pedagogical approaches can be used to provide self-efficacy by giving students practical knowledge and skills to use their theoretical knowledge in problem-solving. Reflection, feedback, and assessment can be used by students as a mirror to challenge their own learning and to understand how they meet their goals. As in this study, the learning diaries as one reflective method seemed to work well in making student really think what they have learnt and how that supports their future working life within marketing. This may also be used to support students’ self-esteem, which is seen as the most important factor in professional identity. However, there should be a balance between requirements and support. Students seem to appreciate learning most when they have found it challenging and passing the course have made them feel proud of themselves as they have achieved something special.

6. References


Adoption of Web 2.0 and Mobility Technology in a Multicultural Population of Hospitality and Leisure Students: Search for Empirical Evidence for a Blended Learning Framework

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Abstract

The aim of this research is: to gather empirical evidence on the current use of Web 2.0 and mobile technology in the population of first semester students in higher education, to analyse the evolution of usage over time, and to verify the influence of technology on learning styles. A quantitative analysis, comparing the results with those of an Australian team, was performed. The statistical analysis used mirrors that of the Australian team to allow for a robust comparison and the reasons for differences are explored. The results from the research demonstrate that on average, 2010 students use computers more than their Australian counterparts in 2006. The difference is even more pronounced in the students’ usage of traditional web technologies. Significantly fewer students in 2010 did not use Web 2.0 technologies and mobile devices compared to 2006, which again is important for the learning styles and blended learning delivery. The results of the first stage of this research support the notion that this institute of higher education’s students use web and mobile technologies to communicate and consume content.

Keywords: millennials, learning styles, higher education, web 2.0, mobility

1. Introduction

On the one hand, the debate (Bennett, Maton, & Lisa, 2008) is still raging about whether or not the “NetGeneration” (Tapscott, 1998, 2008), or “Digital natives” (Prensky, 2001), or “Generation Y”, (AKA “Echo boomers”, “Millenial Generation”) are really tech savvy and their brains are ‘wired’ differently from that of previous generations. This implies that educators and educational institutions need to adapt their teaching practices and learning environments (Oblinger & Oblinger, 2005) or whether the reality of their adoption of leading-edge Information and Communication Technologies (ICT) has not been evidenced scientifically and higher education institutions need to do further research before changing their ways (Kennedy et al., 2006, 2007, 2008, 2009).

On the other hand, the Internet and especially Web 2.0 (Anderson, 2007) and mobile (Mellow, 2005) technologies with their multimedia, interactivity, user-generated content and social networking offer promising new ways of engaging (Tosh, Penny Light, Fleming, & Haywood, 2005) the Net Generation in the classroom (Lorenzo & Dziuban, 2006).

At our institute, the technology used by students in and out of the classroom has evolved considerably in the last 5 years. Students are required to have their own laptop; they have wireless broadband access to the Internet on campus and in their residences. A vast majority favors the new generation of “smart” phones which they use to access their university-provided email account2. Faculties observe students using their laptops and smart phones constantly in the classroom where tablet computers started appearing in the fall semester of 2010. For the last four semesters of 2009 and 2010, in one course, students have been designing and building web 2.0 applications as part of a class project.

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2 A quick survey in one class revealed that only 2 out of 30 students did not have a smart phone.
2. Literature debate

Between 1994 and 1998, American research showed that the percentage of teens who found it desirable to be online jumped from 50% to 88% (Tapscott, 1998, p. 3) and the influence of emerging technology on behavior and development became irrefutable. The Internet has empowered young people to challenge knowledge and grow into critical thinkers (Tapscott, 1998, p. 88). The opportunity to inform and express themselves through, for example, chat groups has an influence on each element of self-esteem: social, academic, and physical (Tapscott, 1998, pp. 91-92). Tapscott (1998, p. 99) points out that it may actually increase intelligence and is, in part at least, responsible for an increase in American reading scores by 15 points compared to 50 years earlier. Seely Brown (2002) also identifies a need to consider the Net generation’s altered aptitude to absorb and create information. Generations considered as ‘information literate’ can be frustrated by traditional learning and their attention can be difficult to capture (Seely Brown, 2002). They are no longer simply absorbing information; they blend skills to consume and create information with varying degrees of “information fluency” (Lorenzo & Dziuban, 2006, p. 3).

With less optimism, Prensky (2001, p. 3) purports that physiological changes in the digital native brain have altered learners’ capacity for reflection and critical thinking. Prensky’s initial paper “Digital Natives, Digital Immigrants” (2001) was presented with little or no empirical evidence to back his claims regarding the digital natives’ characteristics and their implications for higher education.

Subsequent surveys and interviews were used to fill this gap of evidence. A “Study of Students and Information Technology” survey was carried out by the EDUCAUSE Center for Applied Research (ECAR) in 2004. Their findings concluded that students’ experience with technology is primarily about convenience and communication. Students clearly stated a preference for moderate use of IT in the classroom. The most common technologies mentioned in the survey were word processing (99.5%), emailing (99.5%), and surfing the internet (99.5%) for pleasure (Kvavik, Caruso, & Morgan, 2004).

In 2006, the Australian Learning and Teaching Council started a collaborative longitudinal research project entitled “Educating the Net Generation” (Kennedy, 2009). In a 2007 paper, entitled “The Net generation are not big users of web 2.0 technologies”, Kennedy et al. (2007) analysed the results of a survey of 2,588 first year students across disciplines at the University of Melbourne, the University Wollongong and Charles Sturt University. They found that new technologies were not commonly used.

The Australian team’s findings were surprising in the context of our institution where simple observation seems to disprove this finding. Whereas we cannot ignore the fact that most of our students are regularly using social networking websites and smart phones, we agree with the Australian team that “more research is needed to determine the specific circumstances under which students would like their ‘living technologies’ to be adapted as ‘learning technologies’” (Kennedy et al., 2008)

The ‘learning styles and technology’ literature offers two different research frameworks. The first framework implies that “learners’ individual characteristics influence their preferences for using technology”, see Figure 1 (Saeed, Yang, & Sinnappan, 2009, p. 100). Empirical evidence shows that, although learning styles and technology preferences are correlated, Millenials are capable of “stretching their learning styles “(ibid., p. 106) to adapt to emerging technology.

The second perspective agrees with Dede (2004) from the Harvard Graduate School of Education that technology, particularly Web 2.0 technology, influences the lifestyle of the Millenials and in turn, the Millenials’ lifestyles influence their learning styles forcing higher education to adapt (Dede, 2004). To contrast it with the first, this framework could be represented by Figure 2. Dede’s research on immersive virtual environments leads him to warn us against generational generalisations, preferring the descriptor ‘Neomillenial’ for learning styles that have been shaped by emerging technology.

This research aims first to evidence that Web 2.0 and mobile technology usage is increasing with each new wave of students entering higher education and second to verify the hypothesis that Web 2.0 and mobile technology influence students’ learning styles.
3. Web 2.0 and mobility technology

Although the term Web 2.0 seems to indicate the existence of a ‘second generation’ of web technology, there is no ‘date of birth’ of Web 2.0 merely an evolution of features and usage over the years since Tim Berners-Lee invented the World Wide Web (www) in 1989. The term Web 2.0 is associated with O’Reilly media and the year 2004.

In his paper, O’Reilly (2005) argues that Web 2.0 technologies leverage the network (i.e., the Internet) effects and the collective intelligence of its users. The paradigm shift concerns two other aspects: user-generated content – web 2.0 users are both producers and consumers of content – and convergence – web 2.0 services are available on multiple computing platforms increasingly mobile.

Technologies commonly associated with Web 2.0 are: social media, blogs, podcasts, RSS, ratings, wikis, digital content sharing and web services. All of them have been ported from the computer to the new generation of smart.

4. Methodology

The first phase of the research investigates students’ actual use of Web 2.0 and mobile technologies and used a quantitative methodology collecting primary data from a student population.

The research is based upon the questionnaire designed by the Australian team, made available through ‘Creative Commons’ license. Some questions were completed with extra propositions to reflect the evolution of technology, for example: “Use the computer to watch a film”. The questionnaire asked students about the degree to which they accessed and used technology-based tools, how they currently used technology to create and exchange information and knowledge, and their perceptions of how technologies could be used in their studies.

The population consisted of all (318) first semester students. Data was collected through online questionnaires feeding a relational database system. The questionnaires were created using the Survey Monkey web service. The security and privacy of the web service is ensured through an institutional subscription. The web service sent each student a unique survey link through a message delivered by their mail server; each student received a generic email from “IT faculty” with a unique link to the questionnaire. The system then tracked who had responded, who had not responded, who opted out. The system managed responses and automatically selected non respondents to send researcher-initiated reminders; after the initial bulk upload of the students’ emails, the research team had no access to the system’s mailing lists. The web service stored the data and allowed for export in Excel and SPSS formats, consequently, there was no transcription of data that could have generated errors.

In the first phase, the survey was restricted to one campus only. The survey was conducted according to the institute’s code of ethics. Participation was voluntary and students could elect to remain anonymous. The survey was not answered during any class. To guarantee full anonymity, respondents’ email and IP addresses were not stored in the survey.

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3  http://www.surveymonkey.com
97 students (30.5%) filled the survey but only 56 filled it completely. Of the respondents, 54.6% were female and 45.4% male. 98% were between the ages of 17 and 24 with 88.6% between 18 and 21. 40% of respondents come from Western Europe, 26.3% from Asia, 16.3% from Eastern Europe, the rest, 16.9% come from all other regions of the world except Central America.

Though the survey generated a lot more data than analysed in this paper, only the data that matched that published by the Australian team was used. The data was summarised in exactly the same way as that used by the Australian team:

- A percentage of respondents was calculated for each technology (e.g., Use a computer to play games) and regularity of usage (e.g., Once per week).
- A ‘mean regularity’ was calculated by allocating a value to each of the usage frequency, from 0 “not used” to 7 “several times a day” and averaging it across the relevant usage.
- The mean regularity was used as a proxy measure to compare the two surveys.

5. Results

The data tables for the Australian and this research are in Appendix 1. We shall use usage to mean a habitual or customary continued practice and regularity to describe the frequency with which respondents use technology. Table 1 shows the percentage of responses for a series of technologies linked to media manipulation and electronic games.

Except for playing games, the percentage of students in Switzerland who do not ‘use a computer for creating or editing audio and video’ is almost 50% lower and the percentage of students who ‘use a computer to play digital music files (e.g., iTunes) without accessing the internet’ several times a day is almost 50% higher.

The chart in Figure 3 compares the mean regularity of the two surveys. Except for ‘playing games on a console’, the students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; the gap is wider for ‘creating presentations’ and ‘play digital music files’.

For each technology usage, the chart lines have the same contour which indicates that both populations display the same regularity trend; no media and games technology is more popular with students in 2010 than in 2006.
Table 2 shows the percentage of responses for a series of usage of mobile phones. The regularity of usage has increased across all mobile phone usages. The classic usage of mobile phones to make calls, send text messages and take photographs or films have increased less rapidly than other usages. For new usages linked to ‘smart phones’ like ‘Use a mobile phone to access information / services on the web’ or ‘Use a mobile phone to send or receive email’ several times a day, the percentage of students is multiplied by 10 and 20 respectively.

The chart in Figure 4 compares the mean regularity of the two surveys. The students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; the gap widens for ‘use as a MP3 player’: ‘Use a mobile phone to access information / services on the web’ and ‘Use a mobile phone to send or receive email’.

The contours of the curves are divergent over the last four usages linked to the new generation of smart phones whose ownership is unsurprisingly more widespread in 2010 than in 2006.

Table 3 shows the percentage of responses for a series of usage of traditional web technologies. Very low percentages and zeros for lower regularities emerge across all usages except e-commerce, e-banking and web site creation and maintenance. The percentages of multiple daily usages linked to education like accessing a portal or researching information have doubled. The percentages of multiple daily usages for communication have more than doubled.

Figure 5 compares the mean regularity of the two surveys. For e-commerce, e-banking and web site creation and maintenance the students in Switzerland in 2010 display the same regularity of usage as the Australian students in 2006. For all other usages, their regularity is higher.

The contours of the curves are similar, except for streaming audio files over the web. This increase verifies the demise of the traditional music industry and the rise of YouTube-like services.

Table 4 shows the percentage of responses for a series of usage of web 2.0 technologies. More than 75% of students in Switzerland use social networking several times per day this was less than 10% in Australia in 2006. The percentage of students who have never used the web to make a phone call was divided by ten between 2006 and 2010 and that of students who have never used web conferencing or used web to read a RSS feed by four. The percentages of students who have never published a podcast (64.8%), kept their own blog (64.8%), contributed to a wiki (58.2%) remain high in 2010 and have not decreased as fast as other usages (they were 85.2%, 72.6%, and 84.9% respectively in 2006).
Figure 5

Ways in which the traditional web technology can be used

Figure 6 compares the mean regularity of the two surveys. The students in Switzerland in 2010 display a higher regularity of usage than the Australian students in 2006; except for keeping a blog and to a lesser extent publishing a podcast. The gap is particularly wide for social networking, sharing digital content, making phone calls, web conferencing and reading blogs.

The contours of the curves are quite different, which demonstrates that some web 2.0 technologies have been adopted exponentially since 2006; social networking in particular.

Figure 6

Ways in which Web 2.0 technology can be used
6. Discussion

From the above comparison we can infer that students at our institute have developed their usage of technology in two main areas: communication and information consumption.

The development of communication is evidenced in mobile technology by the increase in usage to call, send text messages, but especially send/receive emails. In web technology, this is evidenced by increased usage of sending/receiving emails, chatting, social networking, web conferencing and phoning.

The development of information consumption is supported by the increased use of computers, mobile phones, together with the web to play and share digital content and access information.

The results of this research demonstrate a substantial increase in adoption of those Web 2.0 technologies used for communicating. We can say that, in 2010, when students leverage the network effects, it is predominantly for social usage and when they leverage the collective intelligence of the web, it is for their own consumption.

Indeed, except for creating presentations, students are not displaying practices of content generation which is a main feature of Web 2.0. On the other hand, their mobile phone usage for email, personal organisers and access to information, illustrate how they are taking full advantage of convergence.

The above conclusions are supported by the answers students made to the question “Please list 3 ways in which you think the technology that you use in your everyday life could be useful in your studies?”

7. Conclusion

The Australian team concluded that, in 2006, students from the “Net generation are not big users of Web 2.0 technologies” (Kennedy et al., 2007). However, in 2010, the empirical evidence demonstrates that they can be big users of some of the Web 2.0 technologies. Indeed when a large percentage of students use some of the technologies several times a day, it could be inferred that those technologies have become part the students’ life style.

N-geners have been known to associate fun with learning because of technology (Tapscott, 1998) and ubiquitous Internet and cell phones are influencing behavior, development and learning attitudes (Tapscott, 2008). The extensive use of Web 2.0 and smart phones evidenced by this research indicates that these have become embedded in the life styles AS WELL AS the learning styles of the students and that educators need to adapt accordingly.

In 2002, John Seely Brown said “Now, with incredible amounts of information available through the Web, we find a ‘new’ kind of learning assuming pre-eminence-learning that’s discovery based. (....).” Indeed, Web surfing fuses learning and entertainment, creating ‘infotainment’. This research confirms that they are primarily information consumers, motivated by convenience and communication (Kvavik et al., 2004). Although Lorenzo and Dziuban (2006, p. 3) posit that Net-geners blend skills to create and consume information, this research challenges the notion that they are creators of information.

Referring to Marton and Säljö (1976) and drawing from simple classroom experience, faculties at our institute would agree that the students web surfing practices tend to induce a surface-level learning process, whereas the teachers’ desired outcome would lean towards deep-level learning processes. In the next stage of this research, the team will use statistical analysis to explore the link between technology and learning styles. It would be particularly useful to discover what factors are preventing students from becoming content generating users when, at the same time, they are adept at sharing digital content. Other factors like the specificity of the student population and its homogeneity will also be explored.

The survey will be run again in the first semester of 2011 on another population of first semester students on one campus but we plan to revise the survey to achieve a much higher completion rate while maintaining data comparability. In the future, the same survey will be conducted at other campuses in sister schools and we plan to carry on observing the evolution of students as they move from semester to semester.
8. References


Appendix 1: Summary data tables of ways in which technology can be used (in % of respondents)

<table>
<thead>
<tr>
<th>Australia 2006 = A</th>
<th>Switzerland 2010 = S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use a computer to manage or manipulate digital photos/images (e.g. using Photoshop, GIMP ...)</td>
<td>3.9</td>
</tr>
<tr>
<td>Use a computer for creating presentations (e.g. PowerPoint)</td>
<td>1.5</td>
</tr>
<tr>
<td>Use a computer for creating or editing audio and video (e.g. iMovie, Movie Maker)</td>
<td>1.4</td>
</tr>
<tr>
<td>Use a computer to play digital music files (e.g. iTunes) without accessing the internet</td>
<td>35.8</td>
</tr>
<tr>
<td>Use a computer to play games</td>
<td>8.0</td>
</tr>
<tr>
<td>Use a games console to play games</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Table 1: Media and games
| Use a mobile phone to call people | Australia 2006 | A | Switzerland 2010 | S | Missing/not used | A | S | A | S | A | S | A | S | A | S | A | S |
|----------------------------------|----------------|---|------------------|---|------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
|                                  | Australia 2006 | A | Switzerland 2010 | S | Missing/not used | A | S | A | S | A | S | A | S | A | S | A | S | A | S |
| Several times per day            | 54.6           | 74.1 | 15.2            | 13.0 | 14.9            | 9.3 | 5.8 | 1.9 | 2.5 | 0.0 | 1.2 | 1.9 | 0.5 | 0.0 | 5.4 | 0.0 |
| Once per day                     | 67.0           | 83.3 | 10.5            | 5.6 | 10.3            | 7.4 | 3.2 | 0.0 | 1.9 | 1.9 | 0.9 | 0.0 | 0.5 | 0.0 | 5.6 | 1.9 |
| Use a mobile phone to text / SMS people | 15.0  | 22.2 | 5.9             | 27.8 | 14.2           | 25.9 | 14.6 | 11.1 | 14.2 | 7.4 | 4.7 | 1.9 | 3.5 | 0.0 | 27.9 | 3.7 |
| Use a mobile phone to take digital photos or movies | 7.8  | 14.8 | 3.7             | 7.4 | 8.0             | 22.2 | 9.3 | 5.6 | 12.9 | 14.8 | 8.5 | 14.8 | 5.1 | 3.7 | 44.7 | 16.7 |
| Use a mobile phone to make video calls | 3.1  | 7.5  | 1.0             | 0.0 | 2.3             | 5.7 | 2.8 | 7.5 | 3.7 | 3.8 | 3.9 | 5.7 | 5.4 | 3.8 | 77.9 | 66.0 |
| Use a mobile phone as an MP3 player | 7.1  | 25.9 | 2.5             | 11.1 | 5.2             | 14.8 | 5.5 | 13.0 | 4.6 | 3.7 | 3.7 | 5.6 | 4.4 | 0.0 | 66.9 | 25.9 |
| Use a mobile phone as a personal organiser (e.g. diary, address book) | 13.0 | 29.6 | 8.5             | 11.1 | 11.7            | 11.1 | 8.9 | 5.6 | 8.3 | 9.3 | 4.0 | 1.9 | 3.3 | 0.0 | 42.2 | 31.5 |
| Use a mobile phone to access information / services on the web | 3.2  | 35.2 | 1.9             | 9.3 | 3.1             | 14.8 | 4.2 | 5.6 | 4.5 | 5.6 | 5.1 | 1.9 | 6.7 | 0.0 | 71.4 | 27.8 |
| Use a mobile phone to send or receive email | 2.7  | 44.4 | 0.7             | 3.7 | 1.5             | 11.1 | 2.0 | 1.9 | 2.3 | 3.7 | 2.8 | 1.9 | 5.8 | 0.0 | 82.2 | 33.3 |
Table 3: Traditional web

<table>
<thead>
<tr>
<th>Use the web to access a portal, ‘Course or Learning Management System’ (e.g. Moodle ...)</th>
<th>Australia 2006 = A</th>
<th>Switzerland 2010 = S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Several times per day</td>
<td>Once per day</td>
</tr>
<tr>
<td>Use the web to access a portal, ‘Course or Learning Management System’ (e.g. Moodle ...)</td>
<td>14.2</td>
<td>29.1</td>
</tr>
<tr>
<td>Use the web to look up reference information for study purposes (e.g. online dictionaries/databases)</td>
<td>14.4</td>
<td>30.4</td>
</tr>
<tr>
<td>Use the web to browse for general information (e.g. news, holidaying, event timetables)</td>
<td>23.0</td>
<td>47.4</td>
</tr>
<tr>
<td>Use the web to listen to sound recordings (e.g. via streaming audio, iTunes or YouTube)</td>
<td>10.8</td>
<td>65.5</td>
</tr>
<tr>
<td>Use the web for other pastimes (i.e. for leisure activities like films or music)</td>
<td>22.3</td>
<td>41.1</td>
</tr>
<tr>
<td>Use the web to buy or sell things (e.g. eBay, Amazon, air tickets)</td>
<td>2.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Use the web for other services (e.g. banking, paying bills)</td>
<td>4.1</td>
<td>5.5</td>
</tr>
<tr>
<td>Use the web/internet to send or receive email (e.g. Hotmail, Yahoo, Outlook)</td>
<td>38.0</td>
<td>88.9</td>
</tr>
<tr>
<td>Use the web/internet for instant messaging/chat (e.g. MSN, Yahoo, ICQ)</td>
<td>26.8</td>
<td>62.3</td>
</tr>
<tr>
<td>Use the web to build and maintain a website</td>
<td>3.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Use the web to share photographs or other digital material (e.g. using Blinklist, Flickr)</td>
<td>A</td>
<td>S</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Use the web to make phone calls (e.g. VoIP using Skype)</td>
<td>3.0</td>
<td>31.6</td>
</tr>
<tr>
<td>Use the web to comment on blogs or vlogs</td>
<td>3.6</td>
<td>11.3</td>
</tr>
<tr>
<td>Use the web to contribute to the development of a wiki</td>
<td>1.5</td>
<td>1.8</td>
</tr>
<tr>
<td>Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)</td>
<td>0.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Use the web to download and/or share MP3 files (e.g. music, videos)</td>
<td>9.9</td>
<td>16.4</td>
</tr>
<tr>
<td>Use the web to share photographs or other digital material (e.g. using Blinklist, Flickr)</td>
<td>3.7</td>
<td>13.2</td>
</tr>
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<td>9.9</td>
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</tr>
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<td>Use the web to publish podcasts (e.g. using Podifier, Podcaster, PodProducer)</td>
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<tr>
<td>Use the web to download and/or share MP3 files (e.g. music, videos)</td>
<td>9.9</td>
<td>16.4</td>
</tr>
<tr>
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<td>3.7</td>
<td>13.2</td>
</tr>
<tr>
<td>Use the web to make phone calls (e.g. VoIP using Skype)</td>
<td>3.0</td>
<td>31.6</td>
</tr>
<tr>
<td>Use the web to contribute to the development of a wiki</td>
<td>1.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>
Abstract

A preliminary study was carried out of primary pre-service teachers (PPSTs) professional problem solving styles (PPS). This is defined as cognitive or learning styles applied in practice while problem solving. PPS were deduced from male and female PPSTs using semi-structured interviews and professional problem solving scenarios. Analysis of transcripts of semi-structured interviews and problem scenarios revealed that all PPSTs in a first cohort used verbal reasoning, experiences from lectures, pre-service observations of school teachers and biographical experiences, for example of school and problem solving strategies (learning approaches and learning preferences) to solve scenarios. Generally, all scenarios were spoken about more elaborately where PPSTs had the most experiences. Solution generation were multiple in these cases. All students defined problems, gathered information about them and critically analyzed each when deciding upon courses of action. They broke scenarios down by analysis and used brainstorming as well as visualization of experiences to achieve solutions. PPSTs were consistent in usage of styles across scenarios. By using the CSA (cognitive styles analysis) as another method of gathering data about cognitive styles it is clear that PPSTs are mainly Intermediate – Imagers and according to Riding (1991) they have professional thinking styles related to this categorization. In this case, the conclusion reached is that it is justified to use CSA results as supplementary to semi-structured interviews and vice versa in order to gain a broader understanding of the PPS of PPSTs.

Keywords: primary pre-service teachers, cognitive styles analysis (CSA), semi-structured interviews, mixed methods, professional problem solving styles

1. Introduction

Cognitive and learning styles have been investigated over a number of years and have an important role to play in education. My interest focuses on how a measure of styles, the Cognitive Styles Analysis (CSA) can predict professional problem solving styles and how cognitive styles and or learning styles are related to professional problem solving behaviour and thinking. I investigated styles using professional problem solving scenarios which Post-graduate Certificate (PG.Cert) primary pre-service teachers may face in a professional context. These scenarios were a selective group of professional problem solving situations.

The PG.Cert course is structured to equip PPSTs with skills necessary to teach the age ranges of 5-11 years. A pre-requisite of this course is that PPSTs should have recent experience of primary education at state schools and this may be either on a voluntary basis or as a paid teaching assistant. Through school based practice of sixteen weeks, PPSTs study professional issues and this includes working with parents, responsibilities of teachers and personal tutoring. A QTS (qualified teacher status) skills test is taken by all PPSTs and this is in Literacy, Numeracy and Information and Communications Technology and is required by the Training and Development Agency for schools. Also at university, PPSTs study cross curricular approaches, investigating professional practice as well as learning, teaching and assessing the primary curriculum.

Often, teachers are aware that differences exist between people in terms of how they think, perceive, represent and manipulate information. People learn in different ways. Early research into individual differences...
commenced with Galton (1973) who developed a battery of sensory, motor, reaction time and memory tests. He found no relationship with the results of these tests and education and types of occupation individuals entered into. Other early research was conducted by Witkin and Ash (1948a; 1948b) in the area of perception. They identified the field-independent/field-dependent dimension of cognitive styles and linked this to problem solving. They argued that proficiency at disembedding shapes and objects from their background was associated with competence at disembedding things in problem solving tasks. These tasks may either be socially derived and involving the processes of distinguishing things against a social milieu; or they may require completion by physically manipulating items, for example, simple puzzles. This research developed interest in styles research and by 1988 Entwistle identified that cognitive styles were described in nineteen different ways and researchers identified bipolar dimensions. For example, individuals may lie at either end of the field independent or field dependent dimension. This will indicate the extent to which his or her perceptions are dependent or independent of cues in the environment. How researchers came to view styles was influenced by this early work in perception. For example, Knox (1977) defined cognitive styles as the individual’s typical modes of information processing as he or she engages in perceiving, remembering, thinking and problem solving.

Riding and Rayner (2005) explained that between 1940 and 1980, researchers worked in isolation from one another and investigated what they considered to represent style dimensions. A large variety of labels emerged which researches such as Miller (1987), Riding and Buckle (1990) and Coffield et al. (2004) suggested were different conceptions of the same dimension. Riding and Rayner (1998) suggested that many of the labels reflected single experiments and were not substantiated by empirical work. There was a lack of agreement over basic terminology and a fragmented understanding of the nature of style emerged. However, broader definitions of styles materialized. For example, Zelniker (1989) described cognitive style as a preferred approach to problem solving that characterises an individual’s typical behavioural tendencies across a variety of situations and content domains. But, Saracho (1997) reported that cognitive styles may influence a person’s response in different situations and identifies the person’s behavioural traits in terms of perceptual, social and intellectual activities. These traits indicate how the person understands, remembers, makes judgements and problem-solves. Cognitive styles define types of strategies used by people to problem-solve. These definitions identify styles as being linked with personality, perception and intelligence and this may make it difficult to specify style applications in the educational contexts.

However, the activity-centered theories specified by Sternberg and Zhang (2001) identify styles are concerned with action rather than cognition or personality. Solving a problem constitutes an action. Their theories focus on activities people do, such as teaching. But, according to Sternberg and Zhang (2001) the activity-centered approach does not have a clear definition of style. This approach does not specify how style is developed or if it is possible for a teacher to modify the learning styles of their students (Kolb, 1978; Henson and Borthwick, 1984). In comparison, the cognitive-centered and personality-centered theories consider the development of style in relation to intellectual and personality development. Later developments include that of grouping styles into two broad dimensions and these are Verbal-Imagery (V-I) and Wholist-Analytic (W-A).

Riding and Cheema (1991) grouped thirty style labels into the two dimensions. The (W-A) dimension refers to an individual’s preferred methods of organising new information for example, impulsivity-reflectivity and this is a tendency to look for single outcomes in problem solving against the tendency to consider multiple possibilities (Guilford, 1967; Hudson, 1966, 1968). Measures assess whether an individual tends to organise information into wholes or parts. The (V-I) dimension describes the extent to which individuals represent knowledge in mental pictures or in words (Paivio, 1971; Riding and Calvey, 1981). For example, (V-I) describes the extent to which verbal or visual strategies are used to represent knowledge and in thinking (Richardson, 1977; Riding and Taylor, 1976). This is an important step in styles research because researchers identified thinking, learning and social behaviours arising from the broad groupings of V-I and W-A dimensions. In particular, using categories of the dimensions allows me to investigate how PPSTs problem-solve in the social contexts of education.

The CSA was developed as a result of the assimilation of previous research in the areas of learning and task problem solving. Riding and Cheema (1991) devised the computer based assessment to measure the W-A and V-I dimensions of cognitive style. I propose that once cognitive styles are measured, selectors of teachers to higher education can use such information with school grades to direct their applicants accordingly. Styles therefore are imperative for choosing as well as establishing suitability for an occupation. Riding and Rayner (2005) grouped occupations along W-A and V-I dimensions. Such occupations will have individuals
who are experiential learners and will build teams and delegate. For example Analytic - Verbalisers, bimodals (bimodals tend to use either the verbal or imagery modes of depiction) and imagers can be supervisors, clergies or senior fire service staff. But, Wholist-Bimodals may be architects while Wholist-Imagers tend to be computer operators. In contrast to wholists and analytics, Intermediate - Bimodals and Intermediate-Imagers can be either musicians or bank employees. Additionally, Intermediate-Imagers can also become nurses or café and motel staff. However, Riding and Rayner (2005) have not placed any details regarding the styles of primary school teachers in their model of occupational cognitive styles.

Another influential style model is based on the learning process which Kolb (1984) formulated as structured from experiential learning. Perception is grouped into either concrete or abstract thinking and either active or reflective processing. Kolb’s model led to the development of the Learning Styles Inventory (Kolb, 1999). This measure however tends to regard styles as common among individuals rather than there being individual differences. On the other hand, the CSA tends to treat people more as individuals with particular cognitive structures rather than as groups (Coffield, et al., 2004). This is important because this preliminary investigation reported asks about individuals PPSTs cognitive styles. The CSA also considers individuals as part of the social structures they find themselves in. It therefore identifies aspects of individuals’ personality as being influential in problem solving.

Although, Riding and Rayner (1998) showed that the CSA is a valid test, it is one where there are negative issues surrounding the reliability of the V-I dimension (Coffield, et al., 2004; Peterson, et al., 2003). Evans and Waring (2009) in particular, discussed that the distinction between verbal and non verbal processing is not easily made. In support of this view Geake (2008) and Kozhevnikov (2007) reported that neuroscience literature views thinking as the combination of the verbaliser and imagery dimensions.

Consequently, researchers’ question whether the V-I component of the CSA should be used in educational settings. Further Evans and Waring (2009) implies that it would not always be appropriate to use extreme of style to develop pedagogical practice because styles at the farthest ends, that is Analytic-Verbaliser/ Analytic-Bimodal and Wholist-Bimodal / Wholist-Imager will not identify learning needs which are of extreme cases in the classroom. In this case Evans and Waring contend that most people do not have extreme types of styles as measured by the CSA.

Given these various arguments against the use of the CSA in the educational context, this paper outlines a first level of investigation using semi-structured interviews to deduce professional problem solving styles.


This paper discusses how problem solving styles and strategies contribute to suitable problem solving practice in the professional context. It further discusses other aspects such as the influence of PPSTs beliefs, experiences and biographies on professional problem solving styles. In this context PPS refer to those cognitive/learning styles applied in practice, that is while teaching and problem solving.

2. Rationale

My arguments are based on a number of assumptions:

Students are selected for primary school teacher training in higher education by a number of factors. Interviewers have a priori knowledge of the personal and intellectual qualities which teachers should possess. It is assumed that those who are chosen to study to be teachers are the “right” candidates for the workplace. But how far can we be certain that those who choose to be teachers will perform to a standard required in the classroom and generally at school. Students may enter the higher education process with poor problem solving skills or may not be able to adapt and cope with the range of tasks which face them at school. Teachers should be equipped with the necessary skills to deal with the styles of their students. They might find it useful to use cognitive styles research findings in their day to day problem solving activities at school. Those teachers, who do not possess cognitive styles which are adaptable to the classroom environment, could be taught useful problem solving strategies. But, there is a distinction between styles and strategies. For example Messick (1984) considered that styles imply a general orientation to task situations, while strategies are geared to types of tasks and situations. Such strategies could be adopted by teachers who do not have readily available skills at their disposal.
The argument I propose is that teachers can be observed to solve tasks using strategies which are the result of their styles or most used cognitive styles. Cognitive styles have important parts to play in teacher education. Specifically, it is important to understand the cognitive styles of teachers because they teach an age range whose pupils are at important stages of their intellectual development. For example, Tzuriel (2000) described mediated learning experience (MLE) as an approach which allows teachers to interact with students so as to enhance their development in learning. It is a process which allows cognitive flexibility and encourages academic achievement. The teacher will interpose themselves between a set of stimuli and the child. The more MLE the child receives the more he/she will be able to learn from direct exposure to formal and informal situations.

It is important that both teachers and students are aware of their styles. This will help their own leaning agendas as well as their students. They should also be responsive to the styles of their students and should intervene to enhance their learning. The aim of my research is that students are selected to become teachers because they can improve the quality of their student’s education. Pettigrew and Buell (1989) discussed that students should be given the opportunity to learn and develop to their potential.

It is my aim to gain insight into the range of styles PPSTs use and if it is possible to design teaching to develop problem solving strategies. These may be evaluated to deduce if they are feasible in the workplace. In particular, I intend to establish that styles research is important in teacher education; in so far, that it may help teachers’ professionalism. Styles research may also help those responsible for the selection of teachers. The styles of successful teachers could be used as a foundation to map those of new applicants.

3. Objectives of Research

In particular, the purpose of the research is to investigate the area of cognitive styles which are relevant to primary teacher training that is professional problem solving styles. The long term aim of such research is to produce adaptable and competent teachers who can cope with a range of problem solving situations. Specifically, this paper addresses the following:

Identify the semi-structured interview and the CSA as important tools in gaining access to cognitive and learning styles as well as learning approaches (strategies) in professional problem solving.

4. Research Methodology

The research reported in this paper takes a mixed methods approach. Creswell (2009) explained that mixed methods procedures involve the use of qualitative and quantitative approaches. Both qualitative data from semi-structured interviews (appendices 1 and 2) and from a second cohort of PPSTs, quantitative data was collected from the CSA. This investigation follows a sequential exploratory design (Fig. 1) where data collection and analyses of semi-structured interviews are followed by data collection and analyses from the CSA.

Figure 1: Sequential Explanatory Design

Note: Adapted from Creswell et al. (2003)
The research also takes a concurrent triangulation design

**Figure 2: Concurrent Triangulation Design**

Initially, a cohort of three females and three male PPSTs from a university initial teacher education provider were interviewed about their classroom observations and general problem solving experiences. All were presented with three professional scenarios to solve and a second semi-structured interview examined PPS related to this presentation. All scenarios were created around the knowledge required for QTS. A second cohort of one hundred and five PPSTs completed the online exercise CSA. The results of this paper adopts a grounded theory approach because there is comparison between male and female PPSTs views as well as between data derived from the semi-structured interviews as well as CSA results (Strauss and Corbin, 1990).

All students were informed of their ethical rights to withdraw from the investigation. This took the shape of PPSTs being informed verbally as well as in writing before completion of the CSA as well as asking all participants to sign and date an ethics consent form before interviews. All participants mentioned in this investigation have pseudonyms.

### 5. Results and Discussion

This discussion applies to both males and females. This preliminary investigation found no significant differences in PPS between males and females. For each PPST problem-solving styles were consistent across scenarios.

**SCENARIO ONE**

You find out that your school is falling behind in the league tables for the subject you teach. How would you use these statistics to develop teaching in your subject?

**SCENARIO TWO**

A girl in your class looks withdrawn and is often late for school. Her work is poor and she is from an ethnic background different from yours. How can you help her to become more adaptable at school?
These scenarios were constructed to pose a challenge to PPSTs and so could be seen as problems. Themes arose from analyses of interviews and this related to PPS and scenario completion.

PPSTs saw the scenarios as problems and they approached the problems with solutions. All PPSTs used verbal reasoning - that is, scenarios were either broken down step by step or were thought of as involving multiple ideas where only one solution is required. PPSTs used information from lectures and observations at school to solve scenarios. But this was less evident with scenario one mainly because PPSTs had no experience of the use of statistics. All PPSTs defined problems and gathered information about them when deciding upon strategies for solution. PPSTs would also tend to use experiences of their school days (for example, scenario three - Lucas).

Considering scenario three, Lucas reflected:

‘I was kind a thinking back to my own school days…it was the fear of punishment rather than the motivation of reward/but actually the motivation of reward is much better thing like because it gets them enthusiastic. Maybe/talk to them and listen to them and if you feel/there is an area you can improve upon yourself in your teaching methods/then that’s a good thing’.

But, only in real life situations would students evaluate and implement solutions. Generally, students had more experience with problem three and were happy to speak about problem two, because they have seen similar scenarios in the past. All PPSTs had least experience with problem one, but were able to generate possible solutions using problem solving heuristics.

All PPSTs identified steps they would take to help the pupil in scenario two become more comfortable with school life. This scenario indicates strategies of problem solving of PPSTs, as well PPS. Harvey explained:

‘I think I would solve problems by talking with someone else. I would always go for advice. I might think I approach something in this way but until I am in that situation and the situation may be slightly different/of course that’s going to affect how I approach a problem. There is a goal that you are looking for/but the goal would be for the two boys to behave better and the girl could come out of her shell more’.

‘It depends on the situation/the environment’. In this case talking to someone is a person in authority and Harvey sees himself as a learner who can adapt to different situations. PPSTs were reflective and showed they had strategies of dealing with scenario two.

PPSTs identified the genuine problem and gathered information, not only by speaking with individuals who were familiar with the kinds of things embedded in the problem but also perhaps saw similar problems first-hand in school.

Olivia said:

P- ‘I was reflecting on what I’ve seen other teachers doing/that’s how I tried to solve the problems. I was trying to think of the closest example I could in a natural school/that I could relate to each one of the problems/that’s how I problem-solved’.

Billy commented:

‘The teachers I observed were all very experienced. They were implementing very good behavioural strategies and the lessons clearly had a defined introduction/main activity and plenary. There is nothing I could see that should be done differently’. This PPST would ask for advice about the problems he faces from those in authority, for example, the head teacher. He also tends to deal with all classroom problems using his instincts, stra-
ategic planning and or analyses. So while some problems require to be confronted immediately others may need reflective thinking.

PPSTs may put themselves in the other person’s shoes (the pupil’s) and try to see what things should be like (O’Connell, 2008).

Lucas pointed out:

‘I didn’t have any criticisms of what I observed’. In terms of classroom management techniques he agreed that ‘her teaching methods worked very well’. He could improve on what was observed ‘every child is different/and has different learning needs. But, maybe there are alternatives that certain students would respond to better/in terms of…visuals or…auditory stuff’.

Although the semi-structured interview elicited some information about PPS it is evident that it did not elicit everything about the PPS of PPSTs. A second cohort of one hundred and five PPSTs revealed that twenty-four PPSTs were Intermediate-Imagers while three were Analytic-Bimodals and another three were Wholist-Bimodals. Other categories measured by the CSA were similar in counts. However, it can be concluded that only by using a combination of semi-structured interviews and the CSA can enough information be gathered of the kinds of PPS available to PPSTs and how to best take advantage of these.

6. Conclusions and Implications

This preliminary investigation revealed that although it is possible to identify some strategies and styles in the processes of professional problem solving, it is impossible to give greater details regarding the many other PPS which PPSTs may possess. The CSA tends to provide other details of the PPSTs thinking and this involves many elements of the PPSTs professional discourse such as those of team building. In such cases it is possible to provide views of the effectiveness of cognitive styles in the professional contexts.

Generally, students had more experience with problem three and were happy to speak about problem two, because they have seen similar scenarios in the past. All PPSTs had least experience with problem one, but were able to generate possible solutions using problem solving heuristics. Experiences tended to define differences between problem-solvers rather than the nature of the scenarios presented to PPSTs. If PPSTs used analysis and imagery to arrive at solutions, then they would also use these styles to solve the other two scenarios.

Further research involves using all categories of the CSA and semi-structured interviews to delineate PPS and the effects of experiences on these.

7. References


Appendix 1

INTERVIEW -1

I would like you to answer a few short questions. Please ask me to clarify anything which you do not understand.

Classroom Observations and Other Work

1. Can you tell me about the sorts of work you did in the past, especially any observations of children?
2. What attracted you to the teaching profession?
3. Where did you do your classroom observation?
4. What year groups did you observe?
5. Can you describe the teacher’s classroom management techniques?
6. Do you agree with her methods?
7. Did you observe any use of league table data during your placement?
8. If yes, what do you think about the way the school or teacher used the data to inform his/her teaching?
9. Did you observe the teacher helping students? If yes, what did he/she do?
10. How could you improve on what you observed?

About Problem-Solving

1. What kinds of problems have you encountered or think you might encounter with young children?
2. Using one of the examples how did you or would you tackle it?
3. Are there other ways you might solve a problem like this?

Appendix 2

INTERVIEW -2

About Professional Problem-Solving

1. What experiences did you bring to the problem situations?
2. Do you normally solve problems in these ways?
3. Is problem solving peculiar to specific situations?
4. Are you aware of how you thought the problems should be solved?
5. Did you make any mental plans to solve the problems?
Learning Patterns and Study Success of Bachelor of Pharmacy Students

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Abstract

The Bachelor of Pharmacy curriculum in our University was changed extensively a decade ago (Koster et al., 2009). Completely new integrated courses were developed and new educational methods (problem- and project-based) were implemented. It is unclear whether the new curriculum challenges the students to use learning approaches, which are desirable in an academic environment. Therefore, we decided to investigate the relationship between the learning pattern of students and their study success in all eight first-year courses. Learning approaches were characterized with the Inventory of Learning Styles, which can be used to detect meaning-directed, application-directed, reproduction-directed and undirected learning patterns of students (ILS; Vermunt & Vermetten, 2004).

First-year students (three cohorts) were asked to complete the ILS (120 items, scored on 5-point Likert scales) in March 2006, March 2007 and March 2009, respectively. The questionnaire assesses learning strategies, conceptions of learning and learning orientations on 20 different scales. For 490 students the ILS-data could be linked to their study results, obtained from the registrar’s office. The relationship between course success (dependent variable: pass or fail) and scores on the ILS-scales (used as independent variables) was investigated by logistic regression (Norman & Streiner, 2000). Statistically significant (p < 0.05) positive or negative effects were calculated as odds-ratio’s (OR). The OR represents the change in ‘risk’ of passing a course when the score on the ILS-scale is increased by one unit. TwoStep cluster analysis was used to see whether subpopulations of students could be distinguished based on their learning patterns. All analyses were done with SPSS, version 16.

Statistically significant OR’s > 1.5 were found for the scales ‘relating and structuring’ in seven out of eight first-year courses. This indicates that the success rate in these courses is enhanced for students, who score relative high on this scale. On the other hand, OR’s < 0.6 were found for the scales ‘external regulation’, ‘lack of regulation’ and ‘ambivalent study orientation’ in 4 to 8 courses. Students, who score relatively high on these scales, have a lower success rate in these first-year courses. Cluster analysis indicated that 5 different student subpopulations could be distinguished, which can be characterized as having meaning-directed (15%), application-directed (28%), reproduction-directed (27%), application-undirected (13%) and reproduction-undirected (17%) learning patterns. The latter two categories are less successful in all first-year courses than the other three categories. Relating and structuring knowledge, building a knowledge base and a strong personal interest are usually considered desirable characteristics for academic students, while a strong dependence on memorizing, external regulation and an ambivalent orientation towards the choice of study is considered less desirable.

The result of this study indicates that the first-year courses of the new Pharmacy curriculum positively select for student who demonstrate desirable approaches to learning, while students using less desirable approaches have decreased chances of passing first-year courses.

Keywords: Pharmacy, Learning Pattern, Study Success, Inventory of Learning Styles

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The Future Evolution of Mobile Devices and Consequent Implications for Learning Environments, Enterprise and Academy

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Abstract

What type of growth is likely within the mobile devices industry, and what issues are most likely to arise, in the next five to ten years? The mobile industry has evolved at breath-taking speed within the last few years (Mobile Europe, 2009), (Reisinger, 2010), (ADO Strategies, 2010). The popularity of smartphones, (and mobile phones in general), precludes any reasonable discussion of styles in their use. Styles as an issue has been over-shadowed by more dominant issues, such as size, sensitivity, battery size, ease of use in a multi-modal device which is in use visual, aural, oral, and textual at least and often simultaneous in these modes. Users are prepared to overlook the limitations of these devices in pursuit of communication, connectivity, productivity, creativity and entertainment. This growth in mobile device usage has implications for learning and collaboration both within the enterprise and the academy.

The Delphi technique is one method used to attempt to forecast the future in technological areas (Rowe & Wright, 2001), (Hsu et al., 2007) and is used in analysing mobile industry issues, which entails iterative surveys with a group of industry experts (n = 13). A preliminary Round 0 was run with a small group of experts to set the parameters for the Round 1 Questionnaire. The Round 1 questionnaire was used to provide questions of interest based on issues that have arisen in the literature and others considered pertinent, and that were considered to be of prime importance in the evolution of the mobile industry. This was followed by the Round 2 questionnaire, focussed by the Round 1 questionnaire.

The findings from the two rounds of questionnaires compiled by the industry experts were: the prime growth area within the industry will be mobile data usage, where the connectivity and data usage of the average consumer looks set to soar. A number of key services will emerge on the back of this, with mobile applications, m-commerce, mobile advertising, cloud-based services and online multimedia usage the highlights. Mobile devices will continue to evolve rapidly with interesting innovations predicted over the coming years. The infrastructure around mobile technology is also expected to evolve rapidly, where mobile networks in particular, will have to expand rapidly to supply the ever-increasing demands of the consumer. The other major growth areas in the next 10 years will be Data-based growth, Mobile applications (Apps), Mobile devices, Infrastructure, Security, Advertising, Mobile Commerce (M-commerce), Regulation & Standardisation, and Cloud-based services. These mobile devices can increase student-teacher and student-student engagement, bring services and office hours on-line, remove physical and geographical constraints to learning, and provide a more intuitive and accessible collaborative technology than what has been available up to now. There are, however, disadvantages which are explored. The limitations of the Delphi approach and the study are discussed.

Effective application of mobile devices to Learning, via Education and Training, both organisational and personal, remain a major challenge. This expansion of the power of mobile devices raises the question as to whether styles are of as much consequence any longer in the use of these devices. With modern mobile devices, which are increasingly multimodal (text, imager oral, aural, photos, video interactions), it is arguable that in a learning situation, a user may use many modes simultaneously, so cognitive and learning styles have effectively been de-emphasised by the growth of technology. New mobile devices will cause a number of dimensional shifts within the learning environment.

Keywords: Styles, Delphi study, Mobile devices, Smartphone, Mismatching hypothesis

1. Introduction

Mobile technologies provide much more than the traditional voice and messaging services. Increased access to the online world has now made the personal mobile device a tool for use in everyday life, from accessing practically infinite amounts of information, providing location information, multimedia, supporting the social

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media phenomenon, enhancing learning education and training, both organisational and personal, and much more.

This research attempts to forecast areas of growth and expansion within mobile technology over the next five to ten years. In particular:

- What will be the main growth areas in mobile technology in the next decade
- What are the barriers to the continuing growth of mobile technology and how will these barriers be overcome
- How will this growth in mobile technology and applications affect learning (personal and organisational (including education and training)).

2. The Delphi Method

The Delphi Technique is a widely used technique in carrying out research in the area of technological forecasting. It was developed by Dalkey and Helmer (1963) at the Rand Corporation in the 1950s and is a widely used and accepted method for achieving convergence of opinion concerning real-world knowledge solicited from experts within certain topic areas (Hsu et al., 2007). Originally, the technique was developed to deal with technological forecasting issues, and has since been widely used for supporting judgmental forecasting and decision making in a variety of domains and disciplines (Rowe et al., 2001).

The technique itself involves a number of important points, which include:

- The research is carried out using subject experts.
- All the research carried out in the Delphi process is anonymous, thus minimising the affects certain group interactions like groupthink, specious persuasion, herd and bandwagon effects can have on the data (Postma et al., 2006); participants in a group can be seen to rally to the majority opinion (Nadeau et al., 1993), regardless of their own opinion on the matter.

The Delphi process is an iterative one, meaning there needs to be two or more surveys carried out with the research respondents. The aggregated output of each stage is fed into the input for the succeeding stage. An online survey was used for both rounds of questionnaires carried out in the research. The advantages an online survey possesses are i. its low cost, ii. the sample being used can be geographically dispersed, and iii. the time taken between survey creation, collection and analysis is short in comparison to other methods.

An initial, brief prototype questionnaire (based on a Literature Review, and other issues which arose as being pertinent) was used to test the feasibility, answerability, viability and usefulness of the questions (this was tested on four respondents and could be regarded effectively as Round 0). Round 1 of the survey involved getting the unbiased opinion of each of the participants on their opinion on various subjects relevant to mobile technology.

Ideally, the first round of a Delphi process consists of an open-ended questionnaire. This serves as the cornerstone for soliciting specific information about a content area from the Delphi subjects (Custer et al., 1999). It is necessary to provide this type of open-ended questionnaire as it ensures that the information garnered from the participants is their own unbiased opinion. Without this open-ended nature of the questionnaire, there can be a danger that the researcher’s opinion and agenda could enforce or bias the participant’s feedback (Hsu et al., 2007). The main themes that emerged from this Round 1 analysis were (in order of importance):

1. Mobile Applications
2. Devices
3. Infrastructure
4. Security
5. Advertising
6. Mobile-commerce (m-commerce)
7. Regulation/Standardisation
8. Cloud-based services
The questions that arose in this Round 2 survey were deduced from the output transcripts of Round 1, where the prominent themes were extracted from the transcripts and analysed for common and opposing viewpoints.

3. Research findings

One of the opening questions to the second survey was to rate the Round 1 themes in order of importance (a lower value is more important). The results are outlined in Table 1.

| Table 1: Round 2 Survey Response - Top Rated Mobile Topics |
|----------------------------------|---|---|---|---|---|---|---|---|
|                                  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean Rating |
| Mobile apps                      | 4 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 2.00         |
| Devices                          | 3 | 0 | 0 | 6 | 1 | 0 | 0 | 0 | 3.20         |
| Infrastructure                   | 1 | 3 | 3 | 0 | 2 | 0 | 1 | 0 | 3.30         |
| Security                         | 1 | 1 | 3 | 0 | 2 | 2 | 0 | 1 | 4.20         |
| Advertising                      | 0 | 0 | 2 | 2 | 1 | 1 | 2 | 1 | 5.22         |
| M-commerce                       | 0 | 1 | 0 | 1 | 2 | 2 | 1 | 3 | 5.90         |
| Regulation/Standards             | 1 | 0 | 0 | 1 | 0 | 3 | 2 | 3 | 6.10         |
| Cloud-based Services             | 0 | 0 | 1 | 0 | 1 | 2 | 4 | 1 | 6.22         |

As can be seen, Mobile Apps clearly rated the highest among the research participants, followed by Devices (second) and Infrastructure, Security and Advertising rated next, with Regulation/Standardisation and Cloud-based services clearly finishing with the lowest value of importance.

3.1 Mobile Applications & Data Services

The Mobile Applications and data services topic was the most mentioned throughout the answers to Round 1 of the questionnaire and this was borne out in Round 2 when apps were seen as the most important growth area for mobile technology (as can be seen from the results outputted in Table 4.1.1). If we take a mobile phone as 1 in terms of required bandwidth, a smartphone will require 10 times this; a video camera will require 100 times this, and a laptop will require 1000 the bandwidth of a simple mobile phone (Cisco VNI Mobile, 2010).

There was a certain belief that devices and infrastructure are merely the enablers, whereas applications will drive the usage, services, and revenue growth across the mobile industry.

The real strength of applications is seen in the fact that the next big innovation could be a simple application developed tomorrow, but where this application or service will come from is hard to quantify. As one participant puts it:

“We cannot anticipate the next big mobile innovation. It will be simple, it will be practical, and it will be easy - because that is what people embrace. But what that is, God only knows. The key is not only within the technology, but how that actual technology can be utilised in a cost effective & user friendly manner. Technology is important, but we should not lose sight of the fact that it must always be looked at from the perspective of what it can offer the user, and how it can improve what it is the user does today. Not an easy one sometimes to answer or address.”.

Mobile applications were clearly seen as the most important area in mobile technology in the primary research. 80% of all participants rated it as number one or two when asked to rate it against other areas of prominence within the industry (Table 1). The strength in the mobile applications area lay in the fact that it allows for innovation, ingenuity and is consumer driven at relatively small cost, both from an effort and monetary point of view.

One such question addressing this from Round 2 of the research asks the participants whether data based services will be the biggest growth area in mobile technology. 40% strongly agreed, 30% agreed and 30%
disagreed. As part of Round 2, the participants were asked to rate the data services given in Round 1 in order of importance (Vid. Table 2).

### Table 2: Round 2 Survey Response - The Projected Most Popular Mobile Service (1 being most important)

<table>
<thead>
<tr>
<th>Service</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Mean Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social networking</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2.40</td>
</tr>
<tr>
<td>Content providing services</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.40</td>
</tr>
<tr>
<td>General web browsing</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2.90</td>
</tr>
<tr>
<td>Location-based services</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>3.60</td>
</tr>
<tr>
<td>Augmented reality services</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>4.80</td>
</tr>
<tr>
<td>Video telephony</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>4.90</td>
</tr>
</tbody>
</table>

Social networking and content providing services rated the highest, followed by web browsing and location-based services. Augmented reality and video telephony rated the lowest amounts among the participants.

### 3.2 Mobile Devices

The participants see Mobile Devices as the second most important growth area in mobile technology (Table 1). As part of the first round of research, the participants were asked to outline any mobile device technologies that we have not yet seen in the mass market. The answers received from this included: Voice recognition technology; Better interconnectivity between different hardware devices was cited, (like controlling household appliances, for example); Projectable/portable screens with interactive usage; Hardware/human interaction, from the relatively simple integration of devices into clothes to miniaturised in-ear devices and Direct implanting of devices into the human nervous system (Cyborg devices);.

As part of the clarification process in Round 2 of the research, the participants were asked to outline what timescales they expected the device innovations from Round 1 to take in achieving mass-market appeal. The results to this are outlined in Table 3.

### Table 3: Round 2 Survey Response - Device Innovation Timelines to Market

<table>
<thead>
<tr>
<th>Innovation</th>
<th>1 - 2 years</th>
<th>3 - 5 years</th>
<th>6 - 10 years</th>
<th>&gt; 10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice Recognition</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Device interconnectivity/integration</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Projectable screens/interfaces</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Miniaturised/integrated devices</td>
<td>1</td>
<td>7</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cyborg Devices</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

One major issue posted about devices quite regularly was battery capacity. With ever increasingly powerful devices, the need for better batteries has become paramount.

When talking about devices, it was clear from the primary research that devices will continue to develop rapidly, as it has done to this point with the adoption of smartphones and tablet devices. Smartphone penetration is expected to hit 50% by the end of 2011.

Projectable, portable and foldable screens with human interaction are an obvious partner to these miniaturised devices and are another example cited in the primary research. Again, these innovations were deemed likely within the next 5 years by 80% of participants. Cyborg devices were an example of an innovation that would traditionally have been a mainstay of science fiction, but mobile devices implanted directly into a person were highlighted in the primary research. The likelihood of seeing this soon are slim however, where 40% of participants thought this innovation would not be available in the next 10 years.

Device convergence was cited, with the mobile device becoming ever more integrated.

"Ever more integration of netbook, PDA and mobile phone"
“Convergence means multiple discrete devices being folded onto one mobile device e.g. onto a wristwatch”

Device convergence, interconnectivity and integration are likely in the next 5 years however (with 90% of participants agreeing on this). For near-field-communication services to work adequately, they would need to be available across all devices, not just from certain players in the industry. So when considering retail purchasing, for example, if the industry tried to push this service, it is paramount that all devices (or at least a large proportion) would need to have the correct technology and standards built in.

3.3 Infrastructure

Infrastructure is seen as the key vehicle in maintaining growth in the mobile industry, with special mention going to mobile data infrastructure. When asked to rate how important, the participants in Round 2 saw infrastructure as the third most important issue facing mobile operators (Table 1).

Both from small-screen devices and large screen broadband services, infrastructure is largely agreed to be a key revenue source for operators, with the usage trends from mobile devices on a steep upward curve (ranging from multimedia streaming, applications, general internet usage, etc.). Without going into the technologies involved, it was agreed across all the participants that any new services, applications or usage that will emerge over the next 10 years will involve more data usage, and this in turn, will require more bandwidth being made available to the customer.

Clearly, the demand is there, but the infrastructure isn’t. The infrastructure currently in place (predominantly 3G technologies) would simply not be able to handle the level of usage patterns projected and would be a serious inhibitor to the future growth of the industry. This point came through strongly in the Round 2 questionnaire where a clear risk to the mobile industry was the limited data capacity of current mobile networks. Limited data capacity was therefore seen as a risk to continued growth of mobile technology.

When asked whether decreasing revenue would impact in the investment towards mobile technology, it was widely agreed that there exists a risk of declining Average Revenue Per User (ARPU). But the majority believed that in spite of this declining ARPU, operators will continue to invest in new technologies, simply because they need to:

“I don't think operators will be inhibited from moving forward to new technologies. They always want the latest and greatest so they can be one step ahead of the competition.”

And based on the principles of any business, if the customer requirement is there, there should be sufficient revenue to justify the investment:

“If the need services are met, the return on investment should be there”

As outlined, while the need to invest remains a high priority, there also exists the problem that the revenue to re-invest is dropping. This has been outlined as a risk to the future growth of mobile technology, and a solution offered by multiple respondents entailed getting into more network/revenue sharing agreements with other operators and service providers.

3.4 Security

Security, fourth out of eight according to the Round 2 findings (Table 1), was seen as being highly important in the future. The situation with mobile technology was compared to that of the PC world, i.e. with ever increasing connectivity to the internet, and with mobile devices resembling PC’s in hardware/software terms, virus attacks, and other security attacks are going to be become much more prevalent.

In order to quantify how big an issue the participants saw in this, they were asked in Round 2 to state whether they agreed that security, privacy, data protection were the biggest threats to data based growth in the future.

The group were split quite evenly on this issue. While all agreed in the first round that security was an issue, only 50% agreed that it was the most pressing issue (20% of whom strongly agreed). The other 50% disagreed with this statement.
As has become apparent throughout much of the areas highlighted, security is a risk that underlies the whole industry. This includes increased threats from data usage like virus attacks but also spamming, spoofing, device theft, etc.

3.5 Advertising

Mobile advertising (Item 5 out of 8 in Table 1) is seen as a key market within the mobile industry. How big this market will get is unclear however. The literature review threw up a wide range of estimates in trying to quantify this service by 2012, and it ranged from $1 billion to over $21.31 billion. Clearly, this is a big difference and shows the uncertainty that exists.

There is one key advantage that the mobile industry brings to the table in the advertising world however: it provides the advertisers with what they call a “market of one”. Each device is specific to each consumer, and if the industry is able to leverage this, it could mean “the holy grail for advertisers”. The mobile operators play a key role in this aspect; they hold the relationship with the consumer. When asked what were the most important issues facing mobile operators in the future, the primary research showed that being more customer focussed and better leveraging direct relationship and information with customers was seen as number one. With ever decreasing ARPU, this was widely seen as the most important tool in stopping this trend.

Other application and device innovations like location-based services are also a strong tool. As mentioned, each device is specific to each consumer, and more importantly, it is constantly with that consumer wherever he/she goes. Using location in targeting advertisements again feeds into the personalised and unique nature that mobile advertising could leverage.

3.6 Mobile-commerce

M-commerce (Item 6 in Table 1) was generally seen as having a good future but, in a lot of cases, the exact extent was not obvious initially. For m-commerce to take off, security on the devices needs to improve dramatically from where it is now. If, for example, a Visa service became available via a mobile device, it would be extremely important that the security against theft or virus attack on the mobile device would be sufficiently strong. Currently, if someone were to lose their mobile phone, there is generally nothing to stop another person using everything available on the device for as long as the SIM stays active on a network. Even after the SIM is removed, the information contained on the handset is still fully available.

Bulking up the security is one thing, but winning over the trust of the end-consumer is another battle the mobile industry will have to win in order for m-commerce to take off in a meaningful way. It is a big leap for consumers to suddenly stop using the tried and tested cash/cards and switch to making payments via a mobile handset.

“m-commerce should develop as long as people can trust it and phone security is developed sufficiently quickly to handle it”

For m-commerce to work, it is obviously important that the relevant industries get involved from the start. For example, to properly sell and leverage a viable mobile credit card service, it would be paramount to get buy-in from the industry leaders, like Visa, MasterCard, etc.

“Payment based on mobile subscription and Near-Field Communication (NFC) has a future but requires buy-in from a super-set of the current industry (e.g. Visa etc.)”

As part of the Round 2 survey, the participants were asked to clarify when or if m-commerce would take off. The results were that 50% thought that m-commerce will quickly become a mass-market service for consumers in the next 5 years and 50% felt that m-commerce will slowly take off and will only fully reach mass appeal in the next 10 years.

This clearly shows that the participants believe it will be a viable mobile service with the group split simply on the time it will take for this to happen.

M-commerce is one such service that will be driven by applications (with device innovations also important). It is currently a niche product within the mobile industry and is more predominant in certain markets worldwide, namely the Asian and African market. The high usage in the developing markets can be seen as a direct result of the lack of alternative payment methods.
3.7 Regulation & Standardisation (Item 7 of Table 1)

Regulation was touched upon briefly throughout Round 1 of the research and this was borne out in Round 2 when it was rated second last (seventh out of eight) in the list of the most important areas within mobile technology, with an average rating of 6.1. There was a complete consensus across the research participants that proper regulation is important for the growth of the industry and Government have an important role to play in this.

3.8 Cloud-based Services (Item 8 of Table 1)

The concept of Cloud Computing came to the fore regularly throughout the first round of the research. It was noted that there exist limitations with what a single hardware device can do and the cloud could possibly solve this. Cloud-based services leverage the vast and infinite processing power and storage available on the Internet to provide services to consumers. Cloud-based services are already being used, in services like email, for example, where applications on mobile devices provide direct access to these email service, while keeping all the storage and processing in the cloud. The Round 2 research showed that 50% of participants agreed that the majority of processing, storage and services leveraged by mobile devices will be carried out in the cloud, with 60% subsequently expecting this to materialise with the next five years.

While it is clear that the majority agreed that cloud-based services were likely, a not unsubstantial 30% said they didn’t know, showing a slightly uncertain view on the area. The main reason for this uncertainty was security and data protection.

3.9 Issues Facing Mobile Operators

One of the questions asked in Round 2 of the research was aimed at gaining clarity on what are the most important issues facing mobile operators, with leveraging their customer base more effectively being one of the options asked to be rated in order of importance. Table 4 outlines the results:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Mean Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>More customer focussed</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>2.10</td>
</tr>
<tr>
<td>Bandwidth/infrastructure investment</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2.30</td>
</tr>
<tr>
<td>Better Pricing Models for Customers</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2.60</td>
</tr>
<tr>
<td>Implement network/revenue sharing agreements</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>3.00</td>
</tr>
</tbody>
</table>

3.10 The Next Ten years

The participants were asked a broad question pertaining to how they see the mobile industry looking in 10 years. The following are some of the more pertinent answers:

“Fewer physical networks, operators of tomorrow won’t manage their own network infrastructure – networks will be shared.”

“Content will remain King.”

“Increasing relevance of OS/device & content players.”

“Infrastructure will be well equipped to deal with most data loads; it will no longer be a bottle-neck.”

“The concept of a specific mobile industry will become blurred as mobile operators will move to offer fixed line and fixed line will move to offer mobile services. They’ll probably blend and a company will provide all telephony services regardless of location (fixed/mobile)”

“Always connected On Demand Service.”

“One multi-purpose, cheap, flexible, highly-connected, easily-carried, small device”
4. Discussion & Conclusions

It is clear from the findings of this research that while mobile technology and the industry around it has grown at an amazing pace over the last two decades, the broad findings indicate that this growth is going to continue unabated in the next decade. Current market mainstays like voice and messaging are still extremely strong and will continue to generate massive usage and revenue for a long time to come.

Data based growth is the main market growth area for the foreseeable future. Currently, it generates revenues of $62 billion worldwide, with this number expected to increase dramatically over the coming years. The data usage patterns are expected to increase at an annual rate of 108%, and this at a time when voice usage and revenue (the major revenue generator in the market today) is expected to plateau. With declining ARPU a concern for mobile operators today, data traffic is hoped to stabilise and maybe even grow this number for operators in the future. When asked directly in Round 2 if they agreed that data based growth will be the number one growth area in this industry, 70% of the participants agreed. Data based services is a generic term; it references services that leverage data infrastructure in providing services to the consumer. When expanding on this more, particular areas came into prominence.

Clearly, the demand is there, but the infrastructure isn’t. The infrastructure currently in place (predominantly 3G technologies) would simply not be able to handle the level of usage patterns projected and would be a serious inhibitor to the future growth of the industry. This point came through strongly in Round 2 research, where a clear risk to the mobile industry was the limited data capacity of current mobile networks.

The limitations of this paper include:
Just thirteen experts were used.
The demographic background of the research participants was made up of people who work in the mobile industry within Ireland, as well as people with academic backgrounds.
The feedback process after each round of research is dependent on the researcher, and depending on this feedback, the results to subsequent rounds could be altered. This means that the Delphi technique could, “be used to mould opinion as well as to collect [data] (Cyphert et al, 1971).

Access to the online world opens an infinite number of possibilities for the market, with the likelihood being that the future of mobile will be more integrated into every day life offering any number of services that a consumer may need. At its most simplistic, mobile technology means that a consumer using the services available can stay mobile and this is the industry's key selling point; no other industry can offer this type of access while still maintaining the level of service.

As Sharma (2008) describes, the basic functionality of camera, messaging, GPS, wallet, camcorder, gaming controls, rolodex, glucometer, scanner, presence, and context-awareness can be used to build a multitude of applications and services that are customized to specific demographics and regions and go beyond the downloading of ringtones.

5. Possible Implications of These Findings for the Academy

The smartphone and tables computers (iPad, Xoom and others) point the way forward to what may be available to support the lectureroom/classroom environment. While these new mobile devices will not directly replace the learning and teaching environment, they will cause a number of dimensional shifts in the learning environment. The first one is just that the mobile environment puts information at the learner's fingertips almost immediately. The second dimensional improvement is the availability of Apps to provide online learning in an almost infinite number of varieties (The Apple appstore has in excess of 350,000 applications covering a very wide range and quite inexpensively). The consequences for the learning environment are difficult to see, but there are some obvious ones:

no more note-taking; no more hard copy handouts; less visits to the library; quizzes and tests can easily be run in class to estimate learning progress.

Perhaps more (informal) learning can now take place where it is more appropriate, which is usually not just the lecture room.
It should be possible to get more intensity in class, with much better quantity and quality of feedback. Will this intensity demand 2 (or even 3) lecturers per class? Will a class become more of a symposium? It should also be easy to provide a replay of a classroom session. Also it becomes easier to handle distance learners at the same time.

Some would argue that this revolution is happening now. The profile of the 21st century student is different from that of the traditional student. The new learner is more comfortable with digital technology, smartphones, social networking sites, than with textbooks and face-to-face communication. Colleges must be creative in engaging, equipping and retaining this diverse student population. These mobile devices can increase student-faculty and student-student engagement, bring services and office hours on-line, remove physical and geographical constraints to learning, and provide a more intuitive and accessible collaborative technology than what has been available up to now.

5. References


Learning Style Differences of Middle Eastern Students in Qatar and Faculty from Canada

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Buthaina AL NAQEEB (University of Calgary, Qatar)

Abstract

Our hypothesis was that learning styles as measured by an established and well vetted learning style inventory (LSI) would be different between students who are predominantly from Middle Eastern backgrounds studying at post-secondary institutions in Qatar and instructors predominantly from western backgrounds. If so, this may impact pedagogical strategies. The research team consisted of faculty and students at the University of Calgary in Qatar (UCQ). This is also a follow-up presentation after ELSIN 2010 which introduced our research project.

Based on a literature review focused on learning style inventories, we selected the Kolb LSI and the Vermunt ILS to assess student and faculty learning styles. A follow-up semi-structured interview was designed to help inform the results. A series of learning style workshops were delivered in the spring and fall of 2010 to 80% of students (n=61) at UCQ. All student participants completed the Kolb test, half the Vermunt questionnaire, and a selected subset the interviews. In the case of the faculty, 90% (n=25) completed the Kolb LSI as well.

As hypothesised faculty and students displayed different learning styles as measured by the Kolb LSI. Generally the results found more students in the Active Experimentation category while faculty were in the Abstract Conceptualization category, i.e. students prefer doing activities while faculty prefer thinking.

Nearly two thirds or 64% of faculty preferred Abstract Conceptualization (AC) i.e. thinking, analyzing, and planning systematically. The most common learning style quadrant of faculty was Assimilating (AC plus RO, i.e. Reflective Observation) which may include gathering information, synthesizing it logically, focusing on abstract concepts, preferring lectures, and thinking thoroughly.

The dominant style of students (50%) was Active Experimentation (AE) i.e. doing, learning by actively experimenting, getting things done, taking risks, and influencing others and events through action. 30% of students also preferred AC, mostly the graduating students, and 20% had RO as a preferred category, mostly 2nd year students. Student learning styles may change over the course of their program. For learning style quadrants, most students were in the Diverging quadrant (RO plus Concrete Experience), i.e. preferring concrete situations, observations, different viewpoints, brainstorming, broad interests, gathering info, groups, and feedback.

The Vermunt ILS revealed similar learning patterns. The majority of students at UCQ prefer a stepwise manner to memorize and make concrete use of course content material. Students are motivated to test their knowledge and use it for their vocation. They want teachers to create a stimulating experience.

This was a limited pilot study at the University of Calgary in Qatar where most faculty are from Canada and most students from Qatar or from Middle Eastern backgrounds. The results may indicate differences in cultures or influential background education systems. The importance of the study is that it shows an awareness of different modes of learning, when students have predominantly one style and faculty another. This may affect pedagogy. This may be important to take into account in institutions where the majority of students come from a different background or culture than the institutions.

Keywords: Qatar, learning styles, Middle East, post-secondary students, active experimentation

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Effects of Prior Achievement, Mastery Orientation, Need for Cognition, and Self-efficacy on Achievement in Mathematics

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Abstract

To try to understand the dynamics of the learning process for adolescent females studying mathematics, a theoretically-based, structural equation model was built: Prior achievement affects mastery goal orientation (an intrinsic motivation construct) initially, and self-efficacy (task-capability beliefs) and achievement distally. Mastery activates need for cognition (engagement in complex, deep thinking), propelling self-efficacy, affecting achievement. The model gained statistically significant results, suggesting the possibility of the relationship between the variables.

Reviewing the psychology of academic achievement, Winne and Nesbit (2010) find that research over time captures the learning process, documenting motivational, meta-cognitive, and self-regulatory dynamics that take place as the cognitive system metabolizes information yielding achievement. Incorporating this approach, this study investigates how prior achievement, achievement goals, need for cognition (NFC), and self-efficacy promote mathematics achievement over the long-term for adolescent females, supporting Maher’s (2005) review. Mastery, the process of developing competence (Kaplan & Maehr, 2007), is investigated for its ability to motivate learning. Need for cognition (NFC), enjoyed engagement in effortful problem solving (Cacioppo, Petty, Feinstein, & Jarvis, 1996), serves as the meta-cognitive process. Self-efficacy, beliefs about capabilities to achieve tasks that drive operations (Bandura, 1989), is investigated to see how learning over time shapes one’s capability perceptions.

129 ethnically diverse math students in the first or second years of a North American all-girls parochial secondary school participated, as part of school’s initiative to improve academic achievement. Prior achievement was assessed by first semester exam grades of the corresponding yearlong secondary school level mathematics courses. Mastery goal orientations was assessed at the start of the 2nd semester based on the Patterns of Adapted Learning Scales (PALS) (Midgley et al., 2000), Cronbach’s $\alpha = .713$. NFC was assessed at the middle of the semester, based on Cacioppo, Petty, et al. (1996), Cronbach’s $\alpha = .740$. Self-efficacy was assessed at the end of the semester based on the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1991), Cronbach’s $\alpha = .886$. Cronbach’s $\alpha$ level > .70 was deemed adequate reliability. For each course, a cumulative math exam for the semester followed.

The proposed structural equation model of the variables revealed significant findings. Fit indices were $\chi^2 (4, 129) = .164, p = .997$, TLI = 1.054, CFI = 1.00, RMSEA = .000. $\chi^2$, $p > .05$, TLI = 1, CFI = 1, RMSEA < .05 are benchmarks for best fit. Results showed that prior achievement predicted mastery ($\beta=.186^*$), self-efficacy ($\beta=.545^{**}$), and achievement ($\beta=.577^{***}$). Mastery predicted NFC ($\beta=.546^{**}$), which predicted self-efficacy ($\beta=.191^{**}$), which predicted achievement ($\beta=.255^{***}$), even when controlling for prior achievement. $\beta$ weights demonstrate the amount that the predictor contributes to the predicted variable and can be converted to a percentage. Mastery accounted for 10.4% of the variance on self-efficacy (its total effect). Prior achievement accounted for 69.8% of the variance on achievement, while self-efficacy accounted for 25.5%. Mastery and NFC had small, but significant effects on achievement at 2.7% and 4.9% respectively.

$p =.032^*, .012^{**}, < .001^{***}$

The study builds some support for a dynamic mathematics-learning model for adolescent girls, demonstrating mastery’s relationship to improving achievement and its ability to activate need for cognition, while showing how NFC can be related to self-efficacy and affect mathematics, an abstract reasoning discipline. Controlling for prior achievement, mastery engages NFC, which raises self-efficacy and subsequently achievement. Pedagogical implications include fostering student development of mastery goal orientation and need for cognition approaches to promote self-efficacy and academic achievement.

Keywords: achievement, need for cognition, mastery goal orientation, self-efficacy, adolescent females

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1. Introduction

Academic achievement is defined by *The New Oxford American Dictionary* as “a child's or student's progress in a course of learning, typically as measured by standardized tests or objectives” (2010). The field of Educational Psychology is concerned with analyzing and relating the variables that contribute to the promotion of academic achievement (Winne & Nesbit, 2010). In their comprehensive review on the psychology of academic achievement, Winne & Nesbit discuss the qualities of educational psychology research that are necessary for understanding the phenomenon of academic achievement. Specifically, they believe that research should be conducted over time to capture the shifts in motivation and affect that take place throughout the learning process as information is metabolized through the cognitive system. Such research allows for the documentation of the self-regulatory and metacognitive systems, and sees learners as agents who are actively constructing their knowledge. With this approach, research is able to map the dynamics of learning as the student’s active pursuit to master material. Here, distal variables are linked to proximal variables that lead to achievement to suggest meaningful models of behavior.

According to Winne and Nesbit’s review, research on the learning process is designed to understand conditions and environmental factors needed to learn facts, schemas, and principles of a given domain. The amount of information that is able to be metabolized at a given time is often seen to be determined by cognitive load theory, which states that due to the limits of working memory, there are restrictions to the amount of information processing. There is an intrinsic load of the information due to its inherent difficulty, mental taxation garnered from gathering schemas to aid in processing, and the extraneous processing set off by the information. These three factors work together to limit working memory. The goal of instruction is to help reduce the amount of load so that is not excessive, where information may be processed more efficiently. One way of preparing students for this process is through teaching metacognitive skills. Through metacognition, students learn to monitor and control cognitive processes to enhance learning. In this process, students become agents who actively utilize their skills to improve performance. Beyond cognition and metacognition, other variables add to learning performance (see Winne & Nesbit, 2010 for review), such as motivation (which directs choices and magnitude of effort), self-efficacy (one’s beliefs of competency) and prior achievement (which improves problem-solving abilities). These three have been identified as important components to the learning process. Winne and Nesbit call for research to investigate the relationships of these variables to provide a powerful learning model. The current study seeks to look at these variables, specifically mastery orientation, need for cognition, self-efficacy and prior achievement as related to semester-long mathematics achievement.

1.1 Mathematics

In her review of how student’s structure mathematics learning over the long-term, Maher (2005) describes the process as active and thoughtful. Mathematics is built on a foundation of past ideas, from which new ideas are drawn. Therefore, prior knowledge is critical. These ideas are manipulated creatively to form new concepts. Mathematics is an investigative discipline to which students bring personal experience that mixes with the mental schema, exploratory abilities, beliefs, and social interaction that all combine to build understanding. Math is a process of modification and refinement; students have to be willing to go through the process. Mathematics is also problem solving, where students have to plan out their investigation to develop working models of how to derive solutions. Students are also able to develop concurrent working models to forge multiple solutions that improve their abstract reasoning skills. These working models can become effective means of problem solving, which through experience help form the mathematical foundation that informs future work. While studying mathematics, Mayer finds that individuals form mental mathematical models that are retrieved during problem solving for use or modification. When they are publically shared, models are validated or further refined. This process helps create understanding by connecting the mental representation to problem-solving schema. Through Mayer’s review, mathematics is seen as involving a deepened commitment to the learning process that happens over time, which is improved by prior experience.

1.2 Prior Achievement

Prior achievement in middle school (13/14 years) math significantly predicts high school (14 – 17 years) math achievement (Wang & Goldschmidt, 2003). Beyond Mayer’s account for the cognitive rationale for this finding, lie motivational and efficacy reasons. For the former, Araz and Sungur (2007) also reviewed 13 – 15 year-old student learning and found that prior knowledge significantly predicted intrinsic goal
orientation (the process of engaging in learning for the sake of understanding), along with academic achievement. Those with a high-level of prior knowledge were more likely to study for the sake of mastering the material.

Prior achievement also has effects on efficacy aspects of learning. Bandura (as cited by Elias & Macdonald, 2007) described that individuals look towards prior experiences when dealing with new situations in order to evaluate their competencies. As tasks become more familiar, Bandura posited that self-efficacy would rise and be of importance independent of prior achievement. Elias & Macdonald research supported both views. In a review of college student achievement, they found that prior achievement predicted self-efficacy and achievement and that self-efficacy also predicted achievement. In both realms, prior achievement is an initial accelerator of the learning process.

1.3 Self-Efficacy

Self-efficacy is defined as individual’s beliefs about their capabilities to achieve tasks. These beliefs drive one’s choices as one operates to achieve goals (Bandura, 1994). Bandura believes that self-efficacy increases through mastery experiences, which are prior experiences wherein one feels a sense of success. One needs to also become resilient and be able to overcome failure with sustained effort. Living vicariously through others and believing that one also has the power to succeed also increase self-efficacy. Having models improves one’s internal judgments, which are key for being self-efficacious. People who are coached in a realistic manner, centered on self-improvement, can believe they have what it takes to succeed often feel more self-efficacious. Finally, Bandura feels that people who understand their internal physical and emotional states are better able to judge their abilities. In this context, self-efficacy becomes a function of realistically and positively interpreting data received from internal and external sources.

Self-efficacy drives cognitive, motivational, affective, and selection processes, where it affects goals, drive, mood, and decision-making. Positive self-efficacy leads to perceived optimism, realistic understanding of strengths and weaknesses, and the desire for self-improvement. A sense of agency is developed where one feels an ability of control of one’s actions. Such experiences stem from positive interaction with family and peers, but also from schools. Optimally, schools offer the chance for individuals to succeed from successively challenging tasks, where one develops the mastery experiences necessary for long-term growth. Students can take pride in their work and develop a sense of accomplishment, realistic, optimistic internal judgment, which increases self-efficacy. However, students without such positive moments in their academic career would have lower senses of self-efficacy and underperform.

According to Bandura, self-efficacy is the degree of confidence that someone has in her ability to organize and execute a plan to solve a problem or complete a task (Eccles & Wigfield, 2002). One’s confidence can fluctuate depending on the extent, complexity, and universality of the task. There is a relationship between how one perceives an individual can succeed (outcome expectations) and how one perceives how she in particular can succeed (efficacy expectations). When there is a mismatch between perceptions of general success and perceptions of personal success, there can be impediments to achievement, beyond the scope of ability, because efficacy expectations affect goal setting. One’s sense of academic efficacy predicts school performance and occupation goals.

Wigfield and Eccles (2001) combine domain specific self-efficacy (expectancy) with task value in their understanding of achievement motivation. Expectancies are perceptions of success on a task. Expectancies are influenced by goals, judgments, self-schema, and task difficulty. They are also influenced by affect, memory, perceptions of social situations and past events, and larger social-cultural forces. Expectancies affect achievement behavior, in addition to performance, including choice, persistence, effort and engagement (Shunk, Pintrich & Meece, 2008). Expectancies have been shown to predict achievement.

1.4 Need for Cognition

When thinking of the brilliance of a scholar like Albert Einstein, his brute force intelligence certainly comes to mind. However, this was not the only factor that contributed to his success. Einstein’s styles of thinking and learning were critical components of his intellectual prowess. Though he may have been endowed with a unique mixture of these qualities, he is not alone in possessing them. Most individuals try to make sense of their world. Yet, there are some like Einstein, who have a high need for cognition (NFC) (Cacioppo et al., 1996) and seek out understanding to the fullest extent. The authors describe this characteristic as typical of
Those who are particularly reflective in nature, thinking deeply about the world around them and their relationships within them. This contrasts with those with low need for cognition who do not engage in these processes and rely on others or heuristics to make sense of the world. Cacioppo, Petty and colleagues have studied the phenomena for several decades, seeing one’s need for cognition as a gender neutral, and stable, but not invariant personality trait. It can be developed or changed and has also shown to be separate from intelligence.

Those with high NFC love problem solving, effortful thinking, and technology use, which make them prone to seek out such experiences and get better at them. They extend their thinking to a broad range of topics and can respond well to these stimuli. Such individuals search for detailed information about their world, and enjoy engaging in solving problems or difficult cognitive tasks. In fact, they feel less stressed when doing so: “This is a stable individual difference in people’s tendency to engage in and enjoy effortful cognitive activity” (p. 198). High NFC people are active dynamic thinkers. High NFC people receive lots of positive feedback for their cognitive efforts. These reflective feedback loops are intrinsically reinforcing, so these individuals continue to seek out the experiences. The experiences offer those with high NFC ample opportunities to strengthen their cognitive muscles in a continuously.

Petty, Brinol, Loersch, and McCaslin (2009) find that the high NFC approach is not only a purely rational system of thinking. Rather, it is a dual system, blending rational and intuitive processes. As those with high NFC think, they are more engaged in their thinking, and are more meta-cognitive. They think more about options, and seek out information prior to making decisions. Most importantly, they are able to turn off the thinking process in non-thinking moments and can also switch between rationalizing and intuiting depending on circumstance.

Cacioppo, et al. offer a developmental perspective to how a high need for cognition develops in childhood: As the child learns to solve problems in academic or social realms, both through observation and experience, she may either take a rational approach or a flight or fight approach. The first seeds of developing a high need for cognition come from solving problems rationally and deriving pleasure from the experience. Such involvement creates intrinsic motivation for problem solving, which leads to a sense of self-control, raising confidence for the creation of an intrinsically reinforced structuring and evaluation of the world. The feedback loops begin with these experiences, which continue to improve ability with increased experience.

In a meta-analysis, Cacioppo, et al. found that a high need for cognition is related to academic achievement in increasing intrinsic motivation and mastery. However, they found that it was more related to verbal reasoning and not to abstract reasoning. A question is why, given the fact that it appears that those with high NFC have abilities to succeed across disciplines. The current research will attempt to support that need for cognition can support abstract reasoning in mathematics.

1.5 Mastery Goal Orientation

Two central questions form the basis of achievement goal theory: 1) What does one attempt to attain or avoid (achievement goal)? 2) What does one think is personally achievable (perception of competence)? (Cury, Elliot & Da Fonseca, 2006). These questions are tempered by how one sees ability, either stable or changeable (entity versus incremental) or if one seeks to show competence or develop competence (performance or mastery). Of interest to this study is the mastery-incremental stance that leads to persistence and intrinsic motivation. Mastery orientation refers to the process of developing competence. Such individuals persevere despite challenges, and develop learning goals, i.e. deep learning for its own sake. When this stance interacts with high perceptions of perceived competence, these individuals seek out skill development, which leads to task engagement, interest in self-improvement, and positive outcomes. They even learn without fear that making mistakes will ruin their image. They prefer challenge, persevere, use self-regulation strategies, and display positive affect with stronger beliefs about the possibilities of their efforts (Elliot, 2005; Harackiewicz, Barron, Pintrich, Elliot & Thrash, 2002a, Beier, Campbell & Crook, 2010, Kaplan & Maehr, 2007, Ames & Archer, 1988).

While such an orientation has been seen as the critical trait for learning, raising self-efficacy and effective learning strategy use, the literature has been mixed as to mastery’s effect on academic performance. Kaplan and Maehr’s (2007) review states that differences may be do to the types of assessment and task in the study. Some have said that mastery does not achieve performance (Harackiewicz et al., 2002b, Beier et al., 2010). However, others have found more positive results especially over the long term. When looking at college students, Daniels, Stupnisky, Pekrun, Haynes, Perry and Newall (2009) found that even when controlling for
prior achievement (high school GPA) mastery orientation predicted enjoyment which predicted achievement (intro psychology final grade). Mattern (2005) found a significant difference among high mastery college-age students compared to others on cumulative achievement in a semester-long teacher training course. Schraw, Horn, Thorndike-Christ and Bruning (1995) found that over the course of a semester-long biology class for undergraduates, compared to their peers, those students with a learning (mastery) orientation obtained higher achievement scores, were more strategic in their thinking, and used more metacognitive skills, even when controlling for prior achievement. These last three studies help form the theoretical basis for this study’s inclusion of mastery as an effective variable for promoting achievement over the long term.

1.6 Need for Cognition and Academics

While Cacioppo and colleagues developed the construct of need for cognition, they spent more time focusing their research on the effects of persuasion than on academic realms. Recently, there has been increased interest in exploring how the trait affects school performance. Ellias and Loomis (2002) seek to test how need for cognition and perceived self-efficacy affect academic performance. Two structural equation models were proposed: 1) Self-efficacy affects need for cognition which affects GPA, *The Bandura Model*; 2) Need for cognition affects self-efficacy which then affects GPA, *The Cacioppo and Petty Model*. Though there were significant correlations between both variables and GPA, the Cacioppo and Petty Model was supported, with no differences in age or gender of the college-level participants. These findings endorse that school should be made enjoyable and realistically challenging to make the need for cognition variable to play into student success most. In this manner, the students’ pleasure for learning will be activated and if students are made to feel effective, they will enabled to do well.

Day, Espejo, Kowollik, Boatman and McEntire (2007) found support for an alternative structural equation model where need for cognition predicted skill acquisition or performance, with mastery approach and self-efficacy serving as mediating variables. In a laboratory experiment, participants learned to play a game. The authors state that need for cognition might be helpful for novel situations predicting performance where the person does not have prior experience with the subject matter. Of note, this study was performed with an all-male population who were given immediate feedback and monetary compensation for their efforts, which differs from population and incentive structure of the current study.

Dickhäuser and Reinhard (2009) in a field study of high school students, demonstrated that need for cognition activates specific self-concept (self-efficacy) in academic abilities for both math and English. When students are evaluating their abilities, the ones with the highest need for cognition scores will activate their knowledge processing of their past experience with the task, in order to make accurate predictions of their performance, which then affects their performance on a given assessment. Those with lower NFC do not take such an investigative approach to assessing their task-related abilities. Instead, they use a more general model, which negatively affects their performance. Results were significant across math and English domains, though they were different, which may suggest that the nature of tasks and subject-specific self-concept can differ, but the theory remains. Those with high NFC were more able to accurately engage their task specific self-competencies, which primed them more for the task. The enabled themselves to activate their self-schema and task memory. This enabled them to activate self-efficacy better than those with low NFC.

1.7 Current Study

In their review of the literature, Sins, van Joolingen, Savelbergh and van Hout-Wolters (2008) discuss how achievement goal theorists posit that learning for sake of understanding gain insight into the material and processing information deeply, which is an active process that improves comprehension and affords the learner the ability to take in ideas and relate them to prior knowledge and experience. Those with a mastery approach may activate their high need for cognition to enjoy this type of learning. Mayhew, Wolnick and Pascarella (2008) discuss need for cognition as a life-long love of learning that can be developed through academic environments, in a review of Cacioppo and Petty research. In their study and in this current one as well, through out the semester, the environment is perceived by those with a mastery orientation as being suitable of for cognitive development, enjoyment, efficacy and mastery learning experiences that activates the state features of need for cognition that propel it for growth. Further evidence for mastery’s ability to predict need for cognition comes from a semester-long study of undergraduate students by Story, Hart, and Mahoney (2009). They found that intrinsic motivation predicted need for cognition. Lord and Putrevu (2006) break need for cognition into four dimensions, as stable traits: enjoyment of cognitive stimulation,
preference for complexity, commitment to cognitive effort, and desire for understanding. By dividing the construct into the four dimensions reveals the necessities of the learning process, especially in learning mathematics over the long-term. Though Winne & Nesbit describe the necessity of using metacognitive structures in learning, those with high need for cognition already use them inherently. Coutinho, Wiemer-Hastings, Skowronsni and Britt (2005) find that driven by their interest and talents in problem solving, those with high need for cognition utilize similar learning strategies as those who apply metacognitive skills.

The current study is a field study of female high school students at an all-girls parochial school. It looks at long-range connections between prior achievement, mastery orientation, need for cognition, self-efficacy, and cumulative academic achievement in mathematics. Data was collected over the course the spring semester for the cognitive and motivational measures, while the outcome measure of math achievement was the spring semester exam score. Prior achievement was the first semester exam score, completed before the study began. Figure 1 presents the proposed model developed based on the aforementioned theoretical background.

![Figure 1: A conceptual model involving prior achievement, mastery orientation, need for cognition, self-efficacy, and math achievement](image)

2. Method

2.1 Participants

129 culturally diverse math students in the first or second years of a North American all-girls parochial secondary school were recruited to participate in an intervention and data collection over the course of a semester to improve meta-cognition, self-regulated learning, and achievement. Participation was deemed a part of their coursework.

Materials and Procedure

Data collected as a part of this study was a subset of a larger study and focused on motivational and cognitive measures for math and math achievement. Measurements included herein consisted of Mastery Orientation to Learning (Mastery Approach), a three-item measure of the degree to which one focused on understanding and learning, coefficient alpha = .713, e.g. I like class work best when it really makes me think, was adapted from the Patterns of Adapted Learning Scales (PALS) (Midgley et al., 2000). Need for Cognition, a four-item measure evaluating one’s need for deep, critical thinking, coefficient alpha = .740, e.g. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought. It was derived from Cacioppo, et al., 1996. Math-specific Self-Efficacy, a three-item measure of one’s perceived ability to learn math material, coefficient alpha = .886, e.g. I believe I will receive an excellent grade in this class was adapted from the Motivated Strategies from Learning Questionnaire (MSLQ) (Pintrich et al., 1991). All items were scored on a 1 to 7 Likert-scale, “not at all true of me” to “completely true”.
2.2 Procedure

Written questionnaires were distributed via the Internet at the beginning of the spring semester, when the students appeared to have transitioned the school year. While the entire questionnaire took approximately 40 minutes to complete, the present study was a subset of questions drawn from the larger battery. The girls continued with their age-level courses in mathematics throughout. Prior math achievement results (January exam grades) were obtained before initial administration. At the first administration, mastery orientation was assessed. At the second administration, need for cognition was assessed. At the third administration, self-efficacy was assessed. June exam grade, the outcome variable, was after the semester of study was complete.

3. Results

3.1 Testing the Hierarchical Model

Structural equation modeling with structured mean (Järeskog & Särbom, 1982) was used to ascertain the fit of the proposed model, suggesting the relationships between prior achievement, mastery orientation, need for cognition, self-efficacy, and math achievement. The program AMOS 19 was used to estimate fit indices, means, and variances. Five types of indices were used to evaluate overall model fit: the ratio between the chi-square statistic and degrees of freedom ($\chi^2$/df), the Tucker-Lewis index (TLI), the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and Hoelter’s N. The chi-square statistic offers an asymptotically justifiable significance test of model fit. Values of ($\chi^2$/df) that are less than 5.00 are acceptable (Marsh and Hocevar, 1985). TLI can vary from slightly below 0 to slightly above 1 in estimating goodness of fit, with values close to 1 showing the best fit (Tucker & Lewis, 1971). CFI shows how the models fit relative to a baseline model of uncorrelated variables, and varies from 0 to 1. Numbers close to 1 show the best fit, and models scoring greater than .90 on the index are said to have reasonable fit (Bentler, 1990). For RMSEA, though some have argued for cutoffs between .05 and .10, the choice of cutoff depends on power, Type 1 error rate, model specifications, degrees of freedom and sample size (Chen, Curran, Bollen, Kirby & Paxton, 2008). A Hoelter’s N beyond the conventional 200 score for adequate sample size (Byrne, 2010) shows good fit. Chen, et al. state that all goodness of fit indices must be used in concert to indicate global model fit.

Based on the selected indices, the model had more than acceptable fit. Table 1 displays the fit results. $\chi^2$ (4, 129) = .164, p = .997, $\chi^2$/df = .041, TLI = 1.054, CFI= 1.00, RMSEA = .000, Hoelter’s N = 7384. This model suggests that mastery can be a positive predictor for need for cognition, which can be a positive predictor for self-efficacy, which can positively predict achievement, even when controlling for prior achievement.

Table 1: Goodness of Fit Results for the Proposed Model

<table>
<thead>
<tr>
<th>Chi-Square</th>
<th>D.F.</th>
<th>Sig.</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>Hoelter .05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td>.164</td>
<td>4</td>
<td>.997</td>
<td>1.054</td>
<td>1.000</td>
<td>.000</td>
</tr>
</tbody>
</table>
Table 2: Standardized Direct, Indirect, and Total Effects for Prior Achievement, Mastery, Need for Cognition, Self-Efficacy on Math Achievement

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Criterion</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Achievement</td>
<td>Mastery</td>
<td>.186</td>
<td>0</td>
<td>.186</td>
</tr>
<tr>
<td>Need for Cognition</td>
<td>0</td>
<td>.102</td>
<td></td>
<td>.102</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>0</td>
<td>.191</td>
<td></td>
<td>.191</td>
</tr>
<tr>
<td>Achievement</td>
<td>0</td>
<td>.049</td>
<td></td>
<td>.049</td>
</tr>
<tr>
<td>Mastery</td>
<td>Cognition</td>
<td>.546</td>
<td>0</td>
<td>.546</td>
</tr>
<tr>
<td>Need for Cognition</td>
<td>0</td>
<td>.104</td>
<td></td>
<td>.104</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>0</td>
<td>.027</td>
<td></td>
<td>.027</td>
</tr>
<tr>
<td>Achievement</td>
<td>0</td>
<td>.049</td>
<td></td>
<td>.049</td>
</tr>
<tr>
<td>Need for Cognition</td>
<td>0</td>
<td>.049</td>
<td></td>
<td>.049</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>0</td>
<td>.027</td>
<td></td>
<td>.027</td>
</tr>
<tr>
<td>Achievement</td>
<td>.255</td>
<td>0</td>
<td></td>
<td>.255</td>
</tr>
</tbody>
</table>

Table 3: Standardized Regression Weights for Prior Achievement, Mastery, Need for Cognition, Self-Efficacy on Math Achievement.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Criterion</th>
<th>b</th>
<th>β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Achievement</td>
<td>Mastery</td>
<td>.021</td>
<td>.186</td>
<td>.032</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>.055</td>
<td>.455</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
<td>.564</td>
<td>.577</td>
<td>***</td>
<td></td>
</tr>
<tr>
<td>Mastery</td>
<td>Need for Cog</td>
<td>.506</td>
<td>.546</td>
<td>***</td>
</tr>
<tr>
<td>Need for Cog</td>
<td>Self-Efficacy</td>
<td>.217</td>
<td>.191</td>
<td>.012</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>Achievement</td>
<td>2.050</td>
<td>.255</td>
<td>***</td>
</tr>
</tbody>
</table>

A recent review of the literature on the psychology of academic achievement (Winne & Nesbit, 2010) called for the creation of dynamic models that explore how students as agents learn to construct knowledge, activate motivation, use self-regulatory strategies, feel efficacious, and achieve. The current study sought to understand such patterns by looking at semester-long math achievement for high school girls. Based on a review of the processes of mathematics (Maher, 2005), it was determined that prior knowledge has a particular effect in learning mathematics, because of its cumulative nature and because of the dynamics of concept construction in the discipline. This rational mixed with the findings on the importance of mastery approach and deep thinking (Sins et al., 2008) and the value of need for cognition in providing necessary self-regulatory structures needed to effectively problem solve (Coutinho et al., 2005).

The proposed model found statistical support and goodness of fit in all measures. While prior achievement and self-efficacy accounted for the greatest percentage of variance explained for achievement, as would be expected, mastery orientation and need for cognition also had significant, albeit small effects on achievement. The former finding supports prior research that states mastery’s effect on achievement (Mattern, 2005, Schraw et al., 1995, Daniels et al., 2009). Moreover, the model suggests an alternative to prior models mapping need for cognition to achievement (Day et al., 2007, Dickhäuser & Reinhard, 2009, Elias & Loomis, 2002, Cacioppo et al., 1996) and suggests that mastery predicts need for cognition. This current finding is supported by other research (Mayhew et al., 2008, Story et al., 2009).
When studying mathematics, those with a mastery orientation gain a high need for cognition which leads to high levels of perceived self-efficacy in the math, which lead to higher academic achievement in the discipline. This theory seems logical because those who have high levels in the cognitive trait have experience of being good at thinking and these experiences and achievements would lead to sentiments of competence, which would foster further achievements.

Learners harness a mastery orientation; meaning that they seek out knowledge, like to learn from their mistakes, and enjoy the learning process in general, which it makes them good thinkers. Intuitively, mastery orientation dovetails nicely with the need for cognition construct (finding pleasure in thinking for long periods of time and working on complex problems). By deriving such gratification from intellectual pursuits across a range of topics (Cacioppo et al., 1996), those with high need for cognition gain a lot of experience in problem solving. Such experience is necessary for success in mathematics (Maher, 2005). Furthermore, these students seek out these experiences, relishing the challenges. It would seem natural that possessing such a trait, when initiated by a mastery orientation, would raise one’s sense of self-efficacy for specific academic tasks. These individuals are primed for scholastic challenges and they feel good doing them; thus, their confidence for their competence grows. As the study looked at math achievement as a semester-long grade, it appears that those with a mastery approach and a high need for cognition were able to continue their level of confidence in their abilities throughout the semester and maintain good grades. It would seem that the feedback that they got throughout the term would be particularly useful in continuing to maintain their confidence, while the mastery approach would let them learn from their experiences to expand their knowledge, which would increase their success. The fact that the study looked at the variables through time, shows how the students were organizing their motivational, cognitive, and effective skills throughout the term as concepts in math continued to build. The students were engaging the in the thinking process described by Maher.

Since mathematics is a cumulative discipline, concepts build upon each other to form the body of work that is covered throughout the course. It would appear that those with a mastery orientation who had a high need for cognition would be apt to delve deep into the concepts and make connections within the curriculum, which would continue to improve their self-efficacy and performance. Such a finding supports Beier et al.’s (2010) hypothesis that mastery orientation supports performance when students are given the opportunity to access and demonstrate higher order thinking over the long-term.

Another relevance in this finding may lie in the fact that self-efficacy is built upon several variables, including prior experience, judgments, self-schema, etc. as theorized by Wigfield and Eccles (2001). Need for cognition can be seen a part of this foundation, as is mastery.

In conclusion, the value in this study lies in its support of a growing body of research connecting mastery, need for cognition, and self-efficacy to academic achievement. This study adds to the literature by demonstrating how need for cognition can affect mathematics, a discipline involving abstract reasoning. Furthermore, it reinforces Dickhäuser and Reinhard’s (2009) finding that need for cognition affects self-
efficacy which affects math performance, but adds additional effects of mastery as a predictor of need for cognition and an distal cause of long-term math achievement. The study therefore adds support to extending the power of the need for cognition beyond influencing verbal reasoning and brings up questions about NFC’s general capabilities for influencing academic performance. In addition, it adds how a mastery orientation can combine with other variables in improving performance over the long-term. It adds to the predictive power of mastery.

Limitations to this study include flaws in the data collection process: As measures were done by self-report, they may not capture what students actually do during class time (Winne & Nesbit, 2010). However, because the assessments were given in conjunction with training in self-regulation, it may be reasonable to assume that the students were acting thoughtfully when responding.

Despite the empirical contribution made, further investigation is warranted: The relationship between need for cognition, mastery, and self-efficacy can yield a rich understanding of how cognitive and motivational variables interact to affect performance. Further research will have to substantiate as to whether having a mastery approach is the most optimal for long-term achievement. If so, pedagogical approaches may need to be changed. In addition, protocols for developing need for cognition in students need to be evaluated and/or created so that students can experience the benefits of the construct. Gender effects will also need to be evaluated, though need for cognition is gender neutral (Cacioppo et al., 1996). Finally, studying the population of mastery learners who have a high need for cognition in varying classroom environments, with diverse teaching styles, and differing areas and approaches to curricula may provide researchers with a means of understanding interdisciplinary thinking, which seems to be a part of the forefront of the educational field. Einstein said, “I believe that love [of a subject] is a better teacher than a sense of duty – at least for me” (Brown, 2004). The current research suggests that he is not alone in that belief.

5. References


Validation of a German Version of the Epistemological Beliefs Inventory (EBI)

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Abstract

Epistemological beliefs are personal beliefs about knowledge and the acquisition of knowledge. As subjective theories of an individual, they have the function of directing and controlling actions. Therefore, they are linked to numerous aspects of academic learning, e.g., to how students approach learning processes or learning strategies.

Researchers investigating epistemological beliefs have encountered the problem of developing a reliable and valid measure of these beliefs. Schraw, Bendixen, and Dunkle (2002) developed a questionnaire EBI (Epistemic Beliefs Inventory). In comparison to other epistemological beliefs instruments, the EBI was one of the few instruments which showed satisfying psychometric properties (Schraw, Bendixen, & Dunkle, 2002). However, when transferring questionnaires into a different language and cultural contexts it is necessary to investigate their psychometric quality again. Therefore, the original EBI version was translated and its psychometric properties were investigated in a first series of pilot studies. The translated version partly showed unsatisfactory psychometric properties (e.g., with regard to item difficulties or varying factorial structures in different samples). Due to these difficulties, new items were developed for a revised version of the EBI.

First, a pilot study was conducted in which qualitative interviews with 90 students were carried out. Based on the results of content analyses of the interviews, new items and a revised German version of the EBI were developed.

1) Item properties and factorial structure: Psychometric properties and the factorial structure of the revised EBI were investigated in a sample of 471 German university students from social sciences and economics. All items showed satisfactory item difficulties. Orthogonal exploratory factor analysis with Varimax rotation was carried out to uncover the underlying structure of the variables. Factor analysis showed a solution with 15 items and four factors: Quick learning, omniscient authority, simple knowledge, and innate ability. The four factors explained 41.59 % of the variance.

2) Retest reliability: For the analysis of the retest-reliability, 222 students of the former investigation filled in the revised EBI version (one month after the first testing). The four factors showed satisfactory retest reliability correlation ranging from r=0.509 for quick learning to r=0.800 for innate ability. These exceed those of all the original EBI (Schraw, Bendixen, & Dunkle, 2002).

3) Invariability of the factorial structure: The stability of the revised EBI version was investigated in an Austrian sample of 364 university students from different majors from social sciences and economics. Confirmatory factor analysis was used to test the model fit of the factorial structure found in the German sample. The factor analysis showed satisfactory model fits when one variable of the factor “structure” was removed (RMSEA=.046, CFI=.974, SRMR=.047).

4) Criterion-related validity: It was investigated how the four factors of the revised EBI version correlate with the application of cognitive learning strategies. In order to investigate the application of cognitive learning strategies a German inventory (LIST) was used. To analyze this relationship a canonical correlation was performed between the EBI and LIST scales. The results show that the scales are related to each other. Altogether, the results indicate that students with more sophisticated beliefs tend to use higher order cognitive learning strategies et vice versa.
Development of a questionnaire for epistemic beliefs with satisfying psychometric properties and the empirical evidence of the relation between epistemic beliefs and learning strategies.

**Keywords:** Test development, epistemic beliefs, relation between epistemic beliefs and learning strategies, EBI

**References**

The Learning Styles of University Students at Admittance: Do They Differ Dependent on Choice of Study Programme?

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Abstract

Knowledge of the cognitive, thinking and learning styles of higher education students potentially has great value for higher education planners and teachers. Particularly knowledge on the relationship between students’ styles upon admittance and their choice of study programme, and knowledge on the possible study-socialising effects of different study programmes on the students’ styles. Research on these relationships is scarce, fragmented and non-comparable with regards to points of measurement, design, methods of analyses and theoretical framework. The aim of the study is to investigate whether students’ styles differ upon admittance according to their choice of study programme, even when controlled for effects of gender, age and year group. The sample consists of 460 students admitted to two bachelor programmes at Copenhagen Business School through the years of 2007 to 2009. The participants’ learning styles were measured upon admittance. The learning styles measure employed was the Danish Self-Assessment Learning Styles Inventory (D-SA-LSI), which is an adaptation of Sternberg’s MSG Thinking Styles Inventory, within the theoretical framework of the theory of mental self-government. For 5 learning styles, significant group differences defined by study programme were found (Executive, Judicial, Local, External and Progressive). For 3 of these styles (Executive, Judicial and Progressive), additional group differences determined by one or more of the control variables were found. For four learning styles (Legislative, Monarchic, Hierarchic and the Conservative), significant group differences were only determined by control variables, but not study programme. For 5 learning styles (Oligarchic, Anarchic, Democratic, Global and Internal), no significant group differences were found. The results showed that a large-scale study on differences in university students’ learning styles dependent on their choice of study programme could indeed provide relevant information on the students’ preferences of thinking when entering university – knowledge that could make a difference in the design, planning and execution of courses in the first term.

Key words: Learning styles, higher education, admittance to university

1. Introduction

Teaching in higher education is continuously challenged by the diversity in the student body (Nielsen, 2005a). Not only diversity in abilities, but also diversity in the students’ preferences for mental processes when learning and thereby diversity in the degree to which these preferences are met by the teaching, supervision and other learning activities. For almost three decades, this challenge has been discussed as the challenge of how student diversity in cognitive, thinking or learning style can be taken into account in course and lesson planning and execution (Evans & Waring, 2009; Henson & Borthwick, 1984; Hyman & Rosoff, 1984; Kolb, 1984; Nielsen, 2005a; Sternberg, 1997; Sternberg & Zhang, 2005). Student diversity in learning or cognitive styles may be considered more important than student diversity ability-wise, since we do not have the same level of knowledge on students’ styles as we have on their intellectual abilities, which are assessed upon application to university and throughout their studies (Nielsen, 2009).

We have little knowledge on how to approach the challenge of student diversity with regard to styles, and it is mainly of two types: theoretically based reasoning towards the usefulness of considering students’ styles in the planning and execution of teaching, and single empirical findings on differences and similarities as well as changes over time in higher education students’ styles at different points in the university time span. The existing knowledge mainly encourages small-scale studies or the testing of students upon the start of a given course or study programme and then, as a teacher, attempting to plan and teach according to the students’ styles, i.e. matching and/or mismatching of student styles (Nielsen 2006; Sternberg & Zhang, 2005; Zhang, 2006; Hayes & Allinson, 1993). Nielsen (2009) argues that there is a divide between the theorists and researchers on one side and the community of practitioners on the other. As pointed out by Nielsen (2008), many more teachers and planner could make practical use of the theories and research on the learning styles

* Address for correspondence: Tine Nielsen, Centre for Clinical Education, Rigshospitalet, Afsnit 5404 Teilumbygningen, Blegdamsvej 9, DK-2100 København Ø, Denmark. (Phone: 004535455415 – email: tine.nielsen@rh.regionh.dk)
of higher education students, if not for the nature of this research making the challenge of considering students’ style-wise diversity a hard one: the number of theories on styles makes it difficult for practitioners to choose the right one for their purpose. The growing internationalisation in higher education is not replicated in the research. The research has been conducted within a multitude of theories with many different groups of students, at different points of measurement during the time span of university study and employing a multitude of methods of analysis. The low degree of comparability of the research makes it practically impossible for practicing teachers to evaluate the pedagogical and didactical potential of the findings on a more general level, let alone employ them in their teaching. Looking briefly into the findings on discipline-specific differences in the cognitive, thinking and learning styles of higher education students demonstrates their lack of comparability and the challenge of implementing them (see for example Baldwin and Reckers, 1984; Fer, 2007; Nielsen; 2005a; Seidel and England, 1999; Witkin, 1976; Zhang, 1999; Zhang & Sachs, 1997).

Many questions, which if answered could provide valuable information to planners and teachers in designing introductory, first-term and later courses for specific study programmes, remains to be investigated. For example: whether students’ choice of study discipline is associated with their styles? Whether students’ styles change in certain ways according to their discipline, age, gender or their level of styles upon admittance?

1.1. Taking on the challenge

Considering university students’ style-wise diversity then actually means taking on the challenge of conducting research which will provide the community of university teachers and planners with applicable knowledge. The research should, as suggested by Nielsen (2009), be conducted within a relatively small number of style theories, for which the pedagogical potential has been documented or can be argued theoretically. Also the design of the research across studies should be such that it allows teachers and planners to compare and aggregate the results. Only through comparable research will the research community succeed in enhancing the practical application of findings on university students’ styles.

The aim of the present study is to investigate whether higher education students’ learning styles upon admittance differ dependent on their choice of study programme, controlling for relevant student characteristics, such as gender, age and year of admittance.

2.Methods

2.1 Participants and instruments

The sample consists of 460 students admitted to Copenhagen Business School over a period of three years. These 460 students make up 93% of the admitted students and 97% of the tested students. Of the 460 students, 88 where admitted to the BSc in Business Administration and Information Technology Programme (IT) in 2009. The remainders of the participants were admitted to the BSc in Business Administration and Psychology Programme (Psych.) in 2007, 2008 and 2009 (Table 1).

<table>
<thead>
<tr>
<th>Table 1: The sample broken down on study programmes and year groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td>Admitted students</td>
</tr>
<tr>
<td>Students tested with D-SA-LSI (%) of admitted</td>
</tr>
<tr>
<td>(% of admitted)</td>
</tr>
<tr>
<td>Sample: students agreeing to test used for research (%) of admitted</td>
</tr>
<tr>
<td>(% of admitted)</td>
</tr>
<tr>
<td>(% of tested)</td>
</tr>
</tbody>
</table>
The gender distribution of the participants is comparable across the three year groups admitted to the BSc BA. Psych. programme, with approximately 75% female and 25% male students. The group of IT students had 85% male and 15% female students. The mean age and age range of the four year groups of students are similar; the mean age is between 21 and 21.9 years, and the age ranges from 18 to 30 (IT) to 18 to 45 (Psych., 2008).

The Danish Self-Assessment Learning Styles Inventory (D-SA-LSI, Nielsen, 2005b; Nielsen & Kreiner, 2005; Nielsen et al., 2007) was administered to the students upon admittance. The administration procedures were identical, except for the administration media: for the 2007 and 2008 year groups, the D-SA-LSI was administered in a paper-pencil version, whereas for the two 2009 year groups, it was administered in a computer-based version. The two versions of the D-SA-LSI are psychometrically comparable.

The D-SA-LSI is a Danish adaptation of Sternberg’s (1997) Thinking Styles Inventory (TSI) specifically measuring 14 learning styles within the theory of mental self-government. The D-SA-LSI is a self-report inventory with 98 statements rated according to how well they describe participants in learning situations in the context of their university study, using a seven-point polytomous answering scale (“not at all” to “extremely well”). The D-SA-LSI has shown good reliability and validity with earlier samples, as determined by graphical loglinear Rasch models (Kreiner & Christensen, 2002), and the reliability of the learning style scales are comparable to the reliabilities for a Chinese short version of the TSI (Zhang, 2002) and the reliabilities for an earlier version of the TSI (Sternberg, 1994).

2.2 Analyses

To test the primary hypothesis, multiple analyses of variance were conducted. In each analysis, the same four independent variables were included in the starting model: gender, age group (18-20, 21-22, 23 and older), study programme (BSc BA. IT, BSc BA. Psych.) and year group (2007, 2008 and 2009). The starting model was defined by the main effects of the independent variables and all two-way interactions between them. Interaction terms and main effects were excluded from the models by backwards model search procedures, removing only one term in each step while observing the hierarchic principal for interactions in regression models (Kreiner, 2007). To ensure that the model found was the correct model, a further step of model search was employed: adding all possible interactions of the variables in the model and repeating a backwards model search until a final model was determined.

3. Results

First, the main results, concerning the main (direct) effect of the primary independent variable study programme, are presented. Second, the control results, concerning the main effects of the control variables gender, age group and year group, as well as any interaction effects between any of the four independent variables, are presented.

3.1 Main results

For five learning styles (Oligarchic, Anarchic, Democratic, Global and Internal), no significant group differences defined by study programme or any of the three control variables were found.

For five of the remaining nine learning style, significant group differences defined by study programme were found (Table 2):

- With two learning styles (Local and External), significant group differences were only determined by study programme: on the Local learning style, IT students scored 1.5 points higher than Psych. students. On the External learning style, IT students scored 1.9 points lower than Psych. students.

- With three learning styles (Executive, Judicial and Progressive), study programme was but one variable determining significant group differences. However, in all these cases, study programme was a main effect variable, and as such independent of the effect of the control-variables: on the Executive learning style, IT students scored 3 points higher than Psych. students. On the Judicial learning style, IT students scored 2 points lower than Psych. students. On the Progressive learning style, IT students scored 2.3 points lower than Psych. students.
### Table 2: Results of multiple analyses of variance

<table>
<thead>
<tr>
<th>Measure</th>
<th>Leg</th>
<th>Exe</th>
<th>Jud</th>
<th>Mon</th>
<th>Hier</th>
<th>Loc</th>
<th>Ext</th>
<th>Prog</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$ male</td>
<td>1.2*</td>
<td>-5.0***</td>
<td>2.1**</td>
<td>-</td>
<td>-1.8**</td>
<td>-</td>
<td>-</td>
<td>2.6**</td>
<td>-1.9**</td>
</tr>
<tr>
<td>$\beta_{18-20,\text{years}}$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.9*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-3.4***</td>
<td>4.1***</td>
</tr>
<tr>
<td>$\beta_{21-22,\text{years}}$</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.3**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-4.2***</td>
<td>3.4**</td>
</tr>
<tr>
<td>$\beta_{\text{IT}}$</td>
<td>-</td>
<td>3.0**</td>
<td>-2.0*</td>
<td>-</td>
<td>-</td>
<td>1.5*</td>
<td>-1.9**</td>
<td>-2.3*</td>
<td>-</td>
</tr>
<tr>
<td>$\beta_{2007}$</td>
<td>-</td>
<td>-1.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-3.2**</td>
<td></td>
</tr>
<tr>
<td>$\beta_{2008}$</td>
<td>-</td>
<td>-1.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-2.7**</td>
<td></td>
</tr>
<tr>
<td>$\beta_{\text{male} \times 2007}$</td>
<td>-</td>
<td>4.2*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$\beta_{\text{male} \times 2008}$</td>
<td>-</td>
<td>3.9*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$F$</td>
<td>5.49*</td>
<td>3.80**</td>
<td>5.42**</td>
<td>4.29*</td>
<td>9.39**</td>
<td>5.15*</td>
<td>7.86**</td>
<td>8.33***</td>
<td>5.42***</td>
</tr>
<tr>
<td>Df</td>
<td>1,458</td>
<td>6,453</td>
<td>2,457</td>
<td>2,454</td>
<td>1,455</td>
<td>1,457</td>
<td>1,457</td>
<td>4,453</td>
<td>5,453</td>
</tr>
</tbody>
</table>

Notes.
- * p < .05, ** p < .01, *** p < .001
- 1. The last category was defined as the reference category in the analyses, so $\beta$-values are given for the remaining categories.
- 2. Degrees of freedom are given as “df for corrected model, df error”.

### 3.2 Control results

Beyond the effect of study programme, one, two or all three of the control variables co-determine significant group differences in the case of seven of the nine learning styles (Table 2):

Significant group differences in the Legislative learning style were only determined by gender; male students scored 1.2 point *higher* than female students.

The main finding of study programmes differences in the Executive learning style was supplemented by a significant interaction effect between the two control variables gender and year group (Table 3).

#### Table 3: Interaction effect ($\beta$) of year group-by-gender on the Executive learning style

<table>
<thead>
<tr>
<th>Year group</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>-2.5</td>
<td>-1.7</td>
</tr>
<tr>
<td>2008</td>
<td>-3.0</td>
<td>-1.9</td>
</tr>
<tr>
<td>2009</td>
<td>-5.0</td>
<td>0</td>
</tr>
</tbody>
</table>

In addition to the main finding of study programmes differences in the Judicial Learning Style, a significant gender difference was found; male students scored 2.1 points *higher* than female students.

Significant group differences in the Monarchic learning style were only determined by age; students aged 18–20 scored 1.9 points *lower* than students aged 23 and older, and students aged 21–22 scored 2.3 points *higher* than the students aged 23 and older.

Significant group differences in the Hierarchic learning style were only determined by gender; male students scored 1.8 points *lower* than female students.

In addition to the main finding of study programmes differences in the Progressive learning style, significant gender and age group differences were found; male students scored 2.6 points *higher* than female students. Students aged 18–20 scored 3.4 points *lower* than students aged 23 and older, and students aged 21–22 scored 4.2 points *lower* than the students aged 23 and older.

The Conservative learning style did not depend on study programme, but significant group differences determined by all three control variables were found; male students scored 1.9 point lower than female students. Students aged 18–20 scored 4.1 points higher than students aged 23 and older, and students aged...
21–22 scored 3.4 points higher than the students aged 23 and older. The 2007 year group scored 3.2 points lower and the 2008 year group scored 2.7 point lower than the 2009 year group.

4. Discussion and implications

4.1 Gender differences

With regard to gender, significant differences between male and female students at the time of admittance were found on five learning styles. Male students scored significantly higher on the Legislative, Judicial and Progressive learning styles than did female students, while female students scored significantly higher on the Hierarchic and Conservative learning styles.

Comparison of these findings with gender differences reported in other studies showed that there are both consistencies and inconsistencies. The present finding that male students scored higher on the Legislative style than female students is supported by the findings of E. Cheung (2002). The present finding that male students scored higher on the Progressive style is supported by findings of F. Cheung (2002)\(^1\) and E. Cheung (2002)\(^1\). The present finding that male students scored higher on the Judicial style is supported by an identical finding in the study of Zhang and Sternberg (2001), but not by the opposite finding by Verma (2001). The present finding that male students scored lower on the Hierarchic and Conservative styles is not comparable to any other findings. In addition, a number of other studies, including one Danish study, have reported that male students scored higher on the Global style than did female students (Nielsen, 2005a; Zhang, 2003; E. Cheung, 2002\(^1\) and Zhang & Sachs, 1997). This and other findings (Verma, 2001; Zhang & He, 2003) (Zhang & Sternberg, 2002) are not replicated in the present study.

The practical implications of the collected findings on gender differences in the (learning) styles of students for course and lesson planning cannot, of course, be generalised. The findings point to the fact that course designers and teachers can expect some learning styles differences to be present in a class according to the gender distribution, information that could be useful in designing and teaching these classes (cf. Table 5). That is, the information that in a class with predominantly male students the dominant ways of thinking when learning among the students will probably be preferences for self-controlled problem definition, strategy making, dealing with new areas and methods and working at a rather abstract and general level. While a class with predominantly female students will most probably be characterised by a lack of preferences for the same ways of thinking when learning. The information does, of course, also hold significance across any gender distribution in a class. However, more studies are needed to make more and genuinely general claims towards the practical usefulness of gender differences in styles for university teaching.

4.2 Age group differences

With regard to age, significant group differences were found between the older group of students (aged 23 and older) and the two younger age groups (aged 18-20 and 21-22) on three learning styles at the time of admittance: the group of 23 and older scored significantly lower than the two younger age groups on the Monarchic and Conservative learning styles, and significantly higher on the Progressive learning style.

As with the gender differences, comparison of the present findings on age group differences with findings reported in other studies showed that there are both consistencies and inconsistencies. The present finding that the older group of students (aged 23 and older) scored higher on the Progressive style is supported by the findings of Nielsen (2005a) and Zhang (1999). The present finding that the older group of students (aged 23 and older) scored lower on the Conservative style is supported by the findings of Zhang (1999). In addition, two studies (Zhang, 1999 and Zhang & He, 2003) have found that older students score higher on the Hierarchic and External styles than do younger students. The present finding that the older group of students (aged 23 and older) scored lower on the Monarchic style is not replicated elsewhere. In addition, three studies (Nielsen, 2005a; Zhang, 1999; Zhang & He, 2003) have reported individual findings on age differences in the single styles of university students.

Accordingly, the existing research suggests that the older university students are, the weaker their preferences for working with known areas of knowledge and methods are. And at the same time, the older

\(^1\) In Zhang & Sternberg (2006).
the students are, the stronger are their preferences for working with new areas of knowledge and methods, for solving problems in a prioritized way and for working with others when learning. This knowledge is useful both in designing classes and teaching them, since (as with gender) the age distribution of a class or intake of students is readily available to planners and teachers. However, it is clear that more studies are needed to make more and genuinely general claims towards the practical usefulness of age differences in styles for university teaching.

4.3 Study programme differences at the time of admittance

With regard to the main concern of this study, namely learning styles differences at the time of admittance between groups of students admitted to different study programmes, the findings were, as expected, that some such significant differences were found. Significant differences between Psych. and IT students on five learning styles at the time of admittance to the respective study programmes were found: on the Executive and Local learning styles, IT students scored significantly higher than did Psych. students. On the Judicial, External and Progressive learning styles, Psych. students scored significantly higher than did IT students.

What is pointed out by the present findings is that there are differences in the learning styles of students choosing to study BSc Business Administration and Psychology and students choosing to study BSc Business Administration and Information Technology, and that these differences are present already at the time of admittance. In practical terms, these findings hold promise for planners and designers of first term courses as well as the teachers – at this point in time for the particular study programmes, but, with additional studies, in the longer term at a more general level as well. A number of the courses and classes in the two study programmes are either identical or very similar due to the element of business administration in both, and in some cases there will even be teachers who teach these classes in both (and other business) programmes. Consequently, it is indeed useful information that the IT students scored significantly higher on the Executive and Local learning styles, i.e. they had stronger preferences for solving pre-defined problems by pre-defined methods and for detailing with details and more pragmatic problems, than did Psych. students. On the other hand, it is equally useful information that the Psych. students scored significantly higher on the Judicial, External and Progressive learning styles, i.e. they had a stronger preference for analysis, evaluation and critique, for working with new areas of knowledge and new methods and for working with others, than did IT students.

The results of this preliminary study can be said to be both as expected and not. The main hypothesis stating that differences in the students’ learning styles upon admittance would depend on their choice of study programme, even when controlling for age, gender and year group, was confirmed with regard to some learning styles, but far from all. However, finding significant differences in five of the learning style determined by study programme when both of these programmes are business programmes, however with diverse foci (psychology and IT), also indicates that students’ ways of thinking are co-determinants of their choice of education subject-wise. One could argue that if the causal relationship under investigation was how students’ learning styles determine their choice of study programme, then the analyses should effectively have been conducted with learning styles as the independent variables (cause) and study programme as the dependent variable (effect). However, there were three inter-twined reasons for conducting the analyses “the other way round”: first, the study also included independent variables such as age and gender, which have been shown to determine differences in learning styles of higher education students. Therefore, it appeared more coherent to appoint study programme to be an independent variable along with the variables age and gender. As such the analyses performed are classical sociological analyses of association, even if the formal causality of the association between learning style and choice of study programme is reversed. Second, the assumption that future studies will include a large number of study programmes. This would mean that having study programme as a dependent (and nominal) variable would limit the choice of analysis methods to methods that are not mainstream among non-statisticians (e.g. loglinear analysis). A choice of such a method would not serve the greater purpose of this or future studies, which is to facilitate comparable studies. Third, the probability argument referred to as Bayes’ Theorem (Bayes, 1763),

\[ P(Y \mid X) = \frac{P(X \mid Y) \cdot P(Y)}{P(X)} \]

or in words: the conditional probability of Y given X is the same as the conditional probability of X given Y multiplied by the ratio of the probability of Y and the probability of X. Replacing X with learning style and
Y with study programme, we then have the statement that the conditional probability of choosing a study programme given the learning style is equal to the probability of the learning style given the choice of study programme multiplied by the ratio of the probability of the study programme on the probability of the learning style. This means that the assessment of the strength of the causal effect of Y on X can be estimated by analysis of regression of X on Y, as effectively done in the present study.

The finding of only two cohort effects (year group) on the students’ learning styles—and one being an interaction effect with age – further supports the notion that students ways of thinking are co-determinants of their choice of education subject-wise, since in this limited study, these effects appear to be stable across year of intake. This should, of course, also be investigated further in a larger study with multiple year groups and several more study programmes.

The findings imply that the main hypothesis is valid and worth investigating further in studies with many more study programmes and year groups included. It is proposed that such studies also include higher education programmes at differing levels, for example, what in Denmark is called short and medium-long higher education (non-university), such as programmes towards degrees in assistant nursing, nursing, primary school teaching, child care – since it could also be argued that not only do students’ preferred ways of thinking, when learning, have an effect on their choice of which subject they should study, but also the level at which they choose to do this.

5. References


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Exploring Teaching and Learning Conceptions and Questioning Intentions of Biology University Teachers

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Abstract

Many researches on teaching in higher education report an internal relationship between teaching and learning conceptions and the adopted teaching practices. The present study is part of a broader research project aiming at understanding more deeply the relationship between teachers’ conceptions, beliefs and motivations and their questioning practices, taking into account the intentions beneath these particular instructional behaviour. Following the stated research purpose, and using as a theoretical reference the concept of Preferential Teaching Approach (PTA), five University teachers, lecturing biology undergraduates, were accompanied during an entire academic year (2010/2011). Data was collected by non participant lecture observation, regular informal meetings and three interviews. All these moments were audio-taped and verbatim transcribed for further analysis. This paper reports work in progress and focuses on the qualitative analysis of data gathered by one task-based interview where teachers were asked to categorize particular Teacher Questioning Practice (TQP), using lecture dialogue transcripts, in order to trigger and support their reflection about questioning. By adopting mainly a ‘template analysis’ approach (Robson, 2002) it is intended to identify and describe the main aspects focused by each teacher during the interview in order to explore more systematically their questioning intentions during undergraduate biology lectures. Findings are being crossed with teacher’s teaching and learning conceptions, already identified and described in previous work (Pedrosa de Jesus & Silva Lopes, 2009), and reconfirmed in this particular study through the application of the Portuguese validated version of the Revised Approaches to Teaching Inventory (ATI-R) to each teacher. First results reveal that lecturers with opposite PTA, therefore different teaching and learning conceptions, focus on distinct advantages and purposes for teacher’s and students’ questions. These outcomes seem to be rooted on distinct conceptualizations of ‘questions functionality’, leading to different questioning intentions when interacting with students. These intentions were called: Product oriented questioning focused on teachers’ benefits and Process oriented questioning focused on conceptual sharing between teacher and students. Considering that research on questioning evidences that teachers’ questions play a relevant role on the quality of the teaching-learning processes, we believe that the discussion of these five cases provides important insights, contributing for a better understanding of this complex pedagogical practice. Relevant outputs for designing strategies for professional development, aiming at promoting quality teaching at university level, are also identified.

Keywords: Teaching and Learning conceptions, higher education, questioning, task-based interview, professional development

1. Introduction

1.1 Teaching in higher education – research on ‘theory’ and ‘practice’

A strong body of literature concerning research studies about teaching in higher education evidence an internal relationship between ‘teaching conceptions’ and ‘theories of action’ (Norton et al., 2005; Oosterheert & Vermunt, 2001; Kane, Sandretto & Heath, 2002). Similar findings were reported by Kember and co-workers (Gow and Kember, 1993; Kember and Kwan, 2000) recognizing strong relations between the orientation (concept) to teaching and the adopted teaching and assessment methods. Indeed, at a conceptual level, teacher’s beliefs (‘theory’) and instructional behaviour (‘practice’) seem to be interrelated (Barak & Shakman, 2008), and can therefore be used to infer about each other.

Self-reported practices of university teachers have also revealed the usefulness of inferring about teaching and learning conceptions. For example, Trigwell and colleagues have been investigating preferential teaching approaches (PTA) in the context of Higher Education. One of their first works (Trigwell & Prosser, 1993) focused on the phenomenological analysis of twenty four interview transcripts of first year lecturers
Findings allowed the identification and description of five different approaches to teaching, each ‘type’ aligned with different teaching and learning conceptions. At the ‘Information Transmission Teacher Focused – ITTF’ pole, teaching is based on the transmission of contents from the syllabus or the textbook, and learning is perceived as ‘information acquisition’, driven and assessed by external factors to the students. At the other pole, the ‘Conceptual Change Student Focused - CCSF’ approach, learning is discussed in terms of developing personal meaning through conceptual development and/or change, while teaching is perceived as supporting the students in this process (Trigwell & Prosser, 1996; Trigwell & Prosser, 2004). According to these authors, conceptions influence teaching intentions and consequently ‘drive’ the adoption of specific teaching practices. Considering this internal relationship, Trigwell and co-workers developed an instrument – the Approaches to Teaching Inventory (ATI) – that allows the identification of the preferential teaching approach, and therefore teaching and learning conceptions. The most recent version of this instrument (Trigwell, Prosser & Ginns, 2005) includes twenty two sentences, describing each one a specific teaching intention and/or teaching strategy. Although unknown to the respondent, each sentence reflects one of the two ‘opposite’ teaching conceptualizations. Teachers are asked to focus on a specific discipline, course or subject and to place themselves for each item on a Likert scale from one (rarely) to five (always). PTA identification is based on the mean numeric response to the twenty sentences of the inventory.

1.2 Teachers’ questioning practices (TQP) and preferential teaching approaches (PTA)

The promotion of a true spirit of inquiry can improve the quality of teaching and, consequently, the quality of learning (Chin, 2007; Chin & Osborne, 2008; Pedrosa de Jesus & Moreira, 2009). Several studies show that questions could help to scaffold ideas, organize tasks and encourage reflection (Watts & Pedrosa de Jesus, 2006).

On what concerns teachers’ questions, Gunel (2008) defined them as a complex ‘pedagogical practice’ reporting a variety of questioning behaviours taking into account complementary features, such as wait-time, cognitive level and body language. Indeed, different teachers seem to use questions during classes in different ways. It is argued that these observed differences might be rooted in different concepts and beliefs of the teachers (Barak & Shakman, 2008).

Taking into account the relevance of the questioning processes in the quality of teaching and learning, and the lack of empirical evidence confirming the internal relationship between teaching conceptions and instructional practices, namely questioning, a research project involving the observation of a group of five university teachers in natural lecture settings was designed and implemented during two following academic years. Findings allowed to identify a relationship between particular questioning practices (Table 1) and Preferential Teaching approaches: ITTF teachers were identified as using lower percentages of self-answers than their CCSF colleagues, having also less success in obtaining a student intervention, particularly student questions. Higher frequencies of students’ participation with CCSF teachers seem to be related to the fact that these teachers had more often a more cognitive stimulating attitude towards students’ interventions (Pedrosa & Silva Lopes, 2009). Therefore, the outputs of this project allowed reinforcing the complementary relationship between teaching conceptions and the adopted teaching practices, such as questioning (Pedrosa-de-Jesus & Silva Lopes, 2011). Based on these results it is believed that TQP can be a useful indicator of the main PTA of a university teacher and, consequently, his teaching and learning conceptions (Table 2).

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1 Our understanding of the importance of question in the quality of Teaching and Learning process is rooted on Clarks’ (1996) concept of ‘joint action’. In order to understand more deeply the pedagogical implications of questions it is important to go beyond ‘isolated’ interrogation, moving from question to ‘questioning’. In this sense, it is important to analyse not only the questions per se but also the behaviours that the formulation of one question induce on others. Consequently, it matters to look at the questions and the obtained answers. Behaviours that emerge when a solicited answer is not obtained are also relevant.
Table 1: Main categories of TQP (agreement percentage of respondent validation over 85% - Pedrosa-de-Jesus & da Silva Lopes, 2009)

<table>
<thead>
<tr>
<th>Event</th>
<th>TQP – main description</th>
</tr>
</thead>
</table>
| Absence of a solicited student answer | **Re-initiation effort**: the teacher repeats the question or reformulates it, maintaining or lowering the difficulty level of the previous question.  
**Self-answer**: the teacher answers to his/her own question, continuing with the discourse or moving to another question. |

<table>
<thead>
<tr>
<th>Event</th>
<th>TQP – main description</th>
</tr>
</thead>
</table>
| Student answer | **Dialogic reaction (Feedback)**: the teacher engages with the expressed student’s reasoning (independently of the scientific correctness of the answer), stimulating the students’ intellect.  
**Non dialogic reaction (Feedback)**: Scientific correctness of the answer might be evaluated, but the teacher does not explore the students’ reasoning/idea/perspective and does not stimulate further reasoning. The teacher doesn’t engage in generating new and shared meaning. |

<table>
<thead>
<tr>
<th>Event</th>
<th>TQP – main description</th>
</tr>
</thead>
</table>
| Student question | **Dialogic reaction**: the teacher engages with the expressed student’s reasoning (independently of the scientific correctness of the answer), stimulating the students’ intellect.  
**Non-dialogic reaction**: Scientific correctness of the question might be evaluated, but the teacher does not explore the students’ reasoning/idea/perspective and does not stimulate further reasoning, generating new and shared meaning. |

<table>
<thead>
<tr>
<th>PTA</th>
<th>Theory/Cognition’</th>
<th>Practice (teacher questioning practice - TQP)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ITTF</strong></td>
<td>Learning Concept*</td>
<td>Teaching Concept*</td>
</tr>
</tbody>
</table>
| Accumulating information with the aim of accomplishing external demands | Transmitting information (‘teaching by telling’) | Students acquire the contents of the discipline, being able to connect them. | Teachers refer when students asks a question, they answer the question, not changing the planned structure of the lesson. | Higher Frequency of self-answers  
Re-initiation efforts commonly with lower level of difficulty (inducing the answer)  
Very high frequency of non dialogic reactions to students interventions, particularly questions |

| **CCSF** | Construct personal knowledge by confronting and changing perception of concepts. | Support students in developing and changing their concepts | Creating opportunities of confronting and changing students’ perception in order to help them to construct their knowledge. | Teacher stated that student questions are an important element of the lesson. The teacher encourages questions and uses them to interact with students. | Very low frequency of self-answers  
Re-initiation efforts are frequently of the same level of difficulty  
Frequent dialogic reaction, particularly to students answers |
2. The present study

2.1. Contextualization

The work reported here is part of a broader naturalistic research project implemented in the context of undergraduate biology courses of a Portuguese university, aiming at promoting conceptions and instructional practices that integrate the valorization and development of teachers’ and students’ questioning skills. Considering that the intention is to investigate teaching and learning processes in natural settings, such as ‘real’ lectures, a Co-researcher Model (Macaro & Mutton, 2002) was adopted, implying a close collaboration between education researchers and a group of five university teachers (designated as Teachers A,B,C,D and E).

The design of the global research follows a qualitative (Tuckmann, 1999; Cohen, Manion and Morrison, 2003) or flexible (Robson, 2002) approach. Data has been gathered mainly by:

a) Lectures observation: one science education researcher acts mainly as a non-participant observer, annotating relevant teacher’s and student’s behaviours in a grid designed for this particular research project (Pedrosa de Jesus & Da Silva Lopes, 2009). Occasionally, non-participant observation switched to participant observation due to specific teacher solicitations.

b) Semi-structured interviews to teachers and students before, during and after the semester. Verbal discourse from lectures and interviews was audio-taped and has been verbatim transcribed in order to allow a more detailed data analysis.

Considering the close and ‘daily’ collaboration between the teachers and the researchers, many opportunities emerged to gather data, in a more ‘informal’ way, for example the e-mail correspondence and the ‘quick chats’ between lectures. Taken into account the richness and authenticity of this type of data, one of the researchers has been writing a research journal (Robson, 2002) in order to keep a detailed record of these collaboration moments. Due to the extended involvements with the teachers, the educational researchers ended up fully immersed in the day-to-day life with the lecturers being studied. These characteristics and conditions also confer ethnographic features to this research project (Robson 2002; Tuckman, 1999).

2.2. Main aim and research questions

Findings from previous research allowed the identification and description of a relationship between Preferential Teaching Approaches (PTA), Teaching and Learning Conceptions and Teacher Questioning Practices (Pedrosa de Jesus & Silva Lopes, 2011). However, drawing from Maxwell’s (1992) ‘types of understanding’, much work has still to be done in order to deepen the level of interpretation and explanation of the identified PTA and TQP patterns. We believe that it is only through capturing and understanding the ‘whole picture’ of the individuals and the context that is being studied, that is it possible to have a chance to effectively promote quality questioning at university level.

Work in progress leads us to the design of a particular interview strategy in order to create the opportunity to explore teachers’ understanding and conceptualization of the questioning processes in the context of their lectures. Based on the stated research purpose, the following research questions were defined:

- What are the main aspects identified by the teachers, when asked to reflect about the questioning processes (teacher and students) in the context of their lectures?
- Is it possible to establish a relationship between the expressed teachers’ questioning intentions and their preferential teaching approaches (and therefore their teaching conceptions)?
2.3. Methodology

2.3.1. Data gathering

In order to confirm the teachers’ PTA, therefore their main teaching conceptions, each teacher responded to a Portuguese validated version of the ATI (Pedrosa de Jesus, Silva Lopes & Watts, 2008). The aim was to cross this quantitative data with the qualitative data obtained by one particular semi-structured interview with each teacher, conducted at the end of the academic year of 2009/2010. Each interview had a mean duration of ninety minutes and was audio-taped, following the same design identified as ‘task based’ approach (Koichu & Harel, 2007). During this type of interview, the whole ‘interrogation’ process is based on the fulfillment of a particular task by the interviewee consisting, in this particular study, the categorization of the teacher questioning practices (TQP) by reading five lecture transcripts. The interview was organized into two main moments. First the interviewer identified the main purpose of the interview, delivering and explaining the organization of a written document integrating the description of the adopted TQP categorization system (Pedrosa & Silva Lopes, 2009) and the five lecture-dialogue transcripts (see Figure 3). After this, each teacher was asked to read the first dialogue for himself and then to ‘think out loud’ during the categorization exercise. Based on the expressed reasoning the interviewer asked particular follow-up questions. This process was then repeated with the remaining four dialogues. Teachers were free to express any doubt or to comment any aspect whenever they considered it important. Some interview questions were common to all teachers (such as: ‘In the dialogue transcript what is your comment about the way the teacher deals with the students’ non-answers?’, ‘How do you feel with the students’ silence after one of your questions?’), other emerged as a particular output of the ideas and meanings that were being shared during the interview process, as the following excerpt illustrates:

Teacher A (reading lecture dialogue 1) – I don’t think that we can consider this behaviour a feedback. The teacher…is trying to make him [the student] talk more, but he didn’t say to him if his answer is correct or wrong.

Interviewer – What do you mean by that?

Teacher A – I understand what the teacher is doing here…he is trying to explore other reasoning with the students…but well…first you have to say if the reasoning is correct or not. You might say “No, what you say is wrong. Let us explore this reasoning...”

Interviewer – So, you think that the evaluation of the scientific correctness (right or wrong) is important...?!

Teacher A – Yes.

Interviewer - Can we say that informing about the scientific correctness of a question/answer stands for the definition of ‘giving feedback’? Do you agree with this statement?

Teacher A – Yes, exactly. We have to confirm to the student what he is saying is scientifically correct or not. And if it is wrong we, as teachers, have to correct it.

2.3.2. Content analysis of the interview transcripts: the template approach

Interview transcripts are being subjected to content analysis, supported by the NVivo 9 software. Considering that key-codes were determined both on a priori bases (derived from theory and research questions) and from an initial read of data, the adopted analysis approach can be identified as a template approach (Robson, 2002). In order to obtain the first holistic impression, we have started by a global reading of the five transcripts. Insights emerging from this ‘diagonal reading’ were annotated, a procedure designated as memoing (Robson, 2002). The same procedure is being adopted along the entire process of analysis transcripts. Combining the initial reading with the literature findings,

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2 The five dialogues that were used correspond to excerpts of lecture’s dialogue transcripts of previously observed lectures from the same group of teachers. The same five episodes were used with all teachers. None of the episodes was identified. The adopted TQP categorization system refers to the one described in Table 1.
integrating the conceptual framework of the present study, namely the investigation related to the concept of PTA, a set of initial key-codes, or template, were defined (see Figure 4). Naturally, this template has been ‘evolving’ throughout the reading and reflection process: new codes and sub-codes emerged and were integrated. The establishment of new codes implied repeating the reading of the previous transcripts in order to minimize bias by excluding relevant thoughts expressed by the teachers. For instance, the adoption of a specific categorization during the reading of the third interview, implied to reread the first and second interviews in order to make sure that the information that lead to the definition of a new code wasn’t present in any earlier read transcript, having been overseen. Once the analysis of the individual transcripts is completed it is planned to proceed with a more complex matrix analysis (Robson, 2002), integrating the use of network maps, flow charts and diagrams.

3. Preliminary Findings - an interim summary

To enrich the analysis and reduce threats to validity (Garrison et al., 2001; Robson, 2002) the interview data are being crossed with the mean numeric response of the teachers to the Portuguese version of the ATI (Table 4). The identification of the PTA of each teacher allows to complement the analysis with the corresponding teaching and learning conception, already described in previous studies (Pedrosa de Jesus, Lopes & Watts 2008; Pedrosa de Jesus & Silva Lopes, 2011).

As previously stated, content analysis of all interview transcripts is still being undertaken. Data from Teacher E will be excluded from the discussion of the preliminary findings since this interview transcript is not completely analysed.

Due to the ethnographical nature of this study and the prolonged involvement of the five teachers with the educational researchers, we would like to emphasise that the insights and knowledge obtained from other strategies, which are not reported here, increase our trust about what has been found so far, which is briefly described in the following sections.

3.1. Teachers’ expressed thoughts about questioning

3.1.1. Teacher questions

Both teachers identified as having an ITTF approach, indicating that they conceptualize learning as ‘transmitting contents’, stated that they ask the majority of the questions at the beginning of the lecture, in order to quickly review the contents covered in last lecture and to see if ‘students had done their work at home’ (Teacher A). It was also stated that frequently they don’t obtain any (correct) student answer, because students are immature (Teacher B) and ‘they just study at the eve of the exam’ (Teacher B). On contrary, both CCSF teachers, and particularly teacher D, stressed out the fact that they try to question students throughout the lecture, in order to ‘make them talk with each other’ (Teacher D). Teacher C went further on his reflection and stated “I use questions to crystallise students’ understanding...and to make the knowledge of one student concrete to other students...I would like that students would have always present the implications of what is said...which knowledge is related and ... constitutes the basis of one short answer...where does it fit...what is beneath and beyond that answer ... that particular reasoning”.

While ITTF teachers explained the low frequency of students’ answers by focusing on students’ characteristics, both CCSF teachers tended to focus their attention on the difficulty to resist the temptation in self-answering the question. Interestingly, the teacher identified in previous studies (Pedrosa de Jesus & Silva Lopes, 2011) as the teacher that used less self-answers (Teacher C), was the most self-critical during the task-based interview, stating “I have always the feeling that I am self-answering to my questions. Frequently while I am lecturing I think...ok there...I am again answering to myself? ... but sometimes it takes so long for students to answer!”
Figure 3: Example of a TQP categorization sheet of the task based interview

<table>
<thead>
<tr>
<th>Teacher-Student Dialogue</th>
<th>I</th>
<th>Please put a cross (X)</th>
<th>Please identify the line (eg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic – Sterilization techniques</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T: Tell me, what type of substance can be sterilized in damp heat?</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std: Culture media.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T: Exactly, you already talked about this in laboratory classes. Give me an example of a solution that has to be sterilized by filtering</td>
<td>II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std: X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T: You don’t remember anything? Well I remember one thing, that you aren’t studying. Try to remember what was said in the laboratory session...</td>
<td>III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std: The solutions if they went to dry heat, it wouldn’t, this is/ (teacher interrupts the student)</td>
<td>IV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T: /No. That we have already talked, for example sterilization of culture media. Now the solutions that are sensible to the heat can’t go, much lesser to damp heat, isn’t it so? Give me two examples of solution.</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std: X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T: Or just one example if you prefer. What was the example I gave you?</td>
<td>VI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Std: X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T: Vitamins and antibiotics.</td>
<td>VII</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Please specify:**

---

*Re-imitation effort*

*Self-answer*

*Non dialogic feedback (this is reaction to a student answer)*

*Non dialogic reaction to student question*

*Other behavior*
On what concerns students’ questions, all teachers emphasized their appreciation when they are able to do so, because they are an indicator of students’ interest and motivation. Both ITTF teachers emphasise the fact of trying to answer the question immediately, except when they don’t really know the answer and have to do some research first. Interestingly, both teacher also ended up referring the ‘timing’ where students questions were more frequent, namely at the eve of the exam: ‘because that is the moment where they finally started to study’ (Teacher B) and ‘they ask those questions mainly to see if the teacher ‘drops’ some information about the test’ (Teacher A). This concern was not verbalized by the two CCSF teachers. However, when the interviewer asked each one if the students ask more questions at the eve of the exam, both agreed. Indeed, these teachers devaluate that...
particular student behaviour, considering it ‘normal’ (Teacher D). On the contrary, teacher A (ITTF) emphasised it repeatedly during the interview, expressing his frustration.

Finally, Teacher D stands out by stressing that he makes a ‘real effort’ for stimulating other students to answer to their peers’ doubt (instead of him), stating that students’ questions are ‘very positive and useful to stimulate other students to think and talk’. Teacher C, for instance, focused on the information that he was able to obtain through a student question and the reasoning he is making: “the reasoning expressed by a questions is more genuine because it don’t follow the traditional book format ... some students’ questions are, year after year, the same...which is interesting to reflect on...what does this say about their previous knowledge, their understanding schemata?”

3.1.3. Interpretation of the expressed thoughts – Inferring questioning intentions

Expressed thoughts about questioning seem to be coherent with the teaching and learning conceptions of both preferential teaching approaches (ITTF vs. CCSF) and also coherent with the observed teacher questioning practices described in a previous study (Pedrosa de Jesus & Silva Lopes, 2011).

Both CCSF teachers state that questions are useful to accommodate students’ contribution and to understand, explore and elicit students thinking in order to construct, or at least recall, their ‘knowledge foundations’ (Teacher C). Questions seem to be conceptualized as an instrument that creates an opportunity to share knowledge and meaning, being the starting point for teacher-student or student-student interaction. On the other hand, both ITTF teachers tend to focus not on the process but more on the product, this is knowledge acquisition itself: teacher questions are there to be answered by students, and student answers are formulated in order to be evaluated by the teacher considering their scientific correctness. Therefore, questions are the ending point of a teaching-learning process, since they are used to ‘verify’ (by the teacher) or to ‘accomplish’ (by the students) external demands.

3.2. Looking beyond questioning intentions – relevant insights for continuing professional development (CPD) strategies

The teachers’ espoused reflection during the task based interviews allowed us to perceive that they had stronger reactions when reading episodes where teachers had an opposite PTA, therefore teaching and learning conceptions. Despite the fact that the teachers didn’t know which teacher was involved in each episode, therefore ignoring the corresponding PTA, it was clear that they didn’t identify themselves with the questioning practices of teachers whose PTA doesn’t match with their own PTA.

It is also important to emphasise the strong positive teachers’ reaction towards the task based interview methodology. All of them stated that it was a very interesting experience, since it supported them on their reflection exercise by using ‘concrete’ examples of their own lectures.

It is believed that the design of professional development strategies which include the creation of opportunities for lecturers to analyse and discuss specific ‘classroom practices’ (such as questioning), particularly with mixed groups (this is, including ITTF and CCSF teachers), has great methodological potential for prompting teachers reflection even in higher education.

4. Concluding remarks

This report is aiming at exploring the main questioning intentions of teachers with different PTA and, therefore, teaching and learning conceptions. In order to chart and justify the obtained findings (Robson, 2002), a detailed description of the task based interview as a main adopted methodology, preceded the discussion of the obtained evidences.

Globally, lecturers identified as having opposite PTA seem to have distinct intentions when interacting with students through questions, being those intentions closely intricate to their teaching and learning conceptions. The two teachers identified as having an ITTF approach, indicating that they conceptualize teaching as ‘transmission of information’, described questions mainly as an instrument for and of the teacher. On the other hand, lecturers identified as having an CCSF approach, tended to focus their reflection on the fact that questions, whether it is a teacher question or a student question...
question, constitute a joint instrument to explore concepts, and that during this process it is possible to develop students’ awareness about their own reasoning abilities. This type of questions ‘functionality’ is strongly related with the learning concept ‘developing and changing personal meaning’. Drawing on this outputs, we argue that questioning intentions can be conceptualized in two broad, and opposite ‘typologies’: [0]Product oriented questioning focused on teachers’ benefits and Process oriented questioning focused on conceptual sharing between teacher and students.

It is believed that the present study deepens the understanding of the relationship between Trigwell and co-workers PTA (Trigwell & Prosser, 2004) and questioning practices in higher education. Besides extending the Preferential Teaching Approaches conceptual framework, and teaching and learning conceptions, the identification of two distinct questioning intentions might also be useful for the design of effective professional development strategies.

5. References


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Abstract

In a knowledge economy employees’ occupational expertise is important for organizations performance and competitiveness. In addition, occupational expertise enables employees to cope with changing job requirements (Van der Heijde & Van der Heijden, 2006). Research from De Grip, Van Loo & Sanders (1998) demonstrates large differences in level of expertise among people from different sectors. Therefore, it is a practically important as well as a theoretically interesting question what factors promote or impede occupational expertise of employees. The purpose of this research is to examine which person-related factors (self-directed learning orientation and career phase) and work context-related factors (job characteristics such as job demands and job control) are related to occupational expertise.

Hypotheses:

Self-directed learning orientation is positively related to occupational expertise.

Mid career phase is positively related to occupational expertise.

Job characteristics (job demands and job control) are positively related to occupational expertise.

These hypotheses were tested in employees of two different sectors.

Our sample comprised 499 employees working in finance (N=226; mean age= 38.79; 80% women) and health care (N= 273, mean age= 38.44; 39% women). Both web and mail questionnaires were used to collect the data. The survey contained measures for occupational expertise (Employability competences Questionnaire; Van der Heijde & Van der Heijden, 2006, α=.89), job demands (DISC; de Jonge & Dormann, 2006; α=.78), job control (Maastricht Autonomy Questionnaire; de Jonge, Landeweerd, & Van Breukelen, 1994; α=.92) and self-directed learning orientation (SDL-scale; Raemdonck, 2006; α=.85). Career phase consisted of three categories: beginning of the career (<35 years), middle of the career (35-49 years) and end of the career (> 50 years).

Descriptives and correlations between the different variables were calculated in order to explore the cohesion between the variables and univariate variance analyses were used to test the hypotheses.

Employees’ level of self-directed learning orientation and job demands are positively related to occupational expertise of employees working in finance and in health care. Moreover, job autonomy is positively related to occupational expertise of employees working in finance. Career phase shows a significant relationship with occupational expertise of employees working in health care. Employees in the beginning of their career demonstrated lower levels of occupational expertise compared to employees in the middle or end of their career.

The present study makes a contribution to our understanding of occupational expertise by providing theoretical insight into the relationship between job characteristics, self-directed learning orientation, career phase and occupational expertise. Next, our findings are of importance for the human resources development policy in all organisations which employ workers. HR officers should stimulate occupational expertise by researching job design and making changes or maintaining existing elements, where appropriate. It is also important for organisations to stimulate a self-directed learning attitude among employees who exhibit low levels of self-directed learning orientation.

Keywords: Occupational expertise, self-directed learning orientation, job characteristics, career phase
References


How Learning Styles of the Human Nervous System Connects Science and Technology and Art and the Humanities

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Abstract

The aim of this paper is to provide evidence, both, theoretical and empirical that the human nervous system processes the disciplines of science and technology and art and the humanities as one and the same. The relationship between the disciplines is multifaceted and established through the physical, biological, chemical and metaphysical associations in the brain. Knowledge of how this information is processed has potential impact on instructional strategies and therefore learning styles. The relationship will be illustrated through logical argument and the citing of references to physical evidence by addressing the concept of “consciousness” being separated into two sections known as, 1) the easy problem and 2) the hard problem. The former refers to awareness or things we can see and realize even when apparently unaware, such as in driving to a destination seemingly “automatically.” The latter refers to that which theologians have called the soul, and scientists have addressed as the intuitive, subjective and affective components of one’s personality, or behaviours in the cognitive emotional realm. Evidence in support of how the brain associates the disciplines of art and science can be found in the neurological functions of the brain. For example, Chompsky noted that laterality in the brain, allowed for phases of receptivity during specific periods of development. Zeki investigated the brain’s plasticity and the brain’s perception of color and light. This led to the understanding that the brain actually constructs an image as opposed to seeing one in its entirety. He also proposed that perception of color is a function of consciousness. Ramachandran and Zeki provided explanations as to how art and cognition are related. This was elaborated upon by Solso who stated that art is processed by the brain by different parts performing various specialized tasks, reacting to form, motion, color and that these are combined to yield a unified visual perception. This coincides with the work of Ramachandran on Synesthesia, a condition in which one neural pathway is stimulated and leads to an automatic, involuntary experience in another. He postulated the presence of a gene mutation which inhibits pruning of connections between brain cell modules may therefore lead to novel associations, such as; subjects, who when confronted with numbers saw colors. This led him to the possibility of hyperconnectivity throughout the brain. This might explain why Synesthesia is found more commonly among novelists, poets and artists. Science and cognition are related to art and cognition in that both attempt to relate a “truth” to the practitioner; the scientist observing and leaning about nature and the artist expressing his/her perception of some reality unique to him/her. Herb Simon, using heuristics, could model scientific discovery which involves creative thought in terms of normal cognitive processes, which are used in every day problem solving. He further theorized that these unifying concepts could encompass the artistic and even the specialized and technical domains. Unifying art and science is plausible through the connection between the processes of problem solving and the physiological processes which lead to creativity, or as Ramachandran might express it, hyperconnectivity among neuronal modules.

Keywords: neuroscience, cognition, art, science, learning

1. Introduction

Humankind has been trying to understand its environment and beginnings for as long as it’s been able to comprehend that as living beings, survival depends on knowledge, adaptability and communication. Two overpowering paradigms developed from this continuing quest for understanding, these are the cultures of art and science. So what then is art and what is science? Are they truly separate entities or do they just appear as though they are? C.P. Snow, the physicist, in the Rede Lectures in Cambridge (1959) explained that the two cultures do indeed exist and that this division was responsible for society’s inability to solve many of its problems of the day.

2. Nature of Science

Simply stated, science is a process by which humankind attempts to observe and understand nature. All the instruments used in the study of nature are simply designed to enhance man’s five senses. From the simplest
microscope to the most complex telescope, to the MRI or the cyclotron, all of these devices only augment man’s ability to minimize his limitations and therefore increase his chances of understanding his world. Indeed, science does not exist alone in the world. It stands alongside art, music, literature, and in short, the humanities. Science is influenced by all the human endeavors, such as politics, religion, and economics. And although it strives for objectivity, which is nature’s truth as it were, it is subject to human frailties and perceptions and therefore may give way to a certain degree of subjectivity or bias.

3. Nature of Art

Art is an attempt by the artist to communicate his/her perceptions or truth of their own world to others. This can be accomplished through the use of virtually limitless mediums, not the least of which are paint, clay, wood, marble, charcoal, etc. The artist, like the scientist is observing his/her surroundings and interpreting what is being observed. What’s important to note is that this communication to others is subject to the same pressures and influences that exert themselves on science. Admittedly, the artist’s work or activity might evoke a higher degree of emotion than that of the scientist, but then ask yourself, what is the common goal of both? Is it not the common goal to construct knowledge through observation, formulate concepts or generalizations for the purpose of sharing same with the members of society. Indeed, it appears that these two disciplines are not so different after all, and that in fact, they are two sides of the same coin.

4. Physiological Aspects of Brain Development

Due to the increased development of technology since 1959, the division between the two aforementioned cultures of science and art, as articulated by C.P. Snow, has diminished and may indeed even have disappeared. The justification for making this statement lies in the physical/biological realm and transverses to the metaphysical, or subjective, and non-observable realm. Over the last decade our knowledge of how the brain learns has increased several times over. In order to understand the dynamics and complexity of the brain, one must consider the neuropsychological aspects of evolution. Merlin Donald (1991) in his book *Origins of the Modern Mind*, outlines a model of evolution of both language and higher order cognitive functions by focusing on three characteristics of the brain: 1) encephalization or brain size, 2) localization of language and 3) lateralization or “sidedness” of cerebral function in other words, the apparent similarities found in both hemispheres of the brain.

In regard to brain size, the first, most relevant feature is its size in relation to the rest of the body. As stated by (Jerison, 1973; Passingham, 1982) the increase in brain size within primates, specifically ape to man, increased by three times with the doubling of the number of neurons. The implication of this change is a decreased density of neural matter with an increase in the number of dendrites and synapses. Hence, the level of complexity of the brain, due to the increased number of interconnections, has been enhanced several times, as the brain develops. This increase is most notably present in the cortex, cerebellum and hippocampus and specifically in the areas of association within the cortex.

The second neuropsychological aspect of evolution pertains to the localization of language in the brain and its lateralization of cognitive function. Language is a unique property of humans and therefore, understanding its biological operation and location will serve to enhance one’s understanding of the brain. Donald states, that language is most likely the most lateralized cognitive function of the human brain. This means that it has the potential to be localized in areas of each hemisphere. Semir Zeki on the other hand, in his book “A Vision of the Brain,” may dispute that proposition because he believes that vision is the predominant human cognitive function.

The third neuropsychological aspect of evolution relates to laterality, or the capacity of the brain to have specific functions localized and duplicated in various areas of the cortex. This opens up several possibilities in regard to structure and function. First, it has the potential for developmental susceptibility. That is, allowing for phases of receptivity during specific periods of development, e.g. language development in children. Chomsky recognized this trait and his proposition was supported by data on the critical period of language and speech acquisition collected by Lenneberg. Second, laterality lends itself to the modular organization of the brain. That is to say, local amorphic areas and/or columnar layers of neurons may in fact be the predominant model upon which the brain is schematically arranged. Zeki acknowledges however, that there does not appear to be a basic unit of organization which is repetitive and uniform everywhere in the cortex.
Zeki states that there are special kinds of neural organizations which predispose its possessor towards music and math. If that neural organization is not nurtured it will disappear. He, like Donald and Darwin, acknowledge that there are periods of time when the nervous system is more receptive to a specific type of learning than at other times. The classic example, again, is language. Wilder Penfield indicated that there is a biological clock for learning language, approximately age 9. Further evidence of time appropriate learning or conditioning is offered by Harlow in the study of love and affection in monkeys. Love was created, destroyed and regained. Still another example is a situation in which vision was created and the transfer of the touch knowledge for a blind person who gains his sight was not transferred. Therefore the individual would not visually recognize what he knew when he was blind and using his sense of touch.

To further elaborate on the dynamics of nerve cells, there exists a characteristic referred to as plasticity. This is the ability of cells to take over the function of other cells within the brain. Zeki sites an example in which there is competition for cortical cells when one eye sends signals to the cortex while the other is blindfolded. The cells of the blindfolded eye will atrophy. The cells in the cortex, receiving the signals from the working eye, will expand to compensate for the cells not receiving signals from the blindfolded eye.

Still another phenomenon is the ability of the brain to see color. It is sensitive to various wavelengths of light. It identifies colors by making comparisons to that which it knows or remembers. For example, when an object is sensitive to a particular wavelength it reflects that wavelength back to your eye so you see the respective color. If that object is placed in a slightly different color light the object will no longer reflect the original color. The object is still sensitive to the original wavelength it just doesn’t reflect that color back to your eye. The brain attempts to remember what it saw, this is called color constancy but it ultimately discards the information relating to intensity and it concentrates on reflectance’s alone. Color is a comparison of comparisons. Conceptually one must ask: what is the cortex doing? In effect it is categorizing the stimuli in our environment according to color, texture, sound, and any other physical attribute it can identify. Hence, the visual cortex is basically categorizing, not analyzing. According to Zeki, in color vision, one learns about reflectance’s of light of different wavelengths by acquiring knowledge about invariant properties of objects. The knowledge can be used to categorize the stimuli in our environment perceptually. The goal of the system is to provide the maximum information with the least cognitive effort.

In order to be able to extract invariant features of stimuli and categorize them according to their properties, the brain uses different cortical areas. These areas are used to identify various invariant attributes of our environment, for example, sounds or touch. The challenge for the brain is that these invariant features are not static and therefore may be identified by one or more cortical areas. Zeki goes on to state that the experimentation that is performed to learn how the brain identifies invariant features is also flawed, in that the experiment is generally static, meaning it has fixed attributes which the real world does not. The real challenge for the brain is to extract invariant features of objects in the environment from the constantly changing information that is reaching it. If the brain can do this it can reduce the differences in stimuli to behaviorally and cognitively usable portions.

The brain constructs an image by relating the analyzed component parts to each other and thus extracting the invariant features of objects which leads to the categorization of objects. The integration operation is a multistage process involving sub modalities of vision and all visual areas. It uses reciprocal connections between specialized areas. Based on several studies performed with respect to akinetopsia in which area V5 is damaged and achromatopsia in which area V4 is damaged and VI is intact, Zeki comes to the conclusion that only a conscious brain can construct colors. This presents an interesting paradox since we know that images and hallucinations can be generated during sleep. The question which logically follows is: how does this happen? The answer is that dreams involve simultaneous activity of several visual areas and must interact to lead to the integration evident in dreams. Dreams are defined by Zeki as perceptions in the absence of visual stimulus. This discussion leads us to a fascinating and yet poorly understood condition of the mind, that of consciousness.

5. Emotion, Learning and Consciousness

This segment illustrates the connection between the two cultures and how we learn and the role of emotion in learning. We know that emotion drives attention which drives learning (Jensen, 1998). We also know that most of our emotions, especially those that are most intense, are located in the amygdala section of the brain (Damasio, 1995, Adolphs, 1999). Since this appears to be the case, how do art, music, and scientific discovery trigger our emotions? Who has never been emotionally moved by a musical piece or by reading
some piece of literature? How do we identify or define “the mind” neurologically? Do we function only through our senses? How might you explain intuition or the "feeling" that you are being watched? Lastly, is it possible that we can pay attention to a visual stimulus, see it and not be conscious/aware of having seen it at all? In other words, how do you explain the intangible or subjective, which causes a physiological and physical response in us?

The answer to these questions may lie in our state of consciousness. What or where in the brain does one locate consciousness or its control? The answer to that question still eludes researchers. Some say it’s dispersed throughout the cerebral cortex, others say it is located in the reticular system atop of the brain stem, still others say it is found in the cerebellum. Eric Kandel, the Nobel Laureate, and neuroscientist discusses various hypotheses proposed by numerous researchers and philosophers, both past and present in his book, In Search of Memory-The Emergence of a New Science of Mind. In particular he discusses the work of Francis Crick who after years of study in later life came to the conclusion that consciousness is the activity of the brain. Zeki states that consciousness is a feature of many neural organizations within the brain operating in conjunction with one another. Zeki takes it a step further. He says there is no color unless one sees it. One cannot see it unless one is conscious. This begs the question of, what kind of neural organization would have features which could be said to contain the minimum necessary number of cells for color vision, motion vision and for consciousness because perceiving the stimulus is a conscious activity? The answer to these questions might lie in the clinical evidence pertaining to the investigation of the occurrence of akinetopsia. Akinetopsia is the condition in which the integrative process required to collate information in V5, an area in the visual cortex, appears to be damaged and therefore the patient cannot acquire knowledge about motion in a direction. Of greater perplexity is the prospect of patients who can “see” directional motion but have no conscious awareness of seeing anything. This is not unlike driving down a familiar highway and upon seeing the exit you want, you take the appropriate action, however you have no recollection of how you actually got there. Chalmers would classify this as an unconscious act. Based on what we know about the brain and its ability to form programs, this is more closely aligned to an automatic act brought about by previous experience or repetitive action which led to neural pathways being formed. Upon the initial stimulation of the first neuron in the pathway the rest in the line would be triggered automatically. The act of exiting the highway therefore, may fall under the category of being unaware, but not of being unconscious.

Kandel also relates the work of Nagel and Searle in which he describes the easy problem of consciousness and the hard problem of consciousness. David Chalmers, a philosopher, divided the consciousness into two parts; 1) the easy problem and 2) the hard problem.

The easy problem consists of information that is readily available to the brain, such as faces or objects in front of a person. These are conscious elements; things that the brain can see, as opposed to holding a pencil or walking, each of which goes on automatically. Chalmers would say that these latter elements go on unconsciously. In reality, the difference between these two conditions is whether the individual is aware of what is going on at any time. As stated earlier in relation to driving on a highway, one can be conscious and yet unaware of one's actions. What then is the hard problem? The hard problem is the subjective or intuitive experience that emanates from neural activity, the feeling that one is being watched, or the feeling that there is a pending disaster. At present, it is not known how the release of neural transmitters manifest themselves in the form of a subjective perception. Thomas Nagel, a philosopher at New York University, has stated in his article, "What is it Like to Be a Bat?", that similar to biology in which the basic units of matter, atoms and molecules, can be understood using our current paradigm of physiological understanding, a whole new set of rules must be put in place if we are to understand how the brain analyzes and synthesizes subjective experiences. In other words: how does the brain operate a state of consciousness?

6. Biochemical Basis for Memory and Learning

We know, for example, that there are five neural pathways for memory which are associated with learning, semantic, episodic, procedural, automatic and emotional (Sprenger, 1999).

- We know that repeated acts cause the development of programs in the brain (Jensen, 1998).
- These acts become automatic, which means that neurons respond to certain, related, stimuli (ibid).
- This reaction triggers other neurons in a memory trace, or patterns of memory traces; which will ultimately utilize as little consciousness/awareness as possible. The example cited pertaining to
driving on a highway and getting off at a particular exit without being aware of just how you got there depicts your semantic (factual) memory, episodic (location) memory, procedural memory, automatic memory and emotional memory, all of which were activated with a minimized state of consciousness.

These neural pathways used for memory are activated when stimulated by pieces of artwork, literature or music, in other words, the humanities or by evidence uncovered by problem solving processes undergone by the scientist. Regardless of the type of stimuli, the same types of brain signals are communicated among neurons. Hence, the biology and physiology are the same. We know this from our use of PET scans and MRI’s which enable us to observe and monitor brain activity with respect to intensity and neurologic location. The question that comes to mind is: what is responsible for this common physiology, or in other words these memory traces? The answer is the chemicals manufactured by the neurons which are the proteinaceous substances (monoamines) which comprise the neurotransmitters (Gilman & Winans Newman,1992). The biogenic amines that have been identified as neurotransmitters are dopamine, norepinephrine and epinephrine, serotonin, histamine and acetylcholine which is, itself, synthesized from acetylcoenzyme A and choline (ibid). The instructions for the production of these neurotransmitters come ultimately, from the DNA located within the cell itself (Byrne & Roberts, 2009), as do the instructions for virtually all other operational and structural proteins. Therefore, DNA's control of metabolic activities, however, directly or indirectly structured, includes messages that are transmitted from one neuron to another. It can further be reasoned that if memory traces are indeed patterns of neuronal pathways communicating with each other, then it is conceivable that these memory traces could be passed from parent to offspring since their origin comes from the genetic make-up inherited from the parents. This establishes a link between the two cultures of science, and art.

Consider the proposition that we readily accept that parents who are musically talented will probably have offspring that are musically gifted. This talent is found in the genotype of the parents. Is not this talent basically manifested in the form of the necessary proteins that bring about the ability to have the appropriate cells of the body perform, with the expertise to which they were predisposed? If indeed this is the case, is this not further evidence of a very real and direct connection between science, specifically, biology and the humanities, even at the most basic or physical levels?

7. Sociological link between Science, Art and Learning Styles

At the time that C.P. Snow made his comments, there was a strong distinction being made between Scientific Realism and Constructivism. Scientific Realism was characterized as the capacity of the observer to make an unbiased, non-culturally oriented assessment about nature. It relied heavily on theories to explain that which "needed" answers. Constructivism, on the other hand, was the world as influenced by society. That is, it was knowledge which was constructed "from" and "on" previous experience. “Knowledge” and “Experience” are the operative words, here. These are the facets which impact our learning and therefore our nervous system. It was thought that the scientist can objectively make an unbiased judgment about nature. If this were true then science and technology were indeed separated from the arts and humanities and therefore existed as two separate and distinct cultures. However, if one takes a historical perspective and examines science and society as it exists today, it is quite obvious that each influences the other. One just needs to hear discussions and read the literature involving stem cell research, cloning, genetically altered crops, space exploration and global warming, just to name a few. Subsequently, it appears that science and technology and arts and the humanities are again, intimately related and indeed, depending upon the time period and even the existing culture, the instructional methods employed and the degree of sensitivity to individual learning styles have been impacted.

8. Conclusion

Having considered the nature of science, the nature of art, the physiological aspects of brain development, emotion, learning and consciousness and lastly, the sociological link between science and art, it becomes apparent that the more we learn how the brain functions, in this case, using science and art, it affords us the opportunity to improve instruction and therefore make more efficient and effective the learning process. One must keep in mind that in this digital age, the brain is being exposed to more information in a shorter period of time and is itself learning to adapt to this new phenomena. As educators, we must adapt our teaching strategies to match the learning styles in which the human nervous system finds itself now engaged.
9. References


Field Independence: A Critique and a Reinterpretation

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Abstract

This presentation aims to provide a critique of the notion of field independence as a putative cognitive style and a reinterpretation in terms of the efficiency of visuospatial working memory.

The concept of field independence originated in the rod and frame test (RFT) which was originally devised by Witkin and Asch (1948) as a test of spatial orientation. In this procedure, the participant is presented with a movable luminous rod that is surrounded by a square luminous frame in an otherwise totally dark room. The participants’ task is to adjust the rod until it lies at the true (i.e., gravitational) vertical regardless of the orientation of the frame. Subsequently, Witkin, Lewis, Hertzman, Machover, Meissner, and Wapner (1954) found that performance on the RFT was correlated with performance on a number of other tasks that required the separation of a stimulus from the field in which it was presented but did not involve spatial orientation. An example of such a task is the embedded figures test (EFT), which requires the participant to locate a simple figure within a larger complex figure. These findings suggested that all these tests were measuring a single trait that reflected a person’s degree of independence from the structure of the prevailing visual field. Some researchers have compared students’ field independence with their sense of autonomy or with their locus of control.

There are several research issues with the RFT and the EFT. Performance on the RFT is influenced by anxiety (Witkin et al., 1954) and depends on sensory factors rather than high-level cognition (Cian & Raphel, 1995). Performance on the EFT is affected by practice and motivation (Goldstein & Chance, 1965). Performance on the RFT is correlated with performance on the EFT in men but not in women (Witkin et al., 1954). Both the RFT and the EFT are measures of cognitive performance rather than measures of cognitive style or preference (Caplan & Kinsbourne, 1982). Performance on both tasks is correlated with verbal intelligence, although the relationship is stronger for the EFT than for the RFT (Loo, 1979). Measures of field independence are not correlated with measures of locus of control (Lau, Figuerres, & Davis, 1981) and are only weakly correlated with measures of students’ self-directedness (Tzuk, 1985). Field-independent and field-dependent students do not differ in their preference for distance education or other forms of independent learning (Moore, 1976; Thompson, 1984). However, there is evidence that tests of field independence measure spatial or perceptual ability (MacLeod, Jackson, & Palmer, 1986; Zhang, 2004) and on computer-mediated learning skills that depend on such abilities (Rittschof, 2010).

Field independence is not a measure of internal locus of control or student autonomy. The RFT and the EFT are not measures of a single dimension of cognitive style. Rittschof (2010) recently argued that they should instead be construed as measures of visuospatial working memory, and that visuospatial skills are likely to be invaluable in the interactive multimedia learning environments with which students are increasingly being expected to engage. (497 words)

Keywords: Embedded Figures Test, Field independence, Rod and Frame Test, Visuospatial working memory

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The objective of this research is to determine whether there is coherence between learning conceptions of pupils in grade eight (the final year) of primary education and their learning results.

In this study learning conceptions of pupils are measured with the aid of the learning conceptions questionnaire (Klatter, Lodewijks & Aarnoutse, 2001). This questionnaire is with aid of confirmative factor analysis revalidated for the last two classes of primary education and the first two years of secondary education (authors). The questionnaire consists after data reduction of fifty questions that like the three (motivation, regulation and mental processing) by Klatter (2003) stated aspects can be presented divided over eight scales (Authors).

Learning results are measured with a final test for primary education. This is a respected progression test that yearly is conducted in almost all primary schools in the Netherlands. The test contains 240 multiple choice questions concerning language, arithmetic and processing information. The reliability in terms of internal consistence for this test lies on .96. Of the total sum of tasks made a national standard score is calculated.

In present study the sample contains 649 pupils in grade eight of primary education spread among 16 schools of primary education in south east of the Netherlands with numbers ranging 9 till 36 pupils in grade eight of each school. The total sample consists of three cohorts where during three years (2006, 2007 en 2008) data were collected in scope of the learning conceptions. Given the hierarchic structure in the data it is possible to state that observations in static terms are incoherent to each others. To analyze presented data multilevel analysis is therefore used.

The results in presented research show that children in grade eight of primary education that score high on the scale negative attribution of the learning conception questionnaire score significant lower on a final school test for primary education. Also pupils with a higher score on external regulation on the learning conception questionnaire achieve according to present study significant lower score on this final test for primary education.

Given the fundamental character of learning experience, the formation of a task orientated motivation and the appliance of adequate processing activities in primary education it is important to investigate the formation of learning conception in young pupils. Insight in learning conceptions of young pupils are very relevant in coherence with their learning results. These learning conceptions develop overtime into the conceptions that are recovered in pupils of secondary education and in students of higher education. (Marton, Dall ‘Alba, & Beaty, E., 1993).

Keywords: Learning conceptions, final school results, primary education

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The Future Impact of Social Networking Sites on Learning & Training in the Enterprise

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Abstract
To explore how social networking sites (SNSs) will evolve to meet the needs of the enterprise over the next five to ten years in the opinions of a group of SNS experts. In particular, it is not clear how social networking sites can be used most effectively for learning, personal and organisational, both in training and education, within the enterprise (DiMicco et al., 2008), (Kettles & David, 2008), (Van Zyl 2008), (Martin et al, 2009), (Van Bellegham 2010). Because of the multi-modal nature of SNSs, which can support many styles and strategies, and their dramatic changes over recent time, it is premature, and certainly difficult, to explore styles in an exploratory study. SNSs are designed for ease of use, in relatively short term interactions, and are not designed to specifically support a range of styles.

The Delphi method was applied, engaging a panel of experts (n = 23) to provide informed opinion across a number of themes over two iterative rounds of feedback (Skulmoski et al., 2007). (A preliminary round with a small number of experts was used to calibrate the questionnaire for Round 1).

The findings can be summarised as follows: where phone and email are invaluable for communicating with one or more specific individuals and are especially suited to “strong ties” (family and close friends), SNSs are seen to benefit collaboration, informal communication and learning and education of staff. This study acknowledges the ability of SNSs to connect with “weak ties” (i.e. people not known or not well known to the correspondent) as a significant characteristic and one that underpins several benefits, as it helps foster communication across departments and helps reduce “knowledge silos”. In the context of the office place, there is a clear recognition that consolidating communication technologies such as phone, email, instant messaging and SNS affords a variety of compelling benefits to industry. The main such advantage identified by this study is the concept of “single sign-on” to office communication channels, a feature that should help bridge the “digital divide” in communication often evident between employees of different generations.

The study shows strong employee and corporate motivations for adopting SNSs. These include the ability to foster innovation and to promote information sharing. Employees also recognise that SNSs make it easier to locate experts and expert content, to keep up-to-date with new technologies and also can aid in building reputation as an expert within an organisation. However, companies have substantial misgivings over SNSs, most notably the potential inadvertent disclosure of information and skepticism as to the security afforded by SNSs. The findings here show that employees also have several profound fears over the introduction of SNSs into the workplace. One of the key concerns is that SNSs will erode the work-life balance and that staff will be expected to respond to work queries via SNS systems outside of business hours. This research has shown a clear recognition of the ability of SNSs to significantly boost productivity in the office. The limitations of the Delphi approach and of the study are discussed.

Despite the success of social networking sites for personal use, the technology has received a lukewarm reception as a communication medium within the workplace, which includes the office, classroom, and other learning spaces, both personal and organisational. It is not clear how social networking sites can be used most effectively for learning, personal and organisational, both in training and education, within the enterprise. In particular, in education and in training, it appears that SNSs can be used to form effective learning support groups, especially in team situations.

Keywords: Social Networking, SNS, Social Capital, Collaboration, Workplace learning via SNSs

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1. Introduction

Social networking sites (SNSs) appeared approximately 10 years ago. Since then, SNSs such as Facebook, MySpace, LinkedIn and Flickr have enjoyed unprecedented success and have come to redefine the manner in which many communicate interpersonally. Recent studies show that 72% of all internet users are a member of at least one SNS (Van Bellegham 2010). Amongst college goers, the level of penetration is even higher, with researchers indicating that approximately 88%-96% of students use Facebook (Martin, Capano, Deris & Desjardins, 2009; Hargittai, 2007).

Adoption of SNSs within the workplace has been slower, but the technology is now receiving increasing attention by enterprise (Kettles & David, 2008). This trend is a familiar one in digital communication technologies; initially email was viewed sceptically by management and believed to reduce office productivity. Now, email is recognised as an indispensable tool (Skeels & Grudin 2009). SNS adoption remains at an early stage in this process.

The focus of this research is exploratory in nature, seeking to understand the factors affecting the adoption of SNSs by the workplace and to consequently make considered predictions as to how SNSs for the enterprise will evolve over the next 5-10 years. It identifies the opportunities that SNSs offer to companies and the potential issues with SNS usage in the workplace and how best to mitigate against these. It is expected that the adoption of SNSs in the enterprise will be repeated in the educational sector at third and second level, but will be adopted at a slower pace due to funding and other limitations (such as control of content, applications, management and others).

The primary goal of this research is to attempt to answer the question of how social networking sites will evolve to meet the needs of the enterprise.

Van Zyl (2008) provides a comprehensive definition of what constitutes a SNS. She suggests that social networking sites must allow some level of social feedback and must support multiple communication modes such as one-to-one exchanges (e.g. email, personal message), one-to-many exchanges (e.g. blog) and many-to-many (e.g. wiki). Additionally, Van Zyl identifies a number of critical features that social networking sites must provide, including the ability to 1) build a representation of oneself (e.g. user profile), 2) maintain and cultivate existing personal relationships, 3) locate new ties (e.g. find domain expert) and 4) develop weak ties into strong ties.

2. The Delphi Method

The study utilizes the classical Delphi method and one of the defining characteristics of this approach is that initial rounds of questionnaire employ open-ended questions, developed to elicit the expert opinion of participants. The Delphi method also involves the statistical aggregation of data. During latter round(s), the responses from individual experts are gathered and presented to the entire group, who then rank the responses. This feedback element affords experts the opportunity to view the issues from different standpoints and is employed in order to try to build consensus. Thus, the Delphi method inherently involves statistical aggregation and numerical analysis and is believed to be of particular relevance to areas such as technology forecasting, where there is a limited understanding of the underlying principles of a phenomenon, or where there are limited data (Linstone & Turoff, 1975). The technique was invented during the early 1950’s by Norman Dalkey & Olaf Helmer, as part of a study conducted by the Rand Corporation, and sponsored by the US Air Force. The aim of the original study was to “obtain the most reliable consensus of opinion of a group of experts” (Linstone & Turoff, 1975). Delphi is described succinctly by Dalkey (1972): “The technology is based on the adage, ‘two heads are better than one,’ or more generally, ‘N heads are better than one’. “

The facilitator’s role in exchanging feedback across the group as a whole, coupled with the anonymity of participants, helps avoid confrontations and off-topic debate. This promotes an environment where informed judgments are made and critiqued (Brown, 1968). Delphi, as a method, has the following central characteristics (Rowe & Wright, 1999): Anonymity, Iteration, Controlled Feedback and Statistical Aggregation.

The Delphi questionnaires were disseminated using online technologies which gives several benefits:

- Allows respondents to complete the questionnaire at a time that best suits them
• Limits ability of researcher / facilitator to bias information gathering
• Provides virtual proximity, reducing the cost of dealing with participants who might be based in different geographic locations
• Reduces the logistics involved in propagating feedback / conducting multiple rounds of interview

In keeping with recommendations on the use of Delphi (Skulmoski, Hartman & Krahn, 2007), all panellists had to be: i. knowledgeable in areas being researched, ii. willing and able to participate, and iii. have good communication skills

Purposive sampling (Trochim, 2006), so called, was adopted because the sample is conducted with a specific purpose in mind. A breakdown of the research population sample is shown in Table 1 (note that the roles are not mutually exclusive).

Table 1: Research population sample (n = 23)

<table>
<thead>
<tr>
<th>Role</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employee Early Adopter</td>
<td>12</td>
</tr>
<tr>
<td>Manager</td>
<td>3</td>
</tr>
<tr>
<td>Architect/Developer</td>
<td>4</td>
</tr>
<tr>
<td>Researcher</td>
<td>9</td>
</tr>
</tbody>
</table>

Prior to commencing the research, a pilot round was adopted in keeping with recommendations by Skulmoski et al. (2007). The pilot round is intended as a test-run for the questionnaire, during which the survey is enhanced both in terms of readability and question coverage. Four individuals agreed to participate in the Round 1 pilot survey, 2 of whom also participated in the Round 2 pilot survey. Once the appropriate updates were made based on feedback from the pilot rounds, 30 individuals were invited to take part in the study. 23 of these agreed to participate in the study. All respondents completed Round 1, with none choosing to opt out of Round 2.

The main aim of the first round was to conduct brainstorming and elicit the panellists’ thoughts and opinions. Questions drew upon themes that were uncovered during the literature review, and also in our own reflections. This approach helps minimize the potential for researcher bias to the questionnaire and is considered best practice (Skulmoski et al. 2007). The second round questionnaire was used to present participants with the entire aggregated set of viewpoints gathered during Round 1. This allows participants to revisit themes covered during Round 1 and view and rate responses from their co-participants (experts themselves). The second round questionnaire was also employed to explore unanticipated themes that arose in individual responses.

The questionnaires and research approach were reviewed and approved by the University’s research ethics committee.

3. Findings and Analysis

3.1 SNS - a competitive or complementary technology?

The role of SNS, vis-à-vis existing office communication technologies, was explored, to better understand whether SNS can be considered a complementary technology and if so its strengths, or whether SNS is competitive to existing office technologies and if so whether it is likely to supplant these media.

In keeping with the Delphi Method, the viewpoints gathered during the Round 1 questionnaire were presented to the entire group during the Round 2 questionnaire, which was then asked to rate the different responses. The results of this survey are shown in Table 2 (the higher the weighted average, the better support).

The research findings strongly suggest that phone and email are indispensable technologies in the office-place. There is a clear recognition that SNSs represent a complementary medium. Where phone and email are invaluable for communicating with one or more specific individuals and are especially suited to “strong ties” (family and close friends), SNSs are seen to benefit collaboration, informal communication and learning and education of staff.

This study acknowledges the ability of SNSs to connect with “weak ties” (i.e. people not known or not well known to the correspondent (Granovetter, 1983)) as a significant characteristic and one that underpins several benefits, as it helps foster communication across departments and helps reduce “knowledge silos”. This finding is in keeping with previous studies (Van Zyl 2008; Howard & Ryan 2010).
Corporate social networking sites differ from other office communication media in that they...

... result in informal conversation across different departments and benefit future collaboration

... are better suited to finding experts

... are better suited to broadcasting messages

Furthermore, SNSs can be used to lessen the geographical divide, and are seen as invaluable, for teleworking environments, such as in IBM (2010), where 40% of the 386,000 employees work remotely. Given the numerous advantages that SNSs have to offer the workplace and given the role of phone and email, this research concludes that SNSs will evolve as a complementary communication tool, alongside phone and email. The role of instant messaging (“Texting”) is less clear. Many SNSs now incorporate both synchronous and asynchronous modes of communication and respondents were divided as to whether SNSs would ultimately replace instant messaging or not. Given the current level of use of instant messaging by corporations, it seems unlikely that SNSs will replace texting. However, this study would conclude that there will be an increasing shift away from standalone instant messaging solutions towards SNS-integrated solutions.

3.2 Employer motivation

The responses collected during Round 1 were aggregated and posed to participants in Round 2, who were asked to rate the motivations from the employer standpoint for adopting an SNS as a mode of communication. The results are shown in Table 3 (the higher the weighted average value, the better support). The results show that experts believe there are a plethora of reasons for companies adopting SNSs in the office. Of the 8 motivations listed, all received an average score of between “Very Important” and “Important”. With the overall highest weighted average (w.a.), the ability of SNSs to share information as never before is seen to provide a huge motivation for adopting SNSs in the workplace. The benefits of SNSs include the ability to make information highly searchable and available, and to centralise information.
To be able to connect to customers to offer support is valued joint second at 3.68 with Innovation (“informal inter-team communication”) in the office place. It is clear that employers value the benefits attributed to marketing, and tele-working, with an average rating of “Very Important”. These findings help show the range and diversity of benefits that SNSs are seen to represent to the company. Many of these criteria are anticipated by existing literature and pilot programs (Brodkin, 2010; Sherter, 2010). The ability to easily discover thought leaders/experts (sixth in rank out of eight), cost reduction and better connecting with younger staff are the remaining items.

3.3 Employee motivation

The results from Round 2 show that panellists believe that there are many strong motivations for employees using SNSs (see Table 4). With the highest overall average rating (“Very Important”), the ability of SNSs to allow employees to enhance their own career by raising their own visibility is recognized as a powerful motivation to employees for using corporate SNSs. These findings coincide with research by DiMicco, Millen, Dugan, Brownholtz & Muller (2008), who identify this phenomenon as ‘climbing’.

<table>
<thead>
<tr>
<th>Rate the motivations for using a corporate social networking site (employee standpoint)</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhance visibility (benefit career by building reputation as key contributor)</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>4.00</td>
</tr>
<tr>
<td>Keep up-to-date with emerging technologies (e.g. join relevant groups, track interests of experts)</td>
<td>0</td>
<td>1</td>
<td>7</td>
<td>8</td>
<td>6</td>
<td>3.86</td>
</tr>
<tr>
<td>Promote projects and products internally</td>
<td>0</td>
<td>1</td>
<td>9</td>
<td>7</td>
<td>5</td>
<td>3.73</td>
</tr>
<tr>
<td>Easier to find experts/expert content</td>
<td>0</td>
<td>1</td>
<td>10</td>
<td>6</td>
<td>5</td>
<td>3.68</td>
</tr>
<tr>
<td>Develop better working relationship with colleagues</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>3.50</td>
</tr>
<tr>
<td>Easier to tele-work</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>3.27</td>
</tr>
<tr>
<td>Self-expression</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>2.64</td>
</tr>
</tbody>
</table>

SNSs allow experts and aspiring experts to participate as never before. The ability of SNSs to allow staff to keep up-to-date with emerging technologies came in just behind in terms of employee motivation rankings. In allowing employees to not only post questions about breaking technologies, but also follow the interests of established experts, both across the company as a whole and within specific fields, SNSs are seen as a catalyst for innovation across the company. Respondents also suggest that features of SNSs such as support for the promotion of projects and products internally, support for the location of experts and material authored by experts, and support for developing a better working relationship with colleagues represent strong motivations for staff using SNSs in the workplace. SNSs make it easier to tele-work. These results are in keeping research by Van Zyl (2008). The ability of SNSs to allow employees to express themselves creatively was the only motivation that received an average score between “Somewhat important” and “Important”.

3.4 Employer fears

The second round of questionnaire was used to explore the primary fears of employers over the use of a corporate SNS, more fully, by providing participants with the aggregated list of responses from the Round 1 survey for ranking. Results are shown in Table 5 (security merits special examination and is covered elsewhere).
Table 5: Round 2 – Corporate SNSs: Employer Fears

<table>
<thead>
<tr>
<th>Rate the fears of employers over the adoption of a corporate social networking site</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff may inadvertently disclose confidential information (either internally or externally)</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>9</td>
<td>4.00</td>
</tr>
<tr>
<td>Staff may over-use social networking sites for personal communications</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>3.29</td>
</tr>
<tr>
<td>Staff may use social networking sites for improper/illegal purposes (e.g. cyber bullying, exchange of images etc)</td>
<td>1</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>2</td>
<td>3.15</td>
</tr>
<tr>
<td>Social networking sites are not standardized; consequently, there is a risk if the provider / developer goes out of business (vendor lock-in)</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>1</td>
<td>4</td>
<td>3.00</td>
</tr>
<tr>
<td>Staff may bypass managers in conversation trails (this loss of hierarchy might be interpreted as a threat to operation by senior executives)</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>2.90</td>
</tr>
<tr>
<td>Little or no advantage over current communication media (a &quot;fad&quot; technology)</td>
<td>6</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>2.67</td>
</tr>
</tbody>
</table>

The single largest fear for the employer identified by participants is the **inadvertent disclosure of information**. This received an average rating of “Very Important” and a modal rating of “Extremely important”. This indicates the critical need to maintain confidentiality of information within the office, both internally (e.g. notification of planned reductions in staff) and externally (e.g. inadvertent disclosure of sales figures). This fear is one that is discussed in existing literature by authors such as Burger & Rensleigh (2007) and Brodkin (2010). Participants express a fear that employees might **over-use SNSs for non-work related communication** and that some employees might abuse the medium for purposes such as cyber-bullying, identity theft or exchange of improper images. Other employer fears were that the SNS provider might go out of business, staff may bypass management, and the possibility that SNSs might be a “fad” technology.

### 3.5 Employee fears

Participant responses, shown in Table 6, reveal an alarming level of concern by employees across a number of different areas.

The primary concern of employees was identified as **pressure to be ever-online** and responsive on corporate SNS systems. This received a very high weighted average and is indicative of recognition that the introduction of a SNS into the workplace may erode the work-life balance. This topic has received attention by researchers such as Derks & Bakker (2010). Participants also recognize that employees fear being **judged over their level of participation** on corporate SNSs, not only in terms of the number of posts made or connections created, but also in terms of the opinions they express. They were also fearful that they might inadvertently disclose confidential information.

Fear over the **amount of personal information** about staff that is made available by SNS systems is also identified as a strong concern of employees. Employees raised concerns that they would feel **pressurized into sharing ever more personal information** with colleagues, perhaps indicative of further blurring of the work-life balance. Employees also expressed a fear over the potential for **intimidation by knowledge experts**, prompting a further question to panellists as to whether a loss of anonymity might actually cause knowledge gaps. 72.8% of respondents either agreed, or strongly agreed, that corporate SNSs were not, by nature, anonymous, and that this could create an environment where employees feared asking questions, lest they be judged on what they didn’t know (rather than their eagerness to learn). It seems clear that employees harbour many fears over the adoption of corporate SNSs. Staff also feel that they may be **bullied** or be vulnerable to **identity theft**. These fears are generally not well-covered in existing literature, perhaps because much literature is written by enthusiasts and early adopters (who often focus on the positives) and security companies (who may focus on the negatives from an employer standpoint).
Table 6: Round 2 – Corporate SNSs: Employee Fears

<table>
<thead>
<tr>
<th>Rate the fears of employees over the use of a corporate social networking site</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>May feel additional pressure to be &quot;always on&quot; / respond to after-hours work queries</td>
<td>0</td>
<td>2</td>
<td>4</td>
<td>11</td>
<td>5</td>
<td>3.86</td>
</tr>
<tr>
<td>Will be judged on level of participation (number of posts, contacts, writing style etc)</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>3.59</td>
</tr>
<tr>
<td>May inadvertently disclose confidential information</td>
<td>0</td>
<td>4</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>3.59</td>
</tr>
<tr>
<td>May feel company can gather too much information about them</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>3.59</td>
</tr>
<tr>
<td>May feel pressurized into granting colleagues access to more personal material (photos, opinions etc)</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>3</td>
<td>5</td>
<td>3.23</td>
</tr>
<tr>
<td>May be intimidated by knowledge experts (i.e. rise of a new clique)</td>
<td>1</td>
<td>3</td>
<td>12</td>
<td>3</td>
<td>3</td>
<td>3.18</td>
</tr>
<tr>
<td>May be bullied</td>
<td>2</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>2.71</td>
</tr>
<tr>
<td>May be vulnerable to identity theft</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>2.67</td>
</tr>
</tbody>
</table>

3.6 Productivity - Potential Benefits

The research findings show that 89.5% of respondents believe that corporate SNSs have the potential to boost office productivity. This shows an open recognition by experts as to the potential of SNSs to redefine the workplaces of tomorrow in a positive way. A variety of reasons are cited, including that SNSs make it easier to access experts across the organization as a whole, that they reduce geographic barriers and promote discussion and collaboration. Included below is a short list of some of the comments raised by panellists regarding productivity benefits.

“Quick access to lots of people in the workplace.”

“… They (SNSs) enable collaboration of teams / departments dispersed in different countries.”

“I have a global reach and sphere of influence through SNSs.”

“… Organizing this information in one place would make it much easier to update, avoid duplicate work and make it easier to find information.”

3.7 Productivity - Potential Disadvantages

Interestingly, the research findings show that an equal number of respondents (89.5%) believe that SNSs have the potential to hamper office productivity. Primarily, this is attributed to distractions that might arise from constant SNS chatter and misuse of SNSs by employees. Some of the more pertinent comments gathered during the Round 1 questionnaire, describing the potential for loss to productivity, are listed below:

“Constant access to outside world means endless distractions.”

“… if misused by employees, could lead to hours of wasted time by employees.”

“… sometimes without realizing it one goes onto a social network site for 10 minutes and ends up spending half an hour on it. This time wastage would seriously hamper office productivity.”
Laws and the provision of adequate training also have a role in minimizing the potential for loss of productivity. A majority of respondents (70.6%) believe that the benefits of adopting SNSs in the enterprise outweigh the disadvantages, a clear endorsement of the technology.

### 3.8 Policies

The research conducted here highlights the importance of defining adequate policies governing use of SNSs in the workplace.

This is highlighted by results from the Round 1 survey, which show that 94.4% of respondents believe that it is “extremely” or “very” important to define appropriate policies. The Round 2 questionnaire was used to identify what policies should be put in place. Responses are shown in Table 7.

Receiving a weighted average score of 4.45 and 4.32 respectively, experts identify the importance of providing policies to protect both the employee and employer from abuse (e.g. cyber-bullying, deliberate posting of damaging information etc).

Not only do such policies help build confidence around the safety of using SNSs in the enterprise, but they also help to reduce the possibility of litigation against the company. These findings are in agreement with existing literature by M86 Security (2010) and Query & Hanley (2010). Respondents also feel it is “Important” that companies explicitly define social mores for corporate SNSs (e.g. the level of formality or casualness should be adopted). They also feel it is important that the manner in which communication occurs across the organisational hierarchy should be defined. Interestingly, limiting the use of SNSs for personal communications only received an average weighted score of 2.71. A higher relative result was anticipated, given the potential for time-wasting on SNSs and given findings in existing literature, e.g. Burger & Rensleigh (2007).

### 3.9 Procedures

When asked whether it is important for corporations to provide adequate procedures around the usage of SNSs, three areas were identified: the banning/limiting of installation of SNS applications, monitoring, and training (see Table 8). Banning (3.82) and Monitoring (3.68) were identified with a modal rating of “Very Important”. Participants identify the importance of limiting or banning the range of applications that can be installed to a corporate SNS, in order to try to minimize the possibility of employee machines becoming infested with malware. This also indicates the relative importance of being able to detect misuse early and take appropriate steps.

Table 7: Round 2 – What Policies Are Necessary for a Corporate SNS?

<table>
<thead>
<tr>
<th>Policies</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protect the employee from abuse and avoid potential litigation (e.g. cyber-bullying)</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>6</td>
<td>13</td>
<td>4.45</td>
</tr>
<tr>
<td>Protect the employer from abuse/improper use of site and avoid potential litigation (e.g. posting of damaging information)</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>9</td>
<td>10</td>
<td>4.32</td>
</tr>
<tr>
<td>Define social mores (formal or casual)</td>
<td>1</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>3.36</td>
</tr>
<tr>
<td>Define the manner in which communication occurs</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3.00</td>
</tr>
<tr>
<td>Limit/ban the use of social networking sites for personal communication</td>
<td>5</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>2.73</td>
</tr>
</tbody>
</table>

Table 8: Round 2 – Important considerations for SNS deployment

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit or Ban Applications</td>
<td>0</td>
<td>4</td>
<td>6</td>
<td>2</td>
<td>10</td>
<td>3.82</td>
</tr>
<tr>
<td>Monitor</td>
<td>2</td>
<td>1</td>
<td>5</td>
<td>8</td>
<td>6</td>
<td>3.68</td>
</tr>
</tbody>
</table>
There is recognition that SNSs constitute a new form of communication and that employees would benefit from training, with 47.8% of those polled responding that a consolidated communication site would require staff to be educated in the effective use of the technology. This finding is anticipated by Burger & Rensleigh (2007), who make similar recommendations around the effective use of email.

3.10 Need for stricter laws

Experts identify the need for strict laws governing the usage of corporate SNSs, with 83.3% of respondents opining that this area is “Extremely” or “Very” Important. Responses collected during the open-ended Round 1 survey indicate that this need stems from concerns over the potential misuse or abuse of SNS technology to the detriment of the company. The second round of questionnaire sought to explore areas for which legislation should be introduced. Findings are summarised in Table 9.

Findings suggest that current legislation is seen to be insufficient: that employers and employees alike feel that additional legislation would better protect them. This is in keeping with sentiments espoused in recent articles (McCullagh, 2010a; McCullagh, 2010b; Whitney, 2010).

Experts identify a need for **companies to be held accountable** for providing adequate security for corporate SNSs that they manage. This received a weighted average of 4.73, and a modal rating of “Extremely important”. Respondents strongly feel that legislation should be provided governing the lifespan or “permanence” of messages posted to SNS systems. This includes both laws mandating that the records of ex-employees be deleted after a given time-interval, and mandating that staff have a mechanism by which they can appeal to **have a message removed**. These findings help illustrate that legislation has lagged behind technology, in respect to the use of SNSs in the corporation, and that employers and employees alike feel that additional laws are required.

At the time of writing, a number of countries were in the process of proposing or implementing new laws governing the use of SNSs in the workplace, such as in Germany who are looking **to ban the use of SNSs to vet potential hires**. As is often the case with technology, laws lag behind. This study would conclude that adequate legislation will eventually be introduced to govern corporate SNS usage. This seems likely, given that recent headlines have highlighted several instances where employees of popular SNS companies such as Facebook have accessed or modified the profiles of users for inappropriate purposes (Raywood, 2010).

3.11 Features of a Corporate SNS

A significant portion of this research was dedicated to exploring the factors underpinning the adoption of a corporate SNS. This area includes not only understanding the manner in which corporate SNSs will be configured, deployed and administered, but also understanding the critical features that SNSs will provide.

Existing literature is divided in opinion as to the manner in which enterprise should implement SNS solutions for internal communication (i.e. corporate SNS). Researchers such as Zhao & Rosson (2009) suggest that public SNSs such as Twitter and semi-public SNSs such as Yammer are best suited to this role.

<table>
<thead>
<tr>
<th>To what extent is it necessary to create laws</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>... requiring companies to provide adequate security for any social networking sites they manage</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>16</td>
<td>4.73</td>
</tr>
<tr>
<td>... requiring companies to delete an employee's details when they leave the company (or some defined time period thereafter)</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>8</td>
<td>3.59</td>
</tr>
<tr>
<td>... requiring companies to delete any messages that an employee finds offensive</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>5</td>
<td>3.45</td>
</tr>
<tr>
<td>... banning companies from using a prospective employee's social networking site profile (as a criteria for judging the candidate</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>3.27</td>
</tr>
</tbody>
</table>
Many others such as DiMicco et al. (2008) suggest that corporate SNSs should reside behind the firewall. As part of this research, experts were asked as to whether they felt that SNSs for enterprise should reside on the Internet or an Intranet, and were asked as to whether corporate SNSs should be administrated by the company itself or a third party. Findings show that an overwhelming majority of respondents believe that corporate SNSs should reside behind the firewall and that they should be managed by the companies themselves. This is predominantly due to concerns around security and trust issues around the involvement of a third party. Some pertinent comments regarding the hosting of corporate SNSs are shown here:

“The main reason for this (hosting on an Intranet) is protection of company data and to help maintain the line between work and life. If you have to go into the VPN, you are in work mode. Plain and simple.”

“I suppose it could be either but I would see no reason for a company to outsource this work. I don’t see it much different than maintaining an e-mail system. One would have some sort of SNS Administrator who would look after the system, add enhancements specific for company, etc.”

During this research, experts were asked to rate the importance of a variety of features that corporate SNS systems could support (these features were identified during the course of the research). The results from this element of the study are shown in Table 10.

These findings highlight the vital importance of maintaining strict security (4.77) on a corporate SNS, advanced search (4.27) and ensuring an intuitive interface by which a user can easily navigate contents, contacts and manage account details including privacy settings. Integrated support for other communication media is seen as nice-to-have, but unnecessary. The findings show an interesting schism with regard to opinion as to whether organizational hierarchy should somehow be maintained on the corporate SNS, so that managers can influence content/contacts of workers. An analysis of the open-ended responses suggests this division in opinion relates to differences between managerial and employee viewpoints. This is an item that should possibly be explored by future studies, using larger population samples.

One of many unresolved issues is how best to handle multiple identities / representing oneself to different groups of contacts (e.g. family, friends, colleagues, managers) in the advent of projects such as SocialStream (Socialstream, 2011).

<table>
<thead>
<tr>
<th>How important is it for a social networking site, for corporate use, to support the following features</th>
<th>Not Important (weight=1)</th>
<th>Somewhat Important (weight=2)</th>
<th>Important (weight=3)</th>
<th>Very Important (weight=4)</th>
<th>Extremely Important (weight=5)</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong security</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>19</td>
<td>4.77</td>
</tr>
<tr>
<td>Advanced search to allow content to be found easily</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>6</td>
<td>11</td>
<td>4.27</td>
</tr>
<tr>
<td>Intuitive interface by which site permissions for groups / contacts / forums can be managed</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>15</td>
<td>6</td>
<td>4.23</td>
</tr>
<tr>
<td>Advanced search to allow new contacts / experts to be found easily</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>4.19</td>
</tr>
<tr>
<td>Support for instant messaging</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>2.91</td>
</tr>
<tr>
<td>Support for hierarchical relationships, so that managers can suggest and restrict sub-ordinate content for workers</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>2.82</td>
</tr>
<tr>
<td>Support for email</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>2.73</td>
</tr>
<tr>
<td>Support for hierarchical relationships, so that managers can suggest and restrict contacts for workers</td>
<td>7</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>4</td>
<td>2.64</td>
</tr>
</tbody>
</table>
4 Limitations of research

Practitioners and researchers alike remain divided as to whether SNSs can boost productivity in the office, or whether they can redefine the manner in which companies and customers inter-communicate. The factors that underpin the successful deployment of SNSs in the office are not understood.

Researchers such as Linstone & Turoff (1975) and Skulmoski et al. (2007) have shown that the Delphi approach has been successfully applied to a wide variety of research projects. However, a number of studies using Delphi have failed to produce meaningful results. Linstone & Turoff (1975) and Garrod (2008) have found that poor results are due to insufficient planning of the Delphi process.

5 Conclusions

This research concludes that consolidation of communication media will continue, initially more so around communication media for personal use but that this will extend towards the office place and will include corporate SNS solutions. The benefits to a consolidated offering are too compelling to be ignored. When asked whether they felt that SNSs would continue to undergo consolidation, similar to Facebook Messages, fully 87.0% of participants agreed. An equally high percentage, however, feel that the general public is not fully ready for this technology, and opined that adoption would be slow and mixed, with many continuing to use existing communication tools.

During the course of this study, several breaking developments were made in this area. On October 14 2010 (Stern, 2010), Skype added integrated support for Facebook, allowing users to access phone, SMS and a SNS from a single application. Later, on November 15 2010, Facebook announced that it would look to incorporate email, SMS and instant messaging into its offering as part of the Facebook Messages project (Muthukkaruppan, 2010). A number of aspects to corporate SNSs were uncovered that are not dealt with in literature including:

- Consolidation of Communication Technologies
- Multitude of Employee Concerns
- Dual use of SNSs

Adoption of SNS within formal education is lagging behind use within enterprise, which in turn is lagging behind personal use. This is a point recognised in research (Forkosh-Baruch & Hershkovitz 2011) and corroborated by the attention given to discussing the benefits and disadvantages of SNS within a formal education setting, rather than exploring implementation details (such as whether SNSs should reside in the intranet or internet). This suggests that the role of SNS within enterprise may be used as a predictor for the role of SNS within education.

It is the opinion of the researchers that effective SNS use will happen among employees/users first before enterprise use. In other words, informal learning will occur much more quickly and effectively than formal learning within an enterprise SNS framework.

6. References


The Inservice-Teacher-Training in Flemish Schools: Does Practice Make a (More) Perfect Teacher?

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Elke STRUYF (University of Antwerp, Belgium)

Mathea SIMONS (University of Antwerp, Belgium)

Abstract

The aim of this study is to analyse the experiences of student-teachers and mentors regarding the inservice-teacher-training or the “learning-in-the-workplace-trajectory” (LIW) in Flemish secondary schools. How is this trajectory perceived by mentors and student-teachers; i.e. do their individual expectations and capacities match with the formal guidelines implemented by the teacher training institutes (and how). In other words, this study wants to investigate the LIW-trajectory on a pragmatic level, using qualitative research methods such as semi-structured interviews. The focus of this study is twofold: a) coaching during the LIW-trajectory and b) evaluation during and at the end of the LIW-trajectory. The majority of the respondents (mentors and student-teachers) indicated that adequate communication and partnership between school and teacher training institute (on both organisational and individual level) is essential for a successful trajectory. The challenges which both organisations have to face in order to establish an effective partnership and to effectively guide future student-teachers towards their future profession, were made transparent: invest in intensive coaching and install structural involvement of both school and institute during the trajectory. Yet without sufficient financial and structural support, schools and teacher training institutes are left facing these challenges on their own.

Keywords: workplace learning, inservice teacher training, qualitative research

1. The inservice-training in Flanders: a new LIW-trajectory for student-teachers

The “learning-in-the-workplace”(LIW)-trajectory gives someone the opportunity to start working as a teacher and simultaneously follow an on-the-job-learning-program in order to get his teaching diploma (Explanatory Statement of the Decree on Teacher Education in Flanders, 2006). In a LIW-trajectory the student-teacher will teach autonomously without the permanent presence of a mentor in the classroom and he will function as an (often fully) employed teacher in the school, meaning he not only teaches his classes, but also fulfills all other responsibilities associated with a teaching job. This LIW-trajectory is in other words a realization of workplace-learning. Onstenk (2001) defines this as “experience-based learning, an active and constructive process which takes place in the real professional environment, which consequently is a learning-environment with real problems and obstacles from the (future) professional practice as learning-objects” (Onstenk, 2001, p.). Because the learning takes place in an authentic job-situation, the student-teacher will develop situation-specific forms of competence in order to gain more expertise as a beginning teacher (Tynjälä, 2007). Being confronted with an authentic job situation, with real problems and obstacles, workplace learning is considered to be a complex learning process. It is a complex cognitive process mainly because of the informal nature of the learning process (Eraut, 2004). Most of the time, a workplace setting isn’t primarily constructed to learn, for a novice who enters the workplace, but to work in it and achieve professional results. As a consequence, learning often happens implicitly; it occurs as an unstructured, tacit process (Eraut, 2004). Therefore, to maximize the novice’s cognitive progress while functioning in the workplace, adequate coaching and support by experts is an essential situational condition (Tynjälä, 2007). According to the Decree on teacher Education in Flanders (2006), the LIW-student should be coached in the workplace by a staff member of both the teacher training institute and the school. The latter should be appointed as the ‘mentor’. A mentor not only coordinates the support of the preservice trainees, he also organises the coaching of the newly employed teachers and besides teaches his own classes (Decree, 2006). Learning in the workplace for the student-teacher doesn’t only imply ‘learning and working’; it also includes ‘training and being trained in the workplace’. The LIW-student is not only engaged in a job at a school, he also has to participate in formal (mainly theoretical) education issued by a teacher training institute. His

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teaching job at the school should be more than just a training which incidentally takes place in the workplace. It should foremost be part of a structurally organised and cognitively supported training at the workplace (Onstenk, 2001). Consequently both school and teacher training institute need to develop strategies on how to coach, train and assess LIW-student-teachers and foremost make efforts to attune these strategies, in order to attune the learning in the workplace and the learning in the teacher training institute of the student-teacher. (Kelchtermans & Ballet, 2010)

2. This study

Since the school year 2007-2008 the LIW-trajectories are a reality in Flemish secondary education. Since its implementation the LIW-trajectory is becoming more and more popular; each year more student-teachers find their way to the teacher’s profession through this trajectory. Table 1 gives an overview of the guidelines given by the Flemish government regarding the implementation of the LIW-trajectory.

<table>
<thead>
<tr>
<th>Table 1: Overview of the guidelines for implementing the LIW-trajectory according to the Decree on Teacher Education in Flanders (2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
</tr>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Legal/practical</td>
</tr>
<tr>
<td>Coaching</td>
</tr>
<tr>
<td>Assessment</td>
</tr>
</tbody>
</table>

Because these guidelines are insufficiently comprehensive, each teacher training institute has defined them resulting in different expectations for LIW-students and mentors regarding content and amount of learning, coaching and assessment activities.

This study arose from a common issue within six teacher training institutes: how is the LIW-trajectory perceived by mentors and student-teachers and does the trajectory with its different demands and requirements meet the individual needs and expectations of mentors and student-teachers? These issues led to the question: What are the advantages and obstacles of the LIW-trajectory as experienced by mentors and student-teachers? The focus lies on two important topics: a) the coaching activities during the LIW-trajectory and b) the assessment during and at the end of the LIW-trajectory.

3. Methodology

In this qualitative research project 34 semi-structured interviews were conducted with 17 student-teachers and 17 mentors. Each teacher training institute that participated in this study was asked to give a list of names of their LIW-students and mentors. Each respondent was affiliated in a different school. Only those student-teachers who did the entire LIW-trajectory (meaning 500 teaching hours per school year, see Table 1) were contacted and could participate in this study.

The interview focused on experiences during the LIW-trajectory, regarding coaching and assessment. Examples of good practice (and bottle necks) of the LIW-trajectory were collected. Some indicative questions are: Up to now how did you experience the LIW-trajectory? What were your most positive/negative experiences and why? How do you experience the coaching and assessment? Who is responsible for coaching/assessment? How does coaching and assessment takes place? All interviews were recorded, transcribed and encoded using Nvivo.
4. Research results

“One can only become a teacher by standing in front of a class, by teaching alone and by yourself, there is simply no other way.” (mentor N., coaches 1 LIW-student-teacher)

In the following paragraphs the perceptions of the respondents (concerning the LIW-trajectory) will be described thematically (coaching – evaluation) and separately for mentors and LIW-student-teachers. By describing the respondent’s answers regarding these themes the central research question - which are the advantages and obstacles of the LIW-trajectory as experienced by mentors and students - will be answered.

4.1 Coaching during the LIW-trajectory – perceptions of mentors

All but one mentor consider the LIW-trajectory to be of absolute value for the training of future teachers. This positive evaluation is illustrated with a saying which almost all of the respondents (mentors and LIW-student-teachers) use frequently when talking about the LIW-trajectory: “practice makes perfect”. With this trajectory the student-teacher will experience a complete immersion in the profession of a teacher, which means teaching independently but also functioning as a fully employed (beginning) staff member of the school. It is exactly this combination which, according to the mentors, defines the added value of the LIW-trajectory for the teacher training.

Approximately half of the interviewed mentors indicate they perceive the LIW-student-teacher as a new colleague. Subsequently, their coaching of these student-teachers doesn’t differ from the coaching of the new, starting colleagues. According to the mentors five key elements regarding coaching during the LIW-trajectory, need attention: 1) sufficient time/coaching-hours, 2) support from school management, 3) support from colleagues/subject teachers, 4) communication with teacher training institute and 5) developing a trustworthy relationship with the LIW-student-teacher.

4.1.1 Mentors need more time for adequate coaching

“I feel really frustrated I can’t spend more time with them. Sometimes I think: “If I could just observe their classes some more or just be there more to give them advice.” But you only have so little time to really coach them and make sure they can make actual progress before the year is over.” (mentor G., coaches 2 LIW-student-teachers)

Every mentor frequently mentions the lack of time for adequate coaching as an important obstacle in the LIW-trajectory. According to the mentors it is exactly in depth-coaching which is an essential factor for a successful trajectory. The student-teacher will achieve the best results and make the most progress if and when he gets adequate coaching and support. In most cases the mentor is a close colleague of the LIW-student-teacher and has therefore immediate access to his work(and learning)place. Because of the mentor’s high workload however, regular and meaningful contact between both parties is not always easy. Every mentor has his own classes, responsibilities as a teacher and coach of the (other) new starting colleagues and trainees. With the LIW-trajectory a new group of student-teachers has arrived in the schools, but no additional means were offered to the schools and individual mentors to sufficiently guide and coach this new group. Every interviewed mentor made an urgent call for (more) governmental resources for the guidance and coaching of these LIW-student-teachers.

4.1.2 School management support is essential

Coaching LIW-student-teachers (and new starting colleagues as well) needs to be regarded as very important for the professional development of the school; not only by politicians but also and foremost by the school principal. He has to allow them enough flexibility to organise their coaching-tasks.

“Much depends on the way the principal perceives the task of a mentor. Should he say: “look you take care of it, I don’t have the time to arrange anything”, well in that case I don’t think I would’ve accepted the job.” (mentor E., coaches 4 LIW-student-teachers)

There are some mentors who indicate that their principals are not really involved; that their principals consider coaching of LIW-students or beginning teachers not as a priority. These principals seem to look at the LIW-trajectory as a possible obstacle for the mentor’s own teaching. They fear the intensity of the
coaching will interfere with the mentor’s teaching tasks and therefore should be limited. Otherwise, when a mentor is allowed more freedom for efficient planning of both tasks (teaching and coaching), there is less frustration about lack of time or workload.

4.1.3 Involvement of subject teachers/colleagues is useful

According to several mentors a difference in subject specific teaching methods between mentor and LIW-student-teacher, could interfere with the coaching-process in the sense that it will limit the feedback to pedagogical feedback only. Although a limitation, this is not considered to be really problematic. The technical aspect of the feedback may be absent, but other factors are considered to be more important for successful coaching, or a successful trajectory in itself. For instance support from the other colleagues or if possible from the entire teaching staff. If the subject teachers/colleagues are (motivated to be) actively involved in the coaching of the LIW-student-teachers, the formerly mentioned limitation can be compensated. In one case 3 subject teachers/colleagues were systematically involved in the coaching of LIW-student-teachers (and other new starting colleagues). They assisted the mentor regularly when observing the LIW-student-teachers in their classrooms. In this case the LIW-student-teacher gets more and also differentiated feedback from his mentor and other colleagues.

4.1.4 Communication between school and institute needs to be promoted

“Without any doubt I want sufficient contact. Because, I write a report [about the evolution of the LIW-student-teacher] and he [coach from the teacher training institute] writes a report, yet if you compare these written evaluations to a real conversation, they are of course worthless. You see, in 10 minutes you can tell a 100 times more to each other than on 2 pages.” (mentor B., coaches 1 LIW-student-teacher)

Another essential supporting factor for adequate coaching is an open and efficient communication with the teacher training institutes. A majority of the interviewed mentors emphasize a constructive and open relationship with the coach of the institute as being essential for a fluent organisation of the coaching-trajectory. The mentors need clear and constructive guidelines from the institutes regarding number of observations, necessary administrative documents and tasks, timing of coaching interviews, etc. They prefer to attune their view on coaching to the view and expectations of the teacher training institutes through frequent meetings (or minimum one meeting per school year preferably at the beginning of the LIW-trajectory). Adequate and constructive communication is needed for a fluent coaching-process and for a successful trajectory in general. For instance when problems arise during the trajectory (mostly examples were given about student-teachers who underachieve in the classroom and/or are not capable of making fast progress during the beginning of the trajectory) it is essential for both parties (LIW-student-teacher and mentor) that there exist adequate communication between mentor and teacher training institute. In those cases mentors expect the latter to decide whether an intervention is necessary or maybe even a termination of the LIW-trajectory.

4.1.5 A trustworthy relationship with the student-teacher contributes to adequate coaching

A mentor coaches the LIW-student-teacher during the trajectory which means giving him (pedagogical) feedback, showing him the ways around the school and classrooms etc. An underlying factor, according to the majority of the mentors, is building a relationship with the LIW-student-teacher based on mutual trust. This factor is essential for the student-teacher’s learning process. In order for the student-teacher to make progress in the workplace, he needs to learn from and with the mentor in his personal workplace, let him observe and discuss his successes and failures.

“Respecting that boundary is very important for building a trustworthy relationship with the new teacher [LIW-student-teacher]. Because there might be colleagues asking me “hey, how’s the new guy doing in his class?”. But I don’t give any information. Also regarding the principal I’m very careful not to say too much. Because there might be something that he[the LIW-student-teacher] doesn’t do very well, but you feel he has the potential to improve, then it’s up to you to respect that.” (mentor E., coaches 4 LIW-student-teachers)
4.2 Coaching during the LIW-trajectory – perceptions of LIW-student-teachers

Every interviewed LIW-student-teacher emphasizes the many advantages of the LIW-trajectory: an efficient and adequate way to achieve your pedagogical diploma, ideal (but challenging) combination of working and studying and simultaneously experience a real(istic) immersion in the profession of a teacher.

A majority of these LIW-student-teacher sees adequate coaching as an essential condition for a successful trajectory. Five important elements for adequate coaching were denoted: 1) overall support and frequent feedback, 2) constructive attitude for the coach, 3) practice-oriented training, 4) input from colleagues who teach the same subject and 5) adequate internal communication.

4.2.1 Sufficient feedback and support is essential

When the LIW-student-teachers were asked to specify the value(s) of coaching during the LIW-trajectory, a majority illustrates this value with “feeling constantly supported” and “always having an expert close-by”. Preferably they want to be supported and coached in a very pro-active and constructive manner. The LIW-student-teachers value the fact that someone invests time and energy in them which they can reciprocate. Yet they also feel that support in the workplace shouldn’t be given by just one person (mentor); by informing the entire teaching staff (colleagues, principal) about the LIW-trajectory and its demands, the student-teacher can turn to several experts. Frequent feedback on their teaching is an important part of the support. Adequate feedback is described by a majority of the respondents as “getting useful tips”. LIW-student-teachers are eager to learn and evolve in their role as a teacher preferably by getting as much practical and instantly applicable tips as possible.

“I feel I’ve grown a lot as a teacher thanks to this trajectory and the comments my mentor gave me. I realize also I’ve changed because of my work, but mainly because people came in my class-room and observed my classes.” (LIW-student-teacher F., young graduate, no previous teaching experience)

Several LIW-student-teachers feel more observations, more coaching hours, are needed (even though being observed during teaching can give the feeling one is being evaluated and may cause stress by some LIW-student-teachers) in order to receive more (intermediate) feedback. Not only for the student-teacher’s cognitive process, but also to promote and support self-evaluation and self-efficacy of the student-teacher.

4.2.2 An open and constructive attitude contributes to adequate coaching

“I’m very happy with how I was coached. After class he [the mentor] said: “how do you feel about this class” and “I would suggest you do this in the next class”. Very personal, very correct. Not from a “I will flunk you now”-attitude, but more from a “maybe you can work on this, I thought you did very well there”-approach”. (LIW-student-teacher M., one year previous teaching experience)

Several LIW-student-teachers indicate the mentor’s attitude to be a very decisive factor for the quality of the coaching. They find that an open, emphatic and non-pedantic attitude can have a motivating influence on their performance. Which means the student-teachers mustn’t feel they are being judged or evaluated when the mentor points out to some mistakes they might’ve made. A good coach, according to the LIW-student-teachers, is someone who will allow the coaching process to be of a constructive and dialogical nature; he will actively involve the student-teacher in this process, thereby motivating him to have insight in his own cognitive process.

4.2.3 The (teacher) training must be practice-oriented

“I understand there has to be a theoretical component. But still, I’m sitting in class and thinking: “ok, I can’t use this”. (LIW-student-teacher C., lateral-entry student-teacher)

A majority of the interviewed LIW-student-teachers find their training to be “insufficiently pragmatic”. Because the LIW-trajectory amounts to a demanding combination of working as a beginning teacher, learning from your everyday practice and studying at a teacher training institute, the LIW-student-teachers of
this study show a great need for practical information they can instantly use in their workplace. This means they need subjects or theory which is/are directly linked up with the (demands or context of the) LIW-trajectory. This also implies that LIW-student-teachers only value theoretical input which has a utilitarian outcome. Some theory might be very interesting for the pedagogical domain, but if not instantly usable or if it doesn’t show instantly usable characteristics for their workplace, the LIW-student-teachers can’t (or won’t) invest time in this subject.

4.2.4 Input of colleagues who teach the same subject is valuable

For the mentors a difference in professional background was not an immediate obstacle for adequate coaching (see above), yet the LIW-student-teachers point out to a more problematic view. For instance in one case the mentor disapproved some of the pedagogical methods used by a LIW-student-teacher. These methods, however were shown to be very useful and even necessary in this particular domain, which was unknown to the mentor. If teachers who teach the same subject(s) as the LIW-student-teacher’s are involved to assist the mentor, this problem might be compensated.

“I have a few colleagues who each observed two classes. I have to say this went very well. I’m very grateful they wanted to do this, because I received very useful feedback. They also told me it wasn’t a bother, apparently it was also interesting for them.” (LIW-student-teacher F., young graduate, no previous teaching experience)

When in some cases (e.g. small schools) those teachers are absent, both student-teacher and mentor state that the teacher training institute should find a solution for compensating this lack of learning opportunities.

4.2.5 Frequent communication between all parties is essential

A large majority of the LIW-student-teachers frequently underlines the importance of open and efficient communication between all parties (school, teacher training institute and student-teacher). Fluent communication between student-teacher and both coaches (mentor and coach from the institute) needs to be upheld. Even more essential is the internal contact between school and teacher training institute. According to the LIW-student-teachers it is especially the latter party which needs to take responsibility to inform the mentor of the tasks and demands of the LIW-trajectory. If adequate communication between the two organisations is installed through clear formal demands and engagements, this will ensure a good start of the trajectory and guarantee that the student-teacher isn’t the only linking pin between them.

4.3 Assessment of the LIW-trajectory – perceptions of mentors

At the time of the interviews, a large majority of the interviewed mentors are expected to be actively involved (with mainly formative, but sometimes also summative forms of assessment) in the assessment of the LIW-student-teachers. According to the mentors, two essential elements of this evaluation-process are to be underlined: 1) the possibility of coaching without evaluating and 2) installing uniform guidelines and mutual engagements.

4.3.1 To evaluate whilst being a coach forms a dilemma

It is not a surprise that, when we take into account the perceptions of mentors on the nature of their relationship with the LIW-student-teachers as one that is built on mutual trust (see above), almost every interviewed mentor shows great resistance when having to assess the LIW-student-teacher during the trajectory.

“In the end you are almost forced into the position of someone who evaluates. And I personally find that, when you look after colleagues as a mentor, people with whom I will be working for the next 4 years, you can’t tell them: “this is wrong, you should be doing that”. Maybe you could carefully give that message, but still that can only be possible if there aren’t any consequences tied to it. If not, you cannot build a real relationship with these people.” (mentor F., coaches 1 LIW-student-teacher)

For the majority of the mentors this combined task of coaching and evaluating forms a real dilemma. The LIW-student-teacher is not only perceived a student-teacher as seen before, he is also perceived as a possible future colleague of the mentor. A (negative) evaluation might jeopardize their current and future relationship.
Most mentors therefore prefer a strict elimination of any evaluative tasks. Simultaneously, they consider it problematic because this rules out their involvement in the end-assessment of the LIW-student-teacher whom they have guided and coached during a long period of time. In most cases they know much more about their achievements in the workplace compared to the coach of the teacher training institute. The mentors perceive the task of evaluating as a ‘necessary evil’. They want the teaching training institutes to take their views as a coach on the achievements of the student-teacher into account, but their evaluative role must be kept to a minimum and restricted to mainly formative assessment. They agree that the final decision on passing or failing (the summative evaluation) must remain a task for the institutions. They advice involving the school principal in this decision.

4.3.2 Uniform expectations and engagement towards the mentors are needed

The individual expectations and engagements of the teacher training institutes towards the mentors are very diverse. Some institutes want the mentor to be part of a jury, others (only or also) ask for an evaluation of the student-teacher’s portfolio, etc. Half of the interviewed mentors request harmonising these tasks as it will decrease the work load.

“They should level up all the differences. Sometimes I have to give actual marks and with other teachers [LIW-student-teachers] I have to do different things and..well it would make our work much easier and foremost also more objective.” (mentor J., coaches 3 LIW-student-teachers)

In this regard a majority of the mentors ask for more and intensive communication with the institutes. If both parties only express their views on the achievements of the LIW-student-teacher via written reports, much other useful information will not be communicated and mentors might not be well informed about the evaluation-process. Several mentors point out the importance of investing time into formal meetings, especially with regard to the mutual evaluation of the LIW-student-teacher.

4.4 Assessment of the LIW-trajectory – perceptions of LIW-student-teachers

Regarding their evaluation, the LIW-student-teachers denote 3 key elements which need attention: 1) involvement of the mentor, 2) process-oriented evaluation and 3) practice-oriented assignments.

5.4.1 Involvement of the mentor in the assessment is necessary

When bearing in mind the previous stated perceptions of the mentors concerning the paradoxical relation between coaching and evaluation (see above), it is remarkable that a large majority of the LIW-student-teachers states that they prefer the mentor to be actively involved in their assessment and if possible to give a summative evaluation at the end of the trajectory. The mentor, being a colleague at the school where the LIW-student-teacher works, is the ideal party to adequately assess their on-the-job-learning and how or if they made progress at the end of the trajectory. The LIW-student-teachers regard him as the ideal actor in the evaluation-process as he has followed their performance in the workplace; teaching, communicating with their pupils, parents and other colleagues, taking exams, attending staff meeting, etc.

4.4.2 Process-oriented evaluation is preferred over (mainly) product-oriented and singular evaluation

“I don’t like it being only once. Because we are told “you can’t take just take one singular evaluation. You have to make sure you have an overview of the evolution of the entire school year.” So if you get a mark based on one observation only.. Imagine you’re nervous or the class behaves badly that day, or something unusual happens. It might seem way off, yet you have made a significant progress from September till May.” (LIW-student-teacher D., latter-entry student-teacher)

Several LIW-student-teachers feel their pedagogical evolution is insufficiently known by the teacher training institutes. They have the feeling their achievements are measured at and by one particular moment or one particular product alone. Therefore a majority of the student-teachers points out that more visits, observations and performance interviews are necessary. Not only to obtain a more adequate view on their performance at the end of the trajectory, but also to generate intermediate assessments and feedback.
4.4.3 Practice-oriented assignments are necessary

During the LIW-trajectory the LIW-student-teachers are expected to make assignments which are added to their portfolio. Several LIW-student-teachers find that these assignments are sometimes insufficiently attuned to the workplace. Some assignments might be very useful for preservice student-teachers who aren’t fully employed (yet) in a school, but they are less useful for inservice student-teachers. They don’t consider these assignments to be unimportant, but these aren’t generating (new) practical or useful information for their teaching.

“For example, sometimes you have to look up and analyse the school’s sanction regulation plan. Of course I had already done that and used it. When you’re working in a school, well, you already know this stuff. And I didn’t learn anything by it when looking it up again.” (LIW-student-teacher E., lateral-entry student-teacher)

5. Discussion

More financial resources for more coaching as an answer to intensive learning trajectory?

The most important quality of the LIW-trajectory is without doubt the complete immersion of the student-teacher in the professional environment during the teacher training. At the same time this also refers to the biggest challenge of the LIW-trajectory; i.e. it is a very intensive, time-consuming trajectory with high demands for the student-teachers (combination of teaching, working in the school, learning from this practice, studying and attending classes) and the mentors (intensive coaching trajectory with limited official means in combination with work as a teacher and coach of new starting teachers and preservice trainees). Furthermore, the Decree on Teacher Education in Flanders (2006) doesn’t specify if the LIW-trajectory is mainly suited for lateral-entry student-teachers and/or for those student-teachers who have previous teaching experience. As a result nowadays the student population is very diverse (young graduates, more experienced lateral-entry students, students with some previous pedagogical experience, etc.) This diversity can increase the workload for the mentors because the coaching needs to be individually adapted if these students share the same mentor. Mentors are not always capable of investing extra time for coaching when this is needed, e.g.: the student-teacher with insufficient cognitive skills who is unable to make a fast progress. Is the solution to this problem as simple as getting governmental financial resources for these extra coaching activities? It is not in any way contested that it is necessary to revise the budgets for adequate coaching of the LIW-student-teachers. Still does more automatically mean better? At the root of this need for more means lies the realization that the LIW-trajectory is a very highly demanding trajectory for any type of student-teacher, for whom intensive coaching and support are always necessary. A successful trajectory isn’t singularly dependant on the individual characteristics of the student-teacher, but also and foremost on the given coaching and training. More means for more coaching hours are in fact needed, but besides this, mentors need to be structurally supported and professionalized in their role as a coach. When the tasks and responsibilities of coaching the LIW-student-teachers in the workplace are carried out solely by the mentors, this will always be a weight too heavy to bear – even when more hours are given. Both mentors and LIW-student-teachers frequently underline many positive consequences when other (subject) teachers/colleagues are motivated to join the mentor in giving support and coaching to the LIW-student-teachers. More precisely because the latter creates a broader range of support and coaching. Thus throughout the unanimous call for more means, we see an urgent need to generate a larger support system for the mentors via structurally involving other members of the teaching staff (such as subject teachers, colleagues and the principal) in the coaching of LIW-student-teachers.

Creating more communication leads to establishing an effective partnership

Looking at the previously mentioned call for a wider range of involvement in the coaching during the LIW-trajectory, it is only logical that sufficient communication needs to be installed. Both mentors and student-teachers imply that the teacher training institutes should initiate this. Considering that the latter implements the LIW-trajectory, accepts the student-teachers and issues the diploma, it seems natural that the institutes foresee a minimum of communication with schools regarding the formal requirements and mutual engagements. However, this process should be regarded as forming an actual cooperation with schools, which demands mutual participation in formalizing the coaching and evaluation process of the LIW-trajectory. This means the principal of the school and the mentor need to be informed about the necessary
procedures of the LIW-trajectory; what is expected from the mentor and the LIW-student-teacher and how the principal and the rest of the teaching staff can take part in (coaching during )the LIW-trajectory. Institutes should allow schools to have a say in the implementation of these engagements and if necessary adapt the LIW-contract to the needs, capacities and pedagogical position of the school. Both mentors and student-teachers frequently emphasize the use and effect of verbally communicating these engagements. Even though a document with clearly formulated expectations might seem sufficient, the reality of this study showed it doesn’t lead to an effective transfer of the institutes’ view, nor does it give sufficient support of and information for the mentor to handle every situation accordingly.

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Cultural Differences on Cognitive Style – A COSI Study

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Abstract

Cognitive styles are ‘the way people perceive stimuli and how they use this information to guide their behavior’ (i.e., thinking, feeling, actions) (Cools and Van Den Broeck, 2007). Cultural influences on cognitive styles of managers/founders have been explored in management interactions (Abramson et al., 1993), venture creation decision (Mitchell et al., 2000; Busenitz and Lau, 1996), strategic issue categorisations (Sallivan and Nonaka, 1988), embeddedness of culture in cognitive style with respect to strategy formulation (Schneider, 1989) and comparative study of Japanese vs. Canadian cognitive styles (sample of MBA students using MBTI measure) (Abramson et al., 1993). Comparative study of cognitive styles from various national cultures like Egypt, Greece, Hong Kong and the UK (undergraduates, postgraduates and managerial level) using Allinson-Hayes’ cognitive style index (CSI) found that undergraduates (Egypt, Greece and UK) showed no statistically significant difference in cognitive style. It was explained loosely by the fact that educational models were modelled largely upon western business school models, whereas at the postgraduate and managerial level, significant statistical differences were observed. The limitations of the study was that mechanisms (similarities and differences) were not examined and though the study condemned geographical categorizations, more research is expected to understand range of style differences within groups (Savvas et al., 2001). Expertise research has established that development of cognitive indicators move along a progressive trajectory starting from novices, intermediates and experts (Arts, 2007).

The current study explores whether experts/intermediates/novices in management domain from different cultures have similar cognitive styles or do they acquire specific cognitive styles that distance them from one another depending on their national culture.

Bipolarity in terms of analytic versus intuitive styles even assumed as a continuum discounts the tendency that people can simultaneously belong to both poles. Such debate about bipolarity has resulted in the evolution of cognitive style indicator (COSI). This study uses COSI instrument, a refinement of analytic – intuitive cognitive style dimensions to include in the analytic pole, a knowing and planning style (Cools and Van Den Broeck, 2007) to explore the cognitive styles of two cultures belonging to different countries but closer on national culture scores.

The study expects to find differences in cognitive style between cultures but however moderated by the different levels of expertise. It also hopes to give an insight into cognitive styles of cultures (closer on national culture dimension scores) at different levels of expertise in the management domain.

Keywords: COSI, national culture dimensions, novices, intermediates, experts

References


Initiating Practitioner Research into Self-Organising Learning

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Abstract

This paper connects ‘learning to learn’—classroom activities aimed at collectively shaping the process of acquiring competencies—to an idea that has become widespread in systems theory, self-organisation. Self-organisation describes processes in which internal conditions enable a process to develop and persist in relative autonomy, that is without need for a central or external authority. In light of the many references to autonomy in learning to learn discourse two questions arise, namely whether collective learning exhibits self-organising features and if such features are visible in learning to learn activities. We are currently planning for a Dutch regional network of researchers and teachers to intervene in primary and secondary pedagogy and curriculum through practitioner projects in classrooms. These interventions should aim at implementing learning to learn activities; that is, at enabling learners to critically and in accord with their age and ability co-determine how, when, what and why they learn. In order to provide for initialising conditions for self-organisation, the network expects to borrow from resources collected in the British Learning to Learn or L2L national initiative hosted by the Centre for Learning and Teaching at Newcastle University (UK). Experience gained with this and other projects tentatively suggests that some learning to learn achievements—such as minimally invasive teaching and active or self-regulating learning—may trigger collective self-organising learning. This paper reports on four video-interviews with six L2L teachers in the North-East of England whom we invited to talk about teaching and learning gains. These data and our network proposals were presented to and debated with practitioners during a regional workshop in February 2011. The workshop findings suggest that the participating practitioners are conservative about L2L findings but welcoming about networked practitioner research as instrument for exploring active learning.

Keywords: Learning to learn, self-organising learning, actor network theory, systems theory

‘Humans cannot communicate; not even their brains can communicate; not even their conscious minds can communicate. Only communication can communicate.’

(Niklas Luhmann, 2002:169)

1. Introduction

The claim that learners should learn about learning is widespread and has been formalised in the European context of educational policy by including learning to learn as part of a formal commitment to bettering the knowledge-based economic prospects of European citizenry, a commitment that concluded the Lisbon summit in 2000 (European Council 2000). Key element in that strategy as it was subsequently sub-defined by the EU’s Education Council is a focus on accessible lifelong learning, and the Council identified the ‘ability to learn’ (Education Council 2001, objective 1.2) as an important competence for enabling lifelong learning. The range of definitions associated with learning to learn is however very broad (Stringher 2006) and even its very possibility has been contested (Wynch 2008). In searching for measurement instruments that can be used to evaluate learning to learn outcomes, Hoskins and Fredriksson (2008) appraise both the meaning of learning to learn and its status as competence, concluding with the Eurydice statement that most learning to learn definitions aim at ‘the capacity to understand and control one’s own thinking and learning process’ (Eurydice 2002:16), extending into such notions as self-initiated, self-regulated and intentional learning.

Reference to learning that can be self-initiated and self-regulated points to the possibility that collective learning too is or could be self-organising in more radical ways—that is, whether learning can structurally exist as social activity that needs no particular external authority. From an educational perspective the first question would then be under what conditions of classroom work attributes of self-organising learning might...
become visible and testable. Some clear precursors exist, for example in earlier research into active learning (Benware and Deci 1984), and more recently the application of self-determination theory in researching autonomy and competence in the classroom (Niemiec and Ryan 2009). A particular noteworthy example we think is research that led to the notion of minimally invasive teaching. In so-called ‘hole in the wall’ experiments computers with a fast internet connection were made available to disadvantaged children in urban and rural India, by fixing them into the walls of places that children could frequent. However, no teaching or instruction of any kind was introduced. Controls were introduced through the regular teaching of informatics to groups of learners in schools, so that a key variable was the presence or absence of formal curriculum and teaching. Findings suggest that unschooled children have a specifically collective (that is, social) capacity for learning from these computers with minimal need for instruction or teaching, hence the subsequent reference to minimally invasive teaching (Mitra 2010; Mitra et al. 2005). While there is no suggestion that computer terminals can or should replace teaching, such practical experiments also confirm the need to account for non-human actors in shaping the process of learning. This means reconsidering some of the most dearly held epistemes about learning and teaching, in particular those that would conceive of learning and teaching exclusively in terms of individual cognition-based knowledge transfer from a trained and qualified adult to age-matched groups of children; the challenge here is to traditional conceptions of schooling.

The University of Newcastle’s Centre for Learning and Teaching can boast ten years experience with practitioner research in phased, nationally dispersed series of learning to learn projects that have taken place across the UK since 2000 within the context of a national project commissioned by the national Campaign for Learning, called Learning to Learn, or L2L for short. Learning to Learn is an action research network of teachers and schools (primary, secondary and tertiary) that according to the Campaign for Learning website are pioneering different approaches for ‘creating confident, effective lifelong learners [and] trying out new approaches to classroom management, teaching and learning, and assessment.’ The project draws practitioners into a community of enquiry and enables and supports them in following their own ideas and questions with regards to what learning to learn is and what it can do for them and their students. The phase four L2L research report published in 2010 contains a conceptual model of the impact that this ten-year programme of schools-based practitioner action research has had on education, reporting effects on the language used in relation to learning (by practitioners, learners, schools and the wider community) as well as effects on skills, knowledge, understanding and dispositions (Wall et al. 2006:6). The limited amount of attainment data reported to the project by teachers suggest that learning to learn thus far ‘does not impact, either positively or negatively on school level results’ (ibid:102), so that the benefits have to date accrued more in relation to educational process and experience than educational outcome.

This combination of practitioner research and learning to learn activities is something we are now also aiming to establish in the local region around Groningen university in the Netherlands, to see if initialising conditions for collective self-organising learning arise. But before we report on our preparatory planning and pre-project experiences, we will first describe how we ourselves have framed both learning to learn and self-organising learning.

2. Theoretical framework

2.1 Learning to learn conceived as actor-network

We think of learning to learn in concrete terms as those classroom activities that are aimed at collectively shaping the process of acquiring competencies. This foregrounds learning to learn together for a number of reasons that will be detailed below, but in anticipation of our later assessment of Wynch’s (2008) critique of learning to learn, the commonplace overt focus on individual cognition in so many studies of learning as process overlook social constructivist gains that recognise in learning above all else participation in an ongoing collective process of unfolding shared insight and skill, a process that, while formal and often ritually individualising when it takes place in a classroom, is never reducible to individual cognitive process (cf Biesta 2006).

We need no more than consider that learners can be more or less aware of learning, in the clear sense of (not) being able to join dialogue about its nature, purpose and direction, and open to the suggestion that learning has more and less desirable qualities at any one period and place and for any one person or group, to allow for the possibility that learning to learn is indeed a competence that can be learnt and inevitably is learnt
either more or less well. As has been noted elsewhere (e.g. Murris 2008), learning to learn is a jointly reflexive and discursive competence with emancipatory and democratising potential, which equally entails dark sides (Simon and Masschelein 2008). But what we think has greater relevance than normative claims is that learning to learn has become a matter of ubiquitous public intervention through various levels of policy, from the European level to the editing of educational textbooks and the training given to teachers. Learning to learn is therefore a practically realised phenomenon with a particular capacity for perturbing the future of education, regardless of our judgment on its exact definition: this position amounts to the philosophical insight that things are real to the extent that they have practical consequences. This observation makes Wynch’s philosophical discussion of its logical possibility a nominalist matter that hides the practical consequences of obvious everyday learning to learn mobilisations such as academic debates, policy documents, school plans and classroom activities, and indeed the very critique that Wynch intends. Our research is not aimed at academic struggle over pure definition, but at following learning to learn practices and open up their actual operations for analysis.

Our focus on practice and our attention to educational ‘things’ introduces another theoretical element, namely our reliance on actor-network theory (Callon and Law 1982; Latour 1987, 2005) in order to make visible the participation of objects, ideas and techniques such as learning to learn in what education is and how it ‘does’ or performs learning (Fenwick and Edwards 2010; Sørensen 2009). Actor network theory conceives of sociality not exclusively in human terms but in terms of network operations that equally involve object actors such as ideas, techniques, technologies, furniture, institutions, curricula, books, policy, light, food, assessments, tests and diplomas—the boundaries of inclusion are infinite in principle and therefore depend on norms selected on methodological or else communicative grounds. Actor network theory therefore treats education studies as itself part of the extensive network of education, tracing the slow formation of educational facts by treating them not as discoveries about a ‘really real’ reality by skilled formal observation, logical thought, or even action research (which presupposes a reflexive gap between theory and practice), but as the sum total of practical mobilisations of human and non-human actors in dense networks, including observations and thought. Network mobilisations can either support and stabilise or weaken and undermine the unfolding of product actors such as learning to learn, so that actor network theory discards human-centred interest in the reality or ‘correctness’ of facts in favour of tracing the diverse consequences of human, object and concept mobilisations.

2.2 Towards a theory of self-organising learning

The idea of self-organisation, in the sense of a process with an inherent order not determined by external authority, has been a recurrent theme in philosophy since at least Descartes, though the idea more clearly surfaced in Kant’s *Critique of judgment*, in reference to life that ‘sprung from the nature of what is lifeless, that matter should have been able to dispose itself into the form of a self-maintaining purposiveness […]’ (Kant 1914:205). The first mention of the term self-organisation as we now understand it has been in the study of cybernetics, where it formalised as an element of general systems theory in the 1960s (Wiener 1961). Self-organisation has subsequently led to general system descriptions in the field of cognitive and cultural biology, for example in work that has come to understand cognition as a function of all organic forms of life, leading to the claim that ‘living systems are cognitive systems, and living as a process is a process of cognition. This statement is valid for all organisms, with or without a nervous system’ (Maturana and Varela 1980:13). Homeostasis, morphogenesis and flocking behaviour are thought to present good examples of general systems theory as it applies to biology. The related idea of autopoiesis, describing systems that are both autonomous but operationally closed such as is the case for many biological cells, has recently been taken up by German sociologist Niklas Luhmann, who undertook an ambitious and very detailed analysis of social systems in terms of autopoiesis. He concludes that social systems do not comprise of people, but exclusively of the indefinite exchange of communication, a self-referencing system of messages that institutes a boundary between itself as social system and an unknowable environment—unknowable since the system is incapable of communicating with that which would otherwise logically be part of the system. Dutch sociologist Willem Schinkel has since drawn on Luhmann’s social systems theory to analyse discourse and practice of social integration (Schinkel 2009), raising noteworthy findings that have equally grave implications for the collective pursuit of inclusive education.

Luhmann’s social systems theory aligns, despite many differences and contrasts, with actor network theory on three points that we wish to draw attention to here, namely (a) its ontological de-centring of humans and human cognition as core to sociality, evolution or organisation, (b) the human/material co-dependent nature of message-exchange such as knowledge, data, information, monitoring and assessment and (c) its rejection
of humans’ self-centring presuppositions about rational intentionality as the ‘motor’ of sociality—regardless of whether we call that sociality learning, a classroom, school, education, or society—in favour of non-intentional principles of self-organisation (Luhmann 1996). In summary, in their core alignments both Luhmann’s theory of social systems and Latour’s actor-network theory are metaphysical philosophies of post-social thinking about phenomena such as learning. A detailed analysis of the points of contact between social systems theory and actor network theory is beyond the scope of this paper, but the metaphysics of actor-network—including the troubling consequences for human agency and human will—has been discussed by Graham Harman (2009).

In summary of this section, learning to learn is part of an actor network capable of mobilising a diverse range of both human and material actors focussed on learning as explicitly shared discourse and practice. Learning to learn practice is thought to include latent properties of self-organisation such as self-initiation, self-regulation, self-evaluation, self-determination, intrinsic motivation and reflexivity. Learning may consequently be self-organising not merely in the readily obvious sense that it would take effort to prevent it from taking place, but also in the more controversial sense that formal education and teaching, conceived as pre-determining, regulating and governing functions of learning may be considered intervening or modifying actors (Niemiec and Ryan 2009:137), sooner than as core organising principle of learning as pre-determined effort. The sorts of promises we might therefore hold out to for example teachers as participants in learning networks from an educational perspective that combines actor network theory and social systems theory would, hypothetically speaking, be of a wholly different order than conceived in modern Enlightenment educationalist or pedagogical accounts (see also Biesta 2006). We know that at this time our ideas are little more than general pointers, but we hope our work can soon attempt to connect conceptual development with practice-based experimentation, using learning to learn conceptual and practical resources as our departure.

3. First steps towards a regional network

3.1 Hosting a thinking and learning skills symposium

In February 2011 we hosted a 1.5 day regional workshop for 84 participants at the University of Groningen, entitled ‘Denken & Leervaardigheden’ (Thinking and learning skills). Participants were a varied mixture of teaching and coordinating staff from mainstream primary, secondary and tertiary schools and local university researchers in either psychology or education studies. Very few school staff attending had gained a prior sense of learning to learn as educational activity through attention for this in school curricula or small-scale school projects. The programme aimed at providing participants with an overview of activities and achievements collected in the British L2L project, to be followed by discussion about possibilities for transposing an approach of this type to the Netherlands. David Leat and Kate Wall, staff from the Centre for Learning and Teaching at Newcastle University, talked the participants through the L2L goals, structure and core activities. In essence, L2L is an approach that ‘focuses on what happens when we learn and how we can learn more effectively’ (Wall et al. 2010:5). Involving 41 primary and secondary schools and ten projects in two FE (further education) colleges, L2L is practitioner-based action research that draws on metacognition, thinking skills, self-regulation, self-efficacy and self-esteem as underdetermined ideas that teachers themselves can put to work in their teaching practice in order to create ‘new understandings of what L2L is in practice’ (Hall et al. 2006:149). The various element contained in the fourth stage of Claxton’s (2002) ‘four generations of teaching learning’—focussing on the involvement of students in educational process, raising awareness of how they can be helped to help themselves, and their teachers being personally involved in becoming better learners themselves—forms the main umbrella of reasons that the project is supported by the national Campaign for Learning. L2L researchers reporting in 2006 note that while the L2L results may be considered weak with regards to knowledge creation there is increasing evidence that teachers’ developing action research competence has changed them and their professional practice, and their work is challenging and changing others around them (Hall et al. 2006:163). The educational community around teachers involved in L2L projects are disturbed and influenced in iterative and complex ways by the ethos and resources that have emerged out of practitioners and researchers publicly sharing (Stenhouse 1981) their investigations into what learning to learn can mean—this messy, ongoing struggle over meaning, action and purpose is by and large also how processes of mobilisation are conceived in actor network theory and is, we think, an excellent example of learning to learn as contemporary research practice.

1 A separate project about learning is conducted with universities.
One month prior to the workshop we had travelled to the UK’s North-East to conduct four interviews with L2L practitioners living and working in Northumberland. The open interviews consisted of a small set of triggering questions about the reasons respondents had for joining the L2L project, the project they had carried out and what they saw as the main (positive and negative) outcomes. The candidates for the interviews were selected individuals, people who had responded positively to a phone-call invitation by CfLaT researchers following our request for volunteers. We talked to six people for about 1.5 hour per interview, in four separate video-recorded interviews which were subsequently edited and presented to the workshop participants. First we interviewed the Head of Hipsburn First School in Lesburn; we then interviewed four staff in two pairs at Duchess High School in Alnwick and finally one lecturer at Northumberland College in Ashington.2

The people we interviewed were by no means meant to be representative in some way of L2L participants, but were people who were enthusiastic about L2L and willing to talk at some length to two foreign researchers about their L2L involvement. For our part, the particular advantage of doing all interviews in one area was foremost practical, but since the interviews took us from a primary school to a nearby secondary community school and then to a regional college of further education, we also had opportunity to trace how the educational trajectory of some learners might keep them in contact with learning to learn approaches throughout much of their compulsory and professional training. While the four interviews we conducted are too rich and diverse in content to enable a useful summary here, we were struck by three recurrent themes in the discourse of the teachers. The first theme aligns directly with the reported L2L findings, and that is that all the six teachers we interviewed were explicit and confident about L2L having changed their professional practice (sometimes incisively) and affecting at the very least perceptions if not the practices of others around them, from some grannies of primary school children to fellow-teachers. Secondly, the teachers confirmed that L2L experience has had a direct influence on classroom practice and achievement. One experienced teacher reported ‘the best results I’ve ever had’, while another recounted the example of a student who might have withdrawn from her vocational course had teachers not been able to use L2L resources to talk with her explicitly about the learning process having characteristics that can be productively engaged. The third and final theme, and the one that concerned us most, surfaced most explicitly when three teachers—without us prompting them—talked about classrooms engaging with the process of learning to such an extent that very little teaching intervention remained necessary, as their most positive experience with L2L practice. As one teacher told us about recent experience of teaching history to a sixth form class,

‘I was able just to stand there, literally in the middle, and look at them, and listen to them, and know that I didn’t have to do anything. It was all self-starting, I just stood there and the machine rolled through its process. And everybody was dynamically involved: speaking, listening, responding, analysing, considering... And I was doing nothing, except wandering from one group to another, prompting occasionally but not very much, listening, supporting if necessary, throwing in a new idea. It gave me massive freedom, while giving them a big sense of freedom as well.’ (Hugh)

In this quote it is easy to recognise the concept of minimally invasive teaching, and this L2L practitioner spontaneously talks of learning as a self-starting process. Here and elsewhere in the interview the teacher draws on the ‘five Rs’, a commonplace L2L resource comprising of didactic operationalisations of readiness, resourcefulness, resilience, responsibility and reflectiveness as individual and shared competence. Perhaps the five Rs are among initialising conditions for learning to self-organise.

A ‘PMI’ (plus, minus, interesting) activity undertaken by our workshop participants following three inputs—presentations by L2L researchers and interviews with L2L practitioners discussed above, supplemented by a critical viewing of the research posters that the British teachers had made following their L2L projects—provides some insight into the thinking that was taking place among the workshop participants. Participants readily agreed that L2L is a practice-based approach that links professional competence with research ideas and innovation, that it suggests a collaborative ethos that draws on professionals and learners as a shared community of enquiry, and that L2L allows for local relevance through scaling: projects of various sizes can be started in different places, involving individual teachers in one location and perhaps an entire network of schools in another location. Participants also valued the empirical, research-oriented nature and the

2 The people we interviewed were Dot Charlton (Hipsburn First School); Gill Maitland, Diane Murphy, Hugh Dunford and Rebecca Harle (Duchess High School); and Teresa Thornton (Northumberland College).
enthusiasm that it seemed to engender. As downsides participants pointed to the considerable investment of
time and energy that are required, the likely difficulties involved in persuading fellow practitioners and
school boards to trial new ideas and work outside established comfort zones, the need to elaborate a shared
discourse (which simply takes time and cannot be controlled), and the challenge of embedding process
innovations in a context of policy and practice that is foremost oriented towards outcome measures. But the
greatest concern among participants, given the pervasive focus on outcomes throughout the Dutch
educational system, is reserved for the lack of concrete outcome measures that can be derived from L2L
evidence. Ideas for adjusting the approach to the Dutch context or for improving it were also solicited. The
response-set includes a greater use of open access electronic environments (including social media and video
sites) for facilitating day to day networking and sharing of data; offering placements to education studies
students in order to invest learning to learn in forthcoming generations of professionals and share some of
the burden of work undertaken in schools and the university; and ensuring on a structure for giving pupils and
parents a voice and co-shape the projects taking place.

3.2 Starting a network

Following the workshop a first planning meeting has been scheduled for those schools wishing to take part in
an initial round of practitioner-based action research on learning to learn in a Dutch context. At the time of
writing this meeting has not yet been hosted, but two primary, one secondary and one vocational school have
so far registered, supplemented by two teachers involved in a local schools network of inclusive care. One of
the two primary schools is for children with severe learning difficulties. This early inclusion of special needs
and inclusive education categories is not surprising, given that the university department is significantly
oriented towards orthopedagogiek, or pedagogy in relation to those for whom learning is not a self-evident
matter—and we as researchers involved in setting up the network research and lecture partly within this
context.

The research questions that have so far been put forward by those teachers reflect a healthy mix of ambitions,
including how to engender active learning and a work-attitude in pupils, how to involve pupils in developing
ongoing learning paths across primary and secondary, how to find out what pupils themselves think of their
thinking and learning, how to teach children with severe learning difficulties to learn to learn, how to make
learning to learn visual and directed at the level of severe learning difficulty, and identifying which learning
competencies can facilitate language and maths learning among vocational students. We think that this is a
challenging range of research questions that can help us confront, test and extend the existing realities of
learning to learn as discourse and practice. Whether the initialising conditions that we hope for in relation to
self-organising learning will emerge in this context remains very much to be seen.

4. Conclusion

We have defined learning to learn in concrete terms as a combination of policy, instruments, techniques and
tools, and those actual classroom activities that are aimed at collectively shaping the process of acquiring
competencies. This treats learning to learn as a concrete phenomenon with both realised and potential
consequences for education, only partly determined by current academic debate about what learning to learn
is. Learning to learn discourse and a few tentative findings suggest that learning to learn may include
initialising conditions for more autonomous learning and less dependence on teaching. British learning to
learn objectives and practices that developed in the L2L project of practitioner-based action research seem to
connect well with ideas and views that Dutch practitioners have in relation to learning to learn, so that an
attempt can be made to introduce a similar networked research methodology around Groningen University
and among other matters investigate the effects of learning to learn activities on self-organisation.

5. References


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The Underestimated Importance of Variances Illustrated in a Study on the Effect of Learning Strategies

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Abstract

In empirical and experimental studies a large amount of researchers focus on differences in means. In many cases (differences in) the variance(s) is lost out of sight. Consequently the information available in the data is not used completely leading to a loss in possibilities for interpretation of research results.

In this contribution the importance of variances is illustrated by the analysis of an experiment on effects on learning of reading strategies. It will be demonstrated that variances and differences in variances are an important source of information. If we loose track of different sources of variance we loose possibilities for nuances in the data and for possibilities of interpretation of research results. We will demonstrate that even in a very simple pre-test post-test design differences between means and variances need to be estimated simultaneously as otherwise research results are likely to be biased.

In this study 106 students (of four pre-university classes) took part in an experiment on reading strategies. In the experimental condition (N=51) students were thought reading strategies (like, skimming, reading beginning and end of paragraphs, underlining key-fragments, the use of structural markers). Each lesson students focussed on one strategy, which was showed by the teacher (thinking out loud) and practiced using longer texts from a Dutch newspaper. In the final three lessons teachers focussed on when to apply a specific reading strategy, whereas in the final lesson students’ reading skills were measured.

In this study we find that experimental research promotes heteroscedasticity (no homogeneous variances): the variances between respondents become larger. We argue that these differences in variances need theoretical explanation as well in research. Therefore we introduce the Aptitude-Treatment-Interaction theory and show how to analyse the variances in order to evaluate this theory. Furthermore we will demonstrate that even variances between tasks (different texts that students had to read) carries a lot of information that cannot be neglected in this study. Finally we will argue that using statistical models that model individual growth rather than mean differences are more informative for the theory underlying the research.

This paper is relevant for all researchers who rely on statistical analyses and more specific for researchers that rely on the popular pretest-posttest design. By demonstrating that there is so much more behind the “average” scores we hope that researchers will analyse these variances in a proper way and by doing so will promote the theories in their research field more profoundly.

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Abstract

This article is a report of a design-based research project that consisted of three phases: a case study (n=20), a first experiment (n=65) and a second experiment (n=84). In every phase students worked on an integrated assignment: design and build a tandem tricycle. Main question of the overall project was: are the learning results of students participating in a process of guided-co-construction with peers and experts better than the results of students that have ready-made models provided by the teachers? The tricycle assignment proved to be knowledge-rich and the results of the posttests showed positive effects of student learning on mathematics and science. There are clues to suppose that the strategy of 'guided-co-construction' can support students to acquire codified knowledge and understanding of modelling.

Keywords: modelling, vocation education, disciplined perception

This paper reports on a design based research project conducted between 2006 and 2009 in pre-vocational secondary education (VMBO\(^2\)) in which students follow a general curriculum with a vocational perspective.

The overall research question of this design-based project was the following: do students, who participate as model designers in a process of guided co-construction with an expert (teacher) and peers, show better learning outcomes than students who learn to work with ready-made models provided by the teacher? The general, working hypothesis is that collaboratively learning to design and use models in vocational education has positive effects on learning outcomes, compared to providing ready-made models to the students. The basic idea underlying the hypothesis is that students will develop knowledge and skills in modelling along with codified knowledge in mathematics and science as a result of constructive involvement and dialogic inquiry under teacher guidance. In all three interventions the students were to design and construct a technical product in the form of a tandem tricycle (in the first case study a bicycle racing game was the second product). The overall research project was divided into three phases: a case study, and two experiments in a pre-test post-test control group design. These interventions resulted in four studies (see below).

In the first section below the theoretical framework and a methodological overview of the project is given. In the next sections those questions are addressed by providing a chronological summary of the findings of each study. We will end with some remarks on educational theory and practice and propose some suggestions for further research.

Theoretical framework

Within the European Union and elsewhere it is recognised that in order to prepare students for the demands of the future, they should obtain competencies that cover both broad general knowledge as well as technical skills (Cedefop, 2009; Commission of the European Communities, 2008). However, there is an ongoing debate on how to connect formal learning and learning in the workplace (Billett, 2004; Griffiths & Guile, 2003; Guile & Griffiths, 2001; Tuomi-Gröhm & Engeström, 2003). At the same time, little research has been conducted into the learning environments in vocational education that are expected to promote this kind of learning (Koopman, Teune & Beijaard, in press). For example, a query in the ERIC database with the

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\(^2\) VMBO is preparatory senior secondary education. It is secondary education for students 12-16 years that prepares them for senior secondary vocational education. About 60% of all Dutch students 12-16 years attend VMBO (Maes, 2004).
keywords “workplace learning”, “formal” and “informal” returned 44 journal articles of which 14 concerned vocational education. None of them were empirical studies investigating the learning environment. Another search on pre-vocational education journal articles at the secondary level returned 15 hits, three of which concerned the learning environment.

As an attempt to improve the relevance of the knowledge and the effectiveness of transfer to the workplace, reforms are taking place in Dutch pre-vocational schools (De Bruijn, 2004; Guile & Young, 2003; Seezink, Poell & Kirschner, 2009), as in other countries. One of the proposed reforms envisions the teaching-learning process as an activity embedded in a simulation of real world practices, whereby students, guided by teachers, work on products for ‘real’ customers, in the meantime acquiring new knowledge and skills. The basic assumption behind this approach is that the learning of codified knowledge and vocational skills can be integrated into authentic workshop practices. The pedagogical approach is what Tynjälä labels “integrative pedagogics”, which is more of a principle integrating theory and practice than a specific teaching method (2008, p. 144). However, working on a (practical) problem is not enough to motivate students to learn (Guile & Young, 2003), and participating in real life situations is not sufficient to develop expertise on a higher level (Tynjälä, 2008). Explicitly taught knowledge, for example knowledge about modelling or knowledge gained in mathematics education classes, is not automatically used for problem solving in a workshop setting, and vice versa. Students simply do not recognise the connection between theory and practice. This may result in reduced learning outcomes and lack of motivation on the part of students. The challenge for schools is to provide assignments that are meaningful for students and realistic with regard to their future work (Terwel, Van Oers, Van Dijk & Van den Eeden, 2009; Tuomi-Gröhm & Engeström, 2003; Volman, 2006). At the same time, those assignments should also result in highly qualified learning outcomes that enable students to recontextualise their knowledge and skills acquired in the classroom to the workplace. Teaching should support students in relating practical problem solving to codified curriculum knowledge (Guile & Young, 2003; Van der Sanden, Terwel & Vosniadou, 2000). It follows therefore that students, when solving real life problems, need to be supported by “conceptual and pedagogical tools which make it possible for them to integrate theoretical knowledge with their practical experiences.” (Tynjälä, 2008, p.145).

Real workshop activities could increase the need for specific knowledge and skills, and subsequently provide opportunities for learning. Following Guile & Young (2003), such workplaces can be characterised as a “knowledge-rich workplace” (p.73). They are assumed to engage students in meaningful activities while at the same time promoting subject matter learning (including mathematics, see Kent, Noss, Guile, Hoyles & Bakker, 2007).

Models as tools

In vocational education, students are sometimes involved in such knowledge-rich workplaces while designing and constructing real products. In the design process as well as in the actual construction issues arise that need to be solved. To anticipate possible problems and their solutions models may be used. Although drawings and models are important in the design of technology and serve both to communicate and generate ideas, MacDonald & Gustafson (2004) claim that in classrooms the emphasis is on their mere representational function. Students have to draw correctly, while their models are only used for teacher diagnostics. If in these types of environment student drawing were related to orientation in the problem situation as well as to an exploration of ideas, modelling might turn into action-cum-learning strategies by which students could gain deeper understanding of problems and their possible solutions.

Following Van Oers (Van Oers, 1988), a model is defined in this paper as “... any material, materialised (for example a graphical display) or mentally pictured construction, built up from identifiable elements and relations, which structures the user's action ...” (p.127). These models function as tools in activities for orientation and communication, in ways similar as described by Tuomi-Gröhn and Engeström (2003). For example, a model may allow the designer to calculate angles in a drawing in advance, for example to correctly saw steel in a single process rather than by trial and error. Here the mathematical formula functions as an orientation tool. When the drawing is then used by students to negotiate the design, it becomes in addition a tool for communication. Hence, orientation and communication are both functions of a model, and a model can serve both at the same time.

From a sociocultural point of view models have two core functions: orientation and communication. These functions are not mutually exclusive. Orientation, according to Galperin, is essentially the psychological process of human action that constitutes awareness in human activity. Through education this process acquires a cultural form which is characteristic for a certain practice, leading to what we usually call
'disciplined perception' (Stevens & Hall, 1998). Models play a particularly important role in this process: a model is a cultivated tool for orientation towards future actions (Van Oers, 2006), providing direction to someone's activities. Orientation includes valuation, produces information, and functions as a basis for plans and predictions. As tools for communication, models foster the distribution of individual ideas and meaning across the community. When students work together, as in our case on the construction of a tricycle, they utilise drawings and ideas to plan and predict the process, and to discuss the final design. The models provide direction not only to the actual design and the planning of the activities but also to the coordination of ideas and actions among the participants. In other words, the models assist in anticipating the outcomes and meaning distribution in a community (Gal'perin 1969; 1979 in Van Oers, 2006).

Modelling in the practical workshops in vocational education can serve both students' technical codified knowledge as well as the more general type of knowledge in subjects such as mathematics and science. In contrast to simply looking at a technical artefact or making a practical construction, by collaboratively designing models during the construction process students are faced with a newly emerging dimension, by which the basic structure of the construction is uncovered. The new dimension provides insight into how elements relate to each other and how technical artefacts work, for example a tricycle (cf. Verkerk, Hoogland, Van der Stoep & de Vries, 2007). As a result, the student is not only able to see the tricycle as a working means of transport, but also to conceive of it as a concrete specimen for the transmission of forces.

**Guided co-construction**

Introducing students to certain sociocultural practices (e.g., workplace as well as mathematical practice) is best described as a process of legitimate peripheral participation (Lave & Wenger, 1991; Mercer, 1995). In such a context learning may be seen as a process of qualitative change in activities, resulting in enhanced possibilities of sociocultural participation (Van Oers & Wardekker, 2000). When learning takes place in a workplace setting the agents involved (students and teacher) may be characterised as a community of practice (Lave & Wenger, 2005). In these communities the participants share basic assumptions about rules and purposes. As learners they are actively involved in meaning-making activities, as well as in problem solving with the support of tools and artefacts, while communicating with each other as well as with others outside the community.

Furthermore, empirical analysis has shown that in the accomplishment of activities new goals and needs may emerge which drive participants to construct or adopt new tools (Kozulin, Gindis, Agayev & Miller, 2003; Saxe & Guberman, 1998). Hence, by participating in communities, students may be compelled to aim for new goals that encourage them to adopt appropriate new practice-related tools, including concepts, symbols and models (Gravemeijer, Lehrer, Van Oers & Verschaffel, 2002). In guiding the participation process teachers help their students understand the use and meaning of the concepts, symbols and models as tools in a range of similar practices. At the same time the teachers themselves are participants in the same community, as much involved in the co-construction process as the students. It is important to remember that the teacher is not just a guide in this process of meaning making, but also a genuine participant (Van Oers, 2001). For example, the teacher may help students create a construction plan by asking questions while referring to both domain specific drawing rules as well as the relevant mathematical concepts. In other words teachers participate in the teams not only as guides but also as experts.

Guile and Young (2003), however, argue that for knowledge acquisition in a 'community of practice' participation alone is not sufficient. Teachers should explicitly focus on relating both situated and more general knowledge as codified in the curriculum subjects. In our intervention the curriculum project was aimed precisely at this objective: moving from practical problems to modelling, and, eventually, to an understanding of the relevant domain-specific concepts.

The important role of the teacher, as a guide to knowledge acquisition and understanding in practical environments, also includes introducing students to the practice of modelling with the aid of mathematical tools. The teacher's role is to identify what is 'mathematical' in the workplace practice, to recognise the students' emergent need for mathematical tools, and to relate such recognition to the practice of (mathematical) modelling (Van Oers, 2001). In other words: to help students become familiar with the modes of thought that prevail in the discipline (Stevens & Hall, 1998). The discipline is in this case both vocational and academic. However, simply providing models is not sufficient for understanding the use of models as tools; in addition, conditions should be created which focus “… on the hidden rules and assumptions in the tools.” (Van Oers, 2001, p.81). Teacher guidance should therefore promote such understanding by helping students to co-construct the models.
One of the major issues in theories of learning to model involves the question: Are models to be provided or generated? We have theoretical reasons and empirical evidence from earlier research projects in the mathematical domain to the effect that guided co-construction – as a third way in this dilemma - is an effective teaching and learning approach compared to the simple provision of ready-made models by the teacher (Poland, 2007; Terwel, 2004; Van Dijk, 2002). However, questions for further research remain. The outcomes of a number of other studies into the design and use of models in mathematical problem solving show that self-constructed models do not always have the intended effect (De Bock, Verschaffel, Janssens, Van Dooren & Claes, 2003; Perkins & Unger, 1999). In addition, as mentioned earlier, little is known about modelling in the vocational (technical) domain. It was against this background that the present study was planned and conducted.

**Research questions**

The theoretical background sketched above leads to the following overall research question: do students, who participate as model designers in a process of guided co-construction with an expert (teacher) and peers, show better learning outcomes than students who learn to work with ready-made models provided by the teacher?

The general working hypothesis for this study is that collaborative learning to design and use models in vocational education has positive effects on learning outcomes, as compared to providing ready-made models to the students. The basic idea underlying the hypothesis is that students will develop knowledge and skills in modelling along with codified knowledge in mathematics and science as a result of constructive involvement and dialogic inquiry under teacher guidance.

**Design**

The project is a design based research project with three phases or iterations (The design based research collective, 2003). Based on findings from a case study (Study 1) and a first intervention (Study 2), we re-designed an educational programme for students in vocational education aimed at modelling for a second intervention (Study 3 and 4) (Van Schaik, Terwel & Van Oers, in preparation a, in preparation b). All together six schools, about 150 students and 27 teachers participated in the project.

As a design research project, we wanted to study the interventions in authentic contexts. An appropriate way to characterise our interventions would be to place it in the tradition of formative intervention (Engeström, 2007, 2009).

In all phases of the project video was used for observations and interviews. With a three-camera approach teaching practices were recorded, two cameras capturing an overview of the classroom and a third camera was handheld. The handheld camera was operated by one of the researchers and recorded interactions between teachers and students following a protocol (more information in Van Schaik, 2009, 2010). Analyses were conducted over the merged recordings of the three cameras. The video data played a crucial role in the research. First, the video data helped determining the redesign of the interventions. Second, also the method of design based research could be reviewed and adjusted to the typicalities of VMBO. Finally, in hindsight the development of the theory became visible: the perspective changed in the course of the project on the basis of the subsequent findings in the interventions.

In Study 1 we used a qualitative approach and conducted a pattern analyses on video data. In the subsequent interventions both pre- and post-tests as video observations were used in an experiment (trial) with a control group.

**A narrative of the design-based research**

**Case study (Study 1)**

In a case study (Van Schaik, van Oers & Terwel, 2011) we explored the implementation of two assignments and the subsequent teacher guidance at one school and tested whether or not the learning environments became knowledge-rich (Guile & Young, 2003) as a result. Knowledge-rich workplaces are assumed to engage students in meaningful activities and at the same time promote subject matter learning (including
mathematics, see Kent, Noss, Guile, Hoyles & Bakker, 2007). In other words, the learning environment has the potential for students to acquire knowledge that is codified or disciplinary.

For this first phase of the project, one school in the middle of the Netherlands was selected that had been working with assignments like the ones described above. Students first received an assignment to design (on paper) a tandem tricycle or a bicycle race game. Second, the team with the best design, chosen by a teacher jury, was allowed to build the product. The designing took place during a series of four mathematics lessons in the open learning centre next to the workshop. Students were able to use computers to search for information and to ask the mathematics teacher for help. After that, the construction of the products was done during the vocational lessons in the workshop under the guidance of the vocational teacher. The total duration of the project for the school was 12 weeks.

Most of the data we gathered came from observing two practice lessons a week during seven weeks with the three video cameras (thus a total of 14 lessons of 45 minutes). The video data was subjected to multiple viewings to explore the footage for patterns. We used this method, known as pattern analysis (Erickson, 2006; Terwel, 2005), to allow the observers watching the videos to detect patterns in the data. These patterns are called *a posteriori* patterns. A pattern is a formal description of a repeating structure in interviews and in interactions. Patterns can be mentioned by the participants in interviews or can be noticed by the researcher during observation. Analysis was performed on the video data and the materials that the students created in their projects (such as drafts, designs, drawings and calculations. See figure 1.) exploring only the *a posteriori* patterns. This resulted in three patterns.

1. "Let your mind work" outside the workplace, because time is scarce.

In one of the first weeks of the curriculum project, Mr Williams, the technology teacher, was heard saying: “Let your mind work,” three times in one lesson. It seemed to be an encouragement for the students to think. However, the students were given a task they had to perform at home, or in the mathematics classes. Hence, some deeper thinking in the practice workshop can occur, but when students did not come up with solutions or answers fast enough, they had to find them elsewhere. Moreover, we can see that the teacher made an effort in teaching the students more than just the situated knowledge needed for the solution of a particular problem. In the beginning of the construction process, the teacher often referred to mathematics or he explained rules and possibilities in general. However, as the actual construction process proceeded and the teacher and students had less time, and the more situated and tacit the knowledge remained for the students, the less the teacher explained and tended to ‘give away’ or provide the solution to the students. This means that the students received increasingly tailored solutions and ‘tips & tricks’. In the workplace, time is scarce, so deeper thinking that takes more time has to be done outside the workplace, or, later on in the process, solutions are simply provided by the teacher.

2. Problem solving starts with modelling, but solutions are often provided.

As we focus on the students' problem solving, it appears that two different activities occur. First, students design situational models themselves when they are drawing the design or are planning their client interview. Second, canonical models, like models for technical drawing or mathematical rules, are provided by the teacher (see figure 2). As a result, no reinvention of these models occurs. The guidance teachers give on the canonical tools is one of providing students with answers or instructing students how the models should be used, whereas the guidance on the drafts and drawings of the students themselves helps students to transform drawings into the construction of a working model.

---

Figure 1. Design drawing of a tandem tricycle drawn by students
3. A workplace simulation is stimulating

Once the students realize that what they are designing and engineering can be constructed, they take more responsibility for their design, ideas and plans. Hence, they see it as a challenge and they develop ‘ownership’ of their design, whereas the teacher acts as a co-designer. As a result of this ownership, the problems they encounter in the realisation process are meaningful and authentic. The solutions become their solutions that they are proud of.

These results showed that designing a tandem tricycle did, in fact, create opportunities for teaching students’ codified knowledge and modelling. The teachers, however, tended to simply provide ready-made models while for the students the knowledge involved remained situated. That is, as solutions to problems, mathematical and scientific concepts and models tended to be bound to the (practical) situation in which they were constructed. Although the assignment itself was potentially knowledge-rich from the teachers’ perspective, students could not relate the provided problem solving models to more general codified knowledge. Our assumption is that if the models had been designed by the students under teacher guidance, the role of models as tools would have become clear and the relation between theory and practice might have become more transparent in the process.

We also learned from the case study that student design processes should not be disconnected from actual construction; not only for motivational reasons (students who did not construct their designs were disappointed), but also because the transitions from design to construction turned out to be the most interesting. Moreover, the verisimilitude of the situation was also important for student motivation: “Clients should not be teachers playing the client”, as the students put it. Interestingly in this connection, the students that had a primary school as client proved more motivated than the others.

First experiment (Study 2)

Next, for Study 2, two conditions were shaped in a pre-and post-test control group design: a ‘providing’ condition (control group) and a ‘guided co-constructing’ condition (experimental). This first experiment was an intervention at two schools following the case study. A programme based on the tricycle assignment was designed and teachers were trained to guide the students either in a co-constructive or in a providing way (Van Schaik et al., 2010). In the subsequent experiment the two conditions, providing (control group) versus guided co-construction (experimental), differed in the way models were used in the classroom. In the control condition models were drawn by the teacher and functioned only as a fixed representation of the product, as opposed to a developing tool for orientation and communication. In the guided-co-construction condition models evolved into thinking tools for students to help them orientate towards the situation, and communicate with each other and the teacher on their plans and ideas.
Important change in the intervention for students was that they had to design a prototype of a tandem tricycle in a competition (see figure 3 for the winner). Instead of creating just a single product, now the students also had to think about the production process in the light of their final presentation for a jury. In turn this created opportunities to further discover general knowledge.

**Figure 3: Winning prototype tandem tricycle**

For the students the intervention took about 10 weeks. 65 students participated. Using existing knowledge tests pre- and post-knowledge was measured (see figure 4 for an example item). Pre- and post tests were almost identical. The tests also contained a modelling item asking the students to draw a motor in a cart (see figure 5).

Next to the tests final drawings of every subgroup were assessed by design professionals according to criteria for design based on diSessa (2002). The interrater agreement was determined by Cohen's kappa (.86). Video observations and interviews as well as sketches, drawings and products of students and teachers were incorporated in the analyses.

It turned out that although the experimental group outperformed the control group on the knowledge-test (see Table 1), the two groups did not differ significantly when controlled for initial differences. With regard to modelling as measured in the tests, a trend was found that, adjusted for other co-variables, students in the experimental condition produced better models than students in the control condition.
Table 1: Scores on pre- and posttests.

<table>
<thead>
<tr>
<th>Control group (n=15)</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in months)</td>
<td>199.6</td>
<td>6.42</td>
<td>190</td>
<td>210</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>64.73</td>
<td>13.66</td>
<td>40</td>
<td>84</td>
</tr>
<tr>
<td>Pre-knowledge</td>
<td>15.25</td>
<td>8.95</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>Pre-modelling</td>
<td>2.61</td>
<td>2.48</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Post-knowledge</td>
<td>16.83</td>
<td>6.53</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td>Post-modelling</td>
<td>2.31</td>
<td>2.39</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Experimental group (n=50)</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in months)</td>
<td>186.1</td>
<td>6.60</td>
<td>176</td>
<td>206</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>64.96</td>
<td>12.45</td>
<td>41</td>
<td>101</td>
</tr>
<tr>
<td>Pre-knowledge</td>
<td>13.02</td>
<td>5.44</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>Pre-modelling</td>
<td>3.69</td>
<td>3.49</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>Post-knowledge</td>
<td>14.40</td>
<td>5.22</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>Post-modelling</td>
<td>4.69</td>
<td>3.28</td>
<td>1</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 2: Regression analysis for variables predicting the scores on the dependent variable modelling of the product.

<table>
<thead>
<tr>
<th>Model</th>
<th>R Square</th>
<th>Std Error of the estimate</th>
<th>R Square change</th>
<th>F Change</th>
<th>Sign. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.55(^1)</td>
<td>10.50</td>
<td>.55</td>
<td>33.83</td>
<td>.000</td>
</tr>
<tr>
<td>2</td>
<td>.63(^2)</td>
<td>9.64</td>
<td>.08</td>
<td>7.22</td>
<td>.011</td>
</tr>
</tbody>
</table>

1 Predictors: (constant), age in months
2 Predictors: (constant), age in months, interaction age*condition.
# Group scores
A regression analysis showed that a model that predicted the scores on the product-models by condition was significant (see Table 2). However, an interaction effect was found between age and condition. Younger students in the experimental condition scored better.

These results of the intervention showed that there was no difference between the conditions with respect to scores on the posttests on codified disciplinary knowledge. However, the students in the experimental condition produced better models of their products. At the same time younger students scored better than older students. This could mean that younger students benefited more from the intervention due to the fact that the older students were the weaker students (they could be the ones that stayed back in class for example).

From the analyses of the qualitative data the models in the experimental condition indeed functioned as tools in the design and construction process. However, the models in the control condition remained visible longer during the process. Therefore the conclusion was that guided co-construction with explicit attention for modelling could lead to acquisition of knowledge and understanding of modelling.

**Final experiment (Study 3 and 4)**

Phase 3 consisted of two studies (3 and 4) in which the intervention was further developed and implemented at four schools. Main adjustment of the intervention was the incorporation of 'prototype lessons' to maintain explicit attention for modelling. In those lessons students were guided in reflection on the process of designing and construction. Pre- and posttests measuring knowledge and modelling were conducted as in the previous experiment. In addition vocabulary and the g-factor of intelligence were measured (J. Raven, J. C. Raven & Court, 2000). Again video observations and interviews were conducted. In total 87 students divided over 4 schools participated in this final experiment. The analyses are divided over two studies.

**Quantitative study 3**

The study based on quantitative data, showed that two schools, one from each condition, scored better on the posttests (see Table 3). Consequently, explanation of the differences on the knowledge tests – after controlling for initial differences – had to be found at school level. Keeping constant the other variables, both School 2 and 4 scored higher on the knowledge test (Table 4). However this was not significant.

<table>
<thead>
<tr>
<th>Table 3: Descriptives of pre- and post- measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>Overall</td>
</tr>
<tr>
<td>Age (in months)</td>
</tr>
<tr>
<td>Vocabulary</td>
</tr>
<tr>
<td>SPM</td>
</tr>
<tr>
<td>Pretest*</td>
</tr>
<tr>
<td>Posttest*</td>
</tr>
<tr>
<td>Control condition</td>
</tr>
<tr>
<td>Age (in months)</td>
</tr>
<tr>
<td>Vocabulary</td>
</tr>
<tr>
<td>SPM</td>
</tr>
<tr>
<td>Pretest*</td>
</tr>
<tr>
<td>Posttest*</td>
</tr>
<tr>
<td>Experimental condition</td>
</tr>
<tr>
<td>Age (in months)</td>
</tr>
<tr>
<td>Vocabulary</td>
</tr>
<tr>
<td>SPM</td>
</tr>
<tr>
<td>Pretest*</td>
</tr>
<tr>
<td>Posttest*</td>
</tr>
</tbody>
</table>

* Maximum score on pre- and posttest is 47
Our hypothesis that students in the experimental condition would outperform their counterparts in the control conditions, had to be rejected. It needs to be noted that students at School 2 scored high on all pre-measures, whereas students at School 4 scored low on vocabulary. In average students scored 50 per cent on the knowledge tests.

A first analyses of qualitative data showed that these schools explicitly connected modelling to the general subject matter, such as mathematics and physics. Moreover these schools had a smaller student/teacher ratio. Better performing school had less students per teacher (see Table 5).

**Qualitative study 4**

For the second part of the final experiment, Study 4, we continued our analyses by an in-depth qualitative study to find the determinants that might explain differences in learning outcome at school level. First of all, in Study 4, the goal was to examine precisely how the design was enacted at each school. Next, we aimed to establish how the activity of modelling developed with the process of constructing a tandem tricycle. Moreover, we sought to find out if modelling actually brought together practical experiences and the codified theories of the general curriculum. The main focus of this analysis was to find the key determinants of a microlevel pedagogy that supports students’ use of representations as tools. We mainly used the observational and interview data. All products, drawings and other artefacts were considered in the context in which they appeared. The representations that appeared in the observations were classified according to three categories, initial sketches, elaborated and refining drawings, and final and presentation drawings. According to MacDonalds and Gustafson (2004) these are the types of drawings professionals use in their design process. Table 6 shows the categories and the clues by which they were established. We used the clues and categories for the representations we found in the observations.

Based on the analyses of the interactions with models, a vignette was made for every school, especially focussing on the process of modelling.

**School 1**

*Drawings and models are little in-between-assignments with hardly any reference to the actual construction. Teachers in the practice workspace helped the students with practical problems, without explicitly referring to mathematics, science or other codified knowledge. General subject matter is disconnect from the vocational practice.*

**School 2**

*The drawings and representations created by the students develop continuously from initial sketches to final drawings, and are used by the students themselves as well as by the teachers as a tool on which to reflect. General knowledge is implicitly referred to.*
School 3

Drawings and models are almost non existent in the workshop, only internet pictures or the initial computer drawing were used as reference. Hardly any relations to curriculum subjects were mentioned. The prototype lesson was an introduction to the practical problems of tricycle construction.

Table 6: Categories and clues for drawings (from MacDonalds & Gustafson, 2004)

<table>
<thead>
<tr>
<th>Category 1: Initial sketches</th>
<th>Clues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A sketch is made at the beginning of a project.</td>
</tr>
<tr>
<td></td>
<td>The sketch indicates the pupil's initial thoughts/key ideas about the project.</td>
</tr>
<tr>
<td></td>
<td>The sketch is exploratory and conceptual rather than representational.</td>
</tr>
<tr>
<td></td>
<td>The sketch is made quickly and spontaneously.</td>
</tr>
<tr>
<td></td>
<td>The sketch includes images and words.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category 2: Elaborate and refining drawings</th>
<th>Clues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A series of freehand and hard-line drawings are made during the project.</td>
</tr>
<tr>
<td></td>
<td>The drawings are shared with other members of the design team.</td>
</tr>
<tr>
<td></td>
<td>The drawings transform the ideas expressed in the initial sketch.</td>
</tr>
<tr>
<td></td>
<td>The drawings elaborate, refine, expand, and develop the pupil's initial ideas.</td>
</tr>
<tr>
<td></td>
<td>The drawings show increasing accuracy and detail, including dimensionally.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category 3: Final and presentation drawings</th>
<th>Clues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The drawing is made at the end of the project.</td>
</tr>
<tr>
<td></td>
<td>The drawing is a recognizable representation of the finished product.</td>
</tr>
<tr>
<td></td>
<td>The drawing can be used by those outside the design process as a guide to making.</td>
</tr>
<tr>
<td></td>
<td>The drawing is hard-line, finished, precise, and detailed.</td>
</tr>
<tr>
<td></td>
<td>The drawing is labeled and measured.</td>
</tr>
</tbody>
</table>

School 4

Drawings and models remain visible during the whole process. By drawing and questioning, the teacher relates the practical issue of construction to the theoretical concepts of transmission, speed and ratio, as well as to other practical examples. General subject matter is disconnect from the vocational practice.

The conclusion was that the use of models at two schools resembled the practice of professional designers more than at the other schools (MacDonald & Gustafson, 2004). Teachers and students used their models as tools for orientation and communication, which engaged the students more authentically in the reality of the workplace. As a result, the students were presumably better supported at these schools in approaching problems in a vocational as well as an academic fashion (Van Schaik et al., in preparation).

All in all, the question whether or not students show better learning outcomes when they are the model designers in knowledge-rich simulated workplaces in a process of guided-co-construction remains unresolved. Based on the tests in the two experiments, the conclusion is that there is hardly or no difference in learning outcomes compared to students who had ready-made models provided. However, two findings lead us to believe that guided-co-construction might improve the students’ understanding of modelling and codified knowledge. First, the students in the experimental condition in the first experiment produced better models. This may have been due to the fact that the teachers used their models as communication and orientation tools. Secondly, at two schools in the final experiment more interactions on models were found, while models were part of the process for a longer time. Moreover, the models were in a more finalised state. We therefore concluded that the students’ design process at those schools resembled that of professional designers more than that of the students at the other schools. Our impression was that disciplined perception is better supported at schools where designing is integrated into the activities of the simulated workplaces. As a consequence students’ understanding and knowledge are enhanced. This leads to our overall conclusion that the use of models as tools for communication and orientation in product-oriented vocational practice resembling that of professional designers, help students develop better understanding, while codified knowledge of both academic and vocational disciplines is enhanced.

In addition to addressing the overall research question the four studies also resulted in a closer analysis of the research process and, in particular, the use of video in design-based research. In retrospect we can see that the extensive use of video data co-determined the course of the research trajectory in ways that would not
have been possible with quantitative data alone. On the basis of the quantitative data we would have concluded that the research conditions in the project (providing versus co-constructing models) did not work out as predicted in our context of knowledge-rich environments. On the basis of our workplace observations we were able to refine the guiding principles of the design and conduct a replication study which resulted in basically the same outcome as the answers to our main research questions. Through the use of video data from workplace activities of students and teachers the redesigned project enabled us to determine that the use of the models differed at the different schools. We were even able to speculate about conditions that might be conducive to such situations. As a result, our attempts to find an answer to questions on the learning of codified knowledge in simulated, knowledge-rich vocational education obviously needed a new theoretical refinement that no longer focused on examining the possible value of broadly defined conditions such as ‘guided co-construction’, but concentrated on actual microgenetic learning trajectories in the use of modelling (as a tool for orientation and communication). A decade of studies on the issue of providing versus co-construction has reached a new stage with the help of detailed video-analysis, which can be defined as a study of providing in the context of guided co-construction and ways of supporting the meaningful use of tools and codified knowledge in students’ problem solving during the processes of construction and design.

Discussion

Among the first few empirical studies of Dutch pre-vocational education (e.g. Boersma, ten Dam, Volman & Wardekker, 2009; Koopman et al., in press; Van de Pol, Volman & Beishuizen, 2011) this study is the only one that combines the perspective of the students and the role of the teachers by using an intervention that incorporates process data (e.g. video) and output measures (knowledge tests). It resulted in findings that are in line with the other studies. With Boersma et al. (2009) we agree that students are motivated by ‘real’ assignments. That is, tasks which, as Koopman et al. (in press) argued, should be oriented towards delivering a ‘product’. The fact that we observed only two schools at which teachers were able to link students’ practical problems to theory, concurs with the results in Van de Pol et al. (2011), in which observed teachers showed few examples of guidance that were contingent on student capabilities.

Given that we only found minor statistical differences, further study of the complex environment will have to be considered. Strict control of the conditions proved impossible, while a fidelity approach would have been counterproductive in this rather loosely organised school sector. As a consequence the design implementation differed considerably among schools. Since student groups and teacher teams are especially unstable in pre-vocational education, a larger sample could only partly solve that problem. We also know from our logs, observations and interviews that adaptation to the local school context does not ensure implementation of the intervention as intended. The concept of mutual appropriation may therefore be the correct one to gain insights into the dynamics of interventions in (pre-)vocational education, with the researcher(s) on one side and teacher(s) on the other (Downing-Wilson, Lecusay, & Cole, in press).

Taking the conclusions of the four studies in this paper together with the analyses in chapter 2 of the development of the intervention, we propose three suggestions for the modelling curriculum in (pre)vocational education. The first suggestion addresses the content of teaching; the second suggestion, on how the teaching-learning processes could be shaped, is more pedagogical in nature; the third suggestion describes the assignments.

With regard to the content of modelling teaching in vocational education, the focus of teacher guidance should be on the process of designing. Since we learned that those schools performed best at which the enacted curriculum project resembled the practice of professional designers, the suggestion is that when students act as designers they learn better how to use models and reach acceptable levels of knowledge. Moreover, models that are used as tools for orientation and communication and utilised in combination with teacher guidance, can support student understanding as well as enhance the knowledge codified in academic and vocational disciplines.

It follows from the above considerations that teacher guidance is crucial. Two main characteristics can be formulated from our studies. First, teachers who are capable of explicitly integrating theory and practice through their academic background guided students to better (use of) models. Teams of teachers should therefore be composed in such a way that at least one of the teachers has an academic background and is able to connect that to the workplace. This way, students can be guided towards concepts, rules and principles of academic and vocational disciplines by working on practical assignments. Secondly, as we saw, when
students work on their own design and draw models themselves. Their own models are more elaborate, and they perform better on modelling tests. Hence, teacher guidance should have a student’s own design as its starting point.

Finally, for the assignment it proved important that it was 'real' and complex. Students were motivated to work on products that could be used as real products. Although the assignment in the two experiments had no clients, the prototype competition was real enough. In addition, to promote understanding and codified knowledge, assignments need to be complex, though not too difficult. The tricycle assignment had the right balance in this respect. It was complex enough to connect practical problems to academic as well as vocational disciplines, such as, for example, manifested in the concepts of transmission and the principles of designing and modelling. At the same time the assignment proved not too difficult, since most students were able to finish the product.

In light of the above, the discussion about providing versus guided co-construction can be taken a step further by specifying in greater detail what teachers really do, where, when, and finally how their activities are related to learning outcomes. In other words, the proposed focus for future research consists in the further elaboration of the different forms of guidance (by instruction, discussion, etc.) in workplace contexts and how such forms could support students’ development towards expertise in the vocational practice. More detailed studies are required into the development of disciplined perception and into ways in which such development could be stimulated in workplace settings.

Further research should also explore a teaching/learning strategy that incorporates actual school practice. In ideal practical situations students design and construct complex 'real' products, guided by teachers who are able to connect practical problems to disciplinary theories, while the students' own designs form the basis for guidance. Only approximations to such situations could explain what guided co-constructing means for teaching and learning in general, with specific reference to (pre)vocational education.

At this stage the empirical relevance of these practical implications to educational theory needs to be addressed. First of all, in the course of the three interventions we developed the concept of a knowledge-rich learning environment in vocational education. We started by stating that it should be an environment in which students acquire more than just practical skills. Codified knowledge should also be imparted in such an environment. Our final impression is that if the concepts of both Guile and Young (2003) and Stevens and Hall (1998) are connected, the learning environment has the potential for students to acquire codified or disciplinary knowledge. Furthermore, the results of the two experiments have led to an improved understanding of how models work as tools in vocational education and that the use of such tools may result in acceptable knowledge levels (i.e. scores above 50 per cent on posttests). Our view of models as tools for orientation and communication was enriched by the way models work in a design process in school practice (MacDonalds & Gustafson, 2004). Finally, we now have additional proof that guided co-construction as a teaching-learning strategy works in pre-vocational education. Furthermore, the nature of what constitutes relevant guidance has been further elaborated (see for example the suggestions above). While working on real products VMBO students need the type of guidance that leads them from their own designs and models to the knowledge codified in vocational and academic disciplines. Such guidance must explicitly connect theory to practical problems. Only in that way will students be able to learn to recontextualise their practical knowledge within the system of codified disciplinary knowledge. Such recontextualisation will improve their practical skills as well as their theoretical knowledge. In short, our theory of modelling in vocational education has now been connected to VMBO practice.

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Cognitive Style and Personality Trait Diversity in Dyads: How to Optimize the Cooperation

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Abstract

In a leading European Business school, 86 dyads of management students worked on an in-company management project during two months. Cognitive styles were assessed, as well as personality profiles, the overall satisfaction with the teamwork and the end score received for the project. Cognitive style diversity appeared to have a negative impact on performance, whilst personality trait diversity increased performance. Limitations of the study and suggestions for further research are provided.

Keywords: Dyads, Cognitive Styles, Diversity, Personality Traits

1. Introduction

Modern organizations rely heavily on the use of teams (Devine, Clayton, Philips, Dunford, and Melner, 1999; Ilgen, 1999; Kozlowski and Ilgen, 2006). Parallel with the increased popularity of teams in organisations, research interest in team characteristics contributing to their effectiveness has grown strongly (Mathieu, Maynard, Rapp, & Gilson, 2008). The aim of this kind of research is to gain insight into the determining factors of team effectiveness and ultimately to formulate recommendations for the design of high-performing teams. Despite a longstanding research history, no consensus has been achieved regarding the nature (beneficial or hampering) of the effects of team diversity on team performance (Joshi & Roh, 2009; van Knippenberg & Schippers, 2007). Generally, research concludes that team heterogeneity is a double-edged sword: it seems to improve the quality of team decision making, but meanwhile also increases the likelihood of process problems (Horwitz & Horwitz, 2007; Stewart, 2006).

According to Baker and Salas (1997) a team is a unit of two or more individuals who interact interdependently to achieve a common objective. This paper will focus on a specific type of team: the dyad. Dyad research up to now has consisted mainly of dyads with uneven hierarchical levels: the supervisor with his subordinate (e.g. Collins, Hair and Rocco, 2009; Ferris, Liden, Munyon, Summers, Basik and Buckley, 2009; Hsiung and Tsai, 2009; Richard, Ismail, Bhuian, and Taylor, 2009; Werbel and Henrique, 2009). This study investigates the effects of team composition in dyads with similar hierarchical levels.

2. Theory

2.1 Dyad research and team composition

Dyadic relationships, and more specifically dyadic work relationships have mainly been investigated with different hierarchical levels. For example, in social exchange theory, the relation between employee and organisation is seen as dyadic employment relationship. Coyle-Shapiro and Shore (2007) note that the organisational agent in this dyad is often not defined. This is a representative of the company, typically a supervisor. Another typical form of work dyads are a mentor and his protégé. The mentoring process is a dyadic exchange relationship where information, knowledge, resources, and support are exchanged (Young and Perrewé, 2000). In social network theory, a dyadic relationship between two actors is the most basic unit of analysis. In Leader-Member-Exchange research (LMX) the assumption is made of a unique relationship...
between leader and subordinate (Ferris et al., 2009). In this paper we will not investigate the dyadic relationship between individuals of a different hierarchical level, but instead we will focus on same-level co-operators (i.e. two students working on a project).

Team composition, defined as the configuration of member attributes in a team (Levine & Moreland, 1990), is a commonly studied team variable (e.g. Bell, 2007; Guzzo and Dickson, 1996; Hollenbeck, DeRue, and Guzzo, 2004) and can be seen as an instrument for optimizing team functioning (Kozlowski and Bell, 2003). Bell (2007) makes a distinction between surface-level composition variables and deep-level composition variables. Surface-level variables refer to demographic characteristics such as gender, age or tenure, while Deep-level variables refer to underlying psychological characteristics such as personality factors, values, and attitudes. Surface-level variables have been studied often, but researchers now suggest that deep-level variables can have a stronger influence on team performance (Harrison, Price, Gavin, and Florey, 2002; Hollenbeck et al., 2004). Deep-level composition variables can be context-dependent variables or relatively constant team member characteristics. Since the first kind of variables are rather specific for every situation or task, we will focus on relatively constant deep-level variables: personality traits – as measured by the SIMP (Woods & Hampson, 2005), and cognitive style – as measured by the CoSI (Cools & Van den Broeck, 2007).

2.2 Personality and Cognitive Style

Personality can be defined as “the relatively stable set of psychological attributes that distinguish one person from another” (Moorhead and Griffin, 2004, p. 91). The "Big Five" model, most commonly used in contemporary psychology, posits that personality consists of five broad domains or dimensions: Openness, Conscientiousness, Extraversion, Agreeableness, and Emotional Stability. Openness to experience represents people’s openness to new experiences and interest and fascination for novelty. Conscientiousness is about being organised, responsible, careful, and self-disciplined. Extraversion concerns people’s comfort level with relations. Agreeableness refers to people’s ability to get along well with others. Lastly, emotional stability represents the extent to which people can cope with stressful situations and experience positive emotional states (Costa and McCrae, 1992).

The Big Five model is considered to be one of the most comprehensive, empirical, data-driven research findings in the history of personality psychology (John and Srivastava, 1999). The impact of personality traits has been studied in team research (e.g. Barrick, Stewart, Neubert and Mount, 1998; Barry and Stewart 1997; Neuman, Wagner and Christiansen, 1999; Thoms, Moore and Scott, 1996; Van Vianen and De Dreu 2001). However, there is surprisingly little research on the influence of homogeneity of personality composition on team performance (Bowers, Pharmer, & Salas, 2000). The more general theories on deep-level diversity favour the similar-attracts paradigm. People like working together with others who have similar psychological characteristics, since this confirms and reinforces their own beliefs, affect and behaviours (Harrison et al., 2002). In line with these more general theories of team composition on team performance, we hypothesize that a fit in personality characteristics has positive effects, and a misfit negative effects on performance.

**H1**: A fit in personality traits influences the outcome of dyad cooperation.

**H1a**: a bigger difference in personality traits in a dyad, will lead to a decrease in outcome results. (Outcomes: general outcome, content, written, oral, effort, usefulness, satisfaction)

In addition to looking at dispositional traits, we looked at cognitive styles: cognitive styles are fairly stable individual differences in perceiving and processing information (Cools and Van den Broeck, 2007). Cognitive styles and personality are generally seen as related, but independent constructs that together influence behaviour (Cools, 2009). Previous research has been limited to a dichotomous approach of cognitive styles, namely analytical versus intuitive cognitive style, whereby people with an analytical cognitive style favour rational decision making and people with an intuitive cognitive style favour intuitive decision making (Allinson and Hayes, 1996). However, bipolar unidimensional cognitive style models are under debate (e.g. Hodgkinson and Sadler-Smith, 2003; Coffield, Mosely, Hall, and Ecclestone, 2004). Multidimensional cognitive style models offer a valuable alternative. A classification and instrument of particular interest to this study is the Cognitive Style Indicator (CoSI; Cools and Van den Broeck, 2007). The CoSI classifies three cognitive styles: a knowing, planning, and creating style. People with a knowing style
are people characterized by a drive for data and facts. Planners have a need for structure and value preparation and planning. People with a creating style like out-of-the-box thinking and experimentation.

Research suggests that differences in individual cognitive style can have an important influence on the nature of interpersonal relationships (Armstrong, 1999). Cognitive similarity has been argued as beneficial for dyads as far back as 1960 (Triandis, 1960). Given the similar way dyad members with a cognitive fit evaluate events, communication is more effective, mutual liking heightens and better progress is made in achieving interaction goals (Triandis, 1960; Witkin and Goodenough, 1981). Matching has indeed been reported as having a direct effect on performance (e.g. Dunn, 1987; Dunn, Beaudry, and Klavus, 1989; Dunn, Giannitti, Murray, Rossi, Geisert and Quinn, 1990; Sein and Robey, 1991) or indirectly via a positive effect on attitudes (e.g., Cooper and Miller, 1991; Allinson and Hayes, 1996; McCaulley, 1978; Renninger and Snyder, 1983). Cognitive misfit has been suggested to lead to conflict due to differences in interests, values, and problem-solving techniques (Kubes, 1992; Leonard and Strauss, 1997; Rickards and Moger, 1994; Tullet, 1995). Similar to previous research results, we hypothesize that a misfit in cognitive styles will negatively affect outcomes in a dyadic cooperation.

\[
H2: \text{A fit in cognitive styles influences the outcome of dyad cooperation.}
\]

\[
H2a: \text{a bigger difference in cognitive styles in a dyad, will lead to a decrease in outcome results. (Outcomes: general outcome, content, written, oral, effort, usefulness, satisfaction)}
\]

In order to test these hypotheses a study was conducted with dyadic management student teams working on a two month long in-company project.

### 3. Methodology

#### 3.1 Sample and Procedure

Participants were 172 Master in Management students (124 males, 52 females) from a leading European business school, grouped into 86 dyads. Ages ranged from 20 to 32 (M = 23.29, SD = 1.70). Two questionnaires assessing cognitive styles and personality were distributed at the beginning of a two month project. At the end of the project, a second questionnaire was administered to measure team satisfaction. 133 students completed the second questionnaire, creating a sample of 46 dyads with 95 males and 38 females, aged between 21 and 27 (M = 22.85, SD = 1.09).

During two months, each dyad completed a project in a company, the final assignment before getting their Master’s degree in Management. Students were grouped in pairs and assigned to companies based on their motivation and functional background. Cognitive style nor personality was used as a selection or composition criterion, resulting in random dyad composition according to cognitive style and personality. Students wrote a report on the proceedings and results of their work, which they presented in front of a jury.

Standards and expectations of the involved companies were high, given the fact that they paid for the services provided during the project. Project scores highly impacted the overall score for one’s diploma. Dyads’ results were independently evaluated by the company, a promoter from the school, and a critical reader. Scores were given in five categories: content and methodology, written report, oral presentation and defence, personal effort and commitment, and usefulness and practical value. Questionnaires were administered before the start of the project, assessing cognitive styles and personality traits, and after the project, assessing satisfaction with the team work.

#### 3.2 Measures

The Cognitive Style Indicator (CoSI) was chosen as measurement instrument for cognitive style, as previous research found strong support for the construct validity and predictive validity of this model with a broad range of participants (e.g., students, managers, employees, entrepreneurs) (Cools, De Pauw, and Vanderheyden, 2009a; Cools, Van den Broeck and Bouckenoohe, 2009b; Cools and Van den Broeck, 2008a; 2008b). The CoSI is a questionnaire consisting of 18 items that are rated on a 5-point scale – ranging from ‘totally disagree’ to ‘totally agree’. Example items are “I like to analyze problems” (knowing style), “I prefer clear structures to do my job” (planning style), and “I like to extend my boundaries” (creating style).
Personality traits were measured using the Single Item Measure of Personality (SIMP, Woods and Hampson, 2005). The SIMP has been found to be a valid measurement of personality. Although it assesses each of the dimensions in one single item, it has been shown to correlate highly with the landmark 60-item NEO-FFI (Costa and McCrae, 1992), a more extensive personality inventory. Correlations all ranged between .30 for openness and .54 for agreeableness (Furnham, 2008). This study reported good psychometric properties for use in research, arguing for the use of short measures to assess personality for reasons of parsimony and efficiency. The SIMP consists of five bipolar nine-point Likert scales with an opposing description on either pole, one for each dimension of the Big Five.

Since we use multidimensional measurements, dyads can be diverse or less diverse on several dimensions: three cognitive styles and five personality traits. We will therefore use diversity scores to create a general measure of cognitive diversity, and the same procedure will be used to create a general measure of personality trait diversity.

The objective outcome measures used in this study are students’ scores on the project. Table 1 gives an overview of the quotations given by the different parties involved. An average score was calculated for each category (content, written report, oral presentation, personal effort, usefulness), and a measure of general output quality was computed by averaging all of the scores.

<table>
<thead>
<tr>
<th>Category</th>
<th>Company</th>
<th>Promotor</th>
<th>Critical reader*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content and methodology</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Written report</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Oral presentation and defence</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Personal efforts and commitment</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Usefulness and practical value</td>
<td>X</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(♦) A critical reader is an independent person that is not involved in the project, but judges the content and methodology of both the written report and the oral defence.

Team satisfaction was included as a subjective outcome measure. Satisfaction was measured using Basadur and Head’s (2001) Team Satisfaction Index Questionnaire. The instrument consists out of four items (e.g., ‘Would you like to work with this team again?’), scored on a ten-point Likert scale ranging from ‘very bad’ (1) to ‘very good’ (10) or from ‘not at all’ (1) to ‘a lot’ (10).

Converting cognitive style scores and personality trait scores into a measure for diversity, we followed Harrison and Klein’s (2007) recommendations. According to the authors diversity can be operationalized by cumulating absolute or squared distances between pairs of individuals (standard deviation). Because our teams consist of only two individuals, their degree of separation should thus be operationalized by the difference between their scores on their cognitive styles and personality traits. Finally, we summed these scores over the different personality traits and also over the different cognitive style categories, to obtain a general measure of diversity for both factors.

4. Preliminary results

As we are currently still in the data collection phase (i.e., a second data collection wave), it is not yet possible to elaborate on the full findings of our study. Detailed results will be presented during the paper presentation at the conference. However, some preliminary analyses of the data already revealed some interesting findings. Looking at other dyad research (Allinson, Armstrong, and Hayes, 2001; Armstrong, Allinson, and Hayes, 2002; 2004) we used correlations to study the relationship between these difference scores and the outcome variables.

Contrary to our hypothesis, the difference score in personality, as measured by the SIMP, is significantly positively related to the general outcome, the oral defence, effort and satisfaction experienced by the dyad members themselves. The hypothesis was therefore not confirmed for these outcomes. The correlations between the difference score in personality and content, written report and usefulness however, were not significant.
### Table 2: Results

<table>
<thead>
<tr>
<th>General outcome</th>
<th>Content</th>
<th>Written report</th>
<th>Oral defence</th>
<th>Effort</th>
<th>Usefulness</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference score SIMP (n = 31)</td>
<td>.379*</td>
<td>.265</td>
<td>.193</td>
<td>.376*</td>
<td>.433*</td>
<td>.334</td>
</tr>
<tr>
<td>Difference score CoSI (n = 86)</td>
<td>-.258*</td>
<td>-.234*</td>
<td>-.260*</td>
<td>-.272*</td>
<td>-.159</td>
<td>-.173</td>
</tr>
</tbody>
</table>

* p < .05

The difference score in cognitive style, as measured by the CoSI, is, as predicted, significantly negatively related to the general outcome, the content, the written report, and the oral defence. Our hypothesis was confirmed for these outcomes. The correlations between difference score in personality and effort, usefulness and satisfaction however, were not significant. The hypothesis was not confirmed for these outcomes.

### 5. Conclusion

The aim of this study was to investigate the effect of deep-level diversity on team performance. Our results indicated a positive effect of personality trait diversity on team performance and a negative effect of cognitive style diversity on the performance of teams. According to Muchinsky and Monahan (1987) two different models of person-environment fit could explain the impact of team composition on team performance. The first approach, the supplementary model, suggests a performance improvement when the team is homogeneous because team members are compatible with one another, communicate better and are more motivated to work together. The second approach, the complementary model, suggests a performance improvement by a heterogeneous team because each team member has unique characteristics which are important to the team. Looking at our results, the supplementary model is applicable to cognitive styles while the complementary model better fits personality traits. Support for the complementary model was also found in a study by Aamodt and Kimbrough (1982). Group heterogeneity with regard to personality traits led to better group performance than groups composed of homogeneous individuals. According to Kichuk and Wiesner (1998) team member heterogeneity can be beneficial but homogeneity on some other factors is needed in order to keep team harmony and productivity. The results of the study of Allinson, Armstrong and Hayes (2001) supported the complementary model (mismatching of characteristics) but the focus of their research was on the socio-emotional aspects of the dyadic relationship and not on the performance of the dyads.

There certainly is a need for further research on the matching or mismatching of cognitive styles and personality traits (Allinson, Armstrong, and Hayes, 2001; van Knippenberg and Schippers, 2007). Future research should also focus on the different types of tasks. A meta-analysis by Bowers et al. (2000) showed a positive relationship of diversity with group performance on more complex tasks and a negative relationship on simpler tasks. Other research (Stapleton, 2007) has shown that heterogeneous teams with regard to information-processing preferences, produce higher quality decisions than homogeneous teams on complex, ambiguous and disjunctive tasks. Guzzo and Dickson (1996) concluded that team heterogeneity was most strongly linked to team effectiveness for creative and intellective tasks. Furthermore future research should include a qualitative part to examine whether team functioning during the problem-solving task has an influence on the use of team members’ resources.

The findings of this study demonstrated the importance of taking into account individual differences when composing a team in order to maximize the performance of the team. After the second data collection the influence of diversity within each of the traits and cognitive styles on performance will be looked at more closely.

### 6. References


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The Relationship between Academic Motivation, Learning Strategies and First Year Students’ Study Persistence and Study-Progress in a Professional Bachelor Program

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Abstract

Recently, there is an increasing research-interest in students’ persistence and study-progress in the first year of higher education (Berge & Huang, 2004). Previous studies showed that student-characteristics and academic motivation are significant predictors of persistence and study-progress (e.g. Hofman & Van den Berg, 2000; Tinto & Russo, 1994). It is likely, however, that the quality of student learning also influences these outcomes. However, students’ learning strategies have only scarcely been related to persistence or study-progress (e.g. Lindblom-Ylänne & Lonka, 1999).

This study aims to explore the predictive value of learning strategies and academic motivation for persistence and study-progress in the first year of higher education. The following research questions are addressed:

• (RQ1) Do students’ learning strategies and motivation at the start of higher education predict students’ persistence in their first year;
• (RQ2) Do students’ learning strategies and motivation at the start of higher education predict students’ study-progress in their first year;
• (RQ3) To what degree do students’ learning strategies and motivation at the start of higher education predict their persistence and study-progress in their first year, after controlling for other students-characteristics (gender, prior education, study delay).

Participants were 780 first year students enrolled in a professional bachelor teacher-training programme. Students were questioned on their motivation and learning strategies using the Learning and Motivation questionnaire (Donche, Van Petegem, Van de Mosselaer, & Vermunt, 2010). This instrument combines adapted scales from Vermunt’s Inventory of Learning Styles (Vermunt & Vermetten, 2004) with adapted and selected items and scales from the Academic Self-Regulation Scale (Ryan & Connell, 1989).

Persistence is measured through the fact whether a student re-enrolled in the same program for the next academic year. Study progress is defined as the ratio between the amount of study credits a student obtained after the first year and the total amount of credits the student was enrolled in during that first year. Prior education refers to the type of secondary education a student was enrolled in. A distinction was made between general, technical and vocational prior education. Study delay alludes to whether the student encountered any delays during his or her prior education. Information on student-characteristics, enrolment and study-progress was obtained through the student administration office.

Logistic regression was applied for analyses with persistence as dependent variable and linear regression was used for analyses on study-progress. In each case, a stepwise strategy in data-analysis was used.

Results on persistence indicate that concrete processing, analysing, lack of regulation and lack of motivation are significant predictors. When these predictors are combined into one model, only concrete processing and lack of motivation are retained. When student-characteristics are added to the model, gender proves to be an additional predictor. After controlling for student-characteristics the effect of concrete processing became non-significant. The final model explains 6.5% of variation in persistence. For study-progress results show that relating and structuring, external regulation, lack of regulation and lack of motivation are meaningful predictors. Both gender and study delay are additional significant predictors. The final model explains 8.6% in the variance of study-progress.
Results show that learning strategies and motivation are small, but significant factors in predicting study-progress and persistence, in addition to student-characteristics. Especially dimensions signifying ‘a lack of’ appear to be important indicators. Predicting these outcomes, however remains complex.

**Keywords:** Academic outcomes, learning patterns, motivation

**References**


Do Financial Experts Think Alike and Does This Lead to Higher Job Satisfaction? An Examination of Cognitive (Mis)Fit in Finance

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Abstract

As few studies investigated cognitive style differences within particular job types in a fine-grained way, this study aims to fill this gap by focusing on the cognitive profiles of people within specific finance-related sub-functions and the potential effects of cognitive (mis)fit on job satisfaction. More specifically, the following research questions were explored: (1) do people within similar finance sub-functions have similar cognitive style profiles?; and (2) does a fit between one’s cognitive style and type of function lead to more job satisfaction? When writing up this paper, 55 people completed our survey, which is still ongoing. Preliminary results indicate that cognitive style differences exist within the finance domain and vary according to the specific sub-function people hold. Overall, this research will be particularly relevant for selection, recruitment, and development policies within financial departments.

Keywords: Cognitive styles, person-environment fit, finance

1. Introduction

Just like work environments differ in terms of the information-processing demands they require, people differ in the way they perceive stimuli and use information to guide their behaviour, their so-called cognitive styles (Cools & Van den Broeck, 2007; Hayes & Allinson, 1998). The degree of match between an individual’s cognitive style and the cognitive demands of a work context is referred to as cognitive fit, which can be conceptualised as one dimension of person-environment (PE) fit (Chan, 1996; Cools, Van den Broeck, & Bouckenooghe, 2009; Fuller & Kaplan, 2004). Quite some research has been conducted on the link between cognitive styles and people’s career preferences and vocational choices and its impact on people’s work performance and attitudes (Armstrong, Cools, & Sadler-Smith, submitted; Cools, 2011), focusing on a broad range of general job functions, such as artists, engineers, managers, .... However, given that these studies sometimes led to contradictory findings (e.g., Allinson, Armstrong & Hayes, 2001; Chang, Choi, & Kim, 2008), some scholars pointed out that there might not only be cognitive style differences between functional groups in organisations, but also within functions (Kirton, 2003), implying that sub-functions within one functional group can yield different cognitive styles.

Starting from this premise, the aim of our research is to examine cognitive (mis)fit in the finance sector by focusing on the cognitive profiles of people in diverse finance-related sub-functions. We chose to look at this specific sector as it is undergoing major changes nowadays with increasing non-linear demands within the complex global economy (Shaw & Pant, 2006). According to Hensman and Sadler-Smith (2011), the finance sector is no longer just an epitome of rationality driven by hard data, but creativity is also increasingly important in finance departments. However, style research thus far found that financial workers on average score highest on linear, rational, and analytical thinking (e.g., Cools, 2011; Cools et al., 2009), which means that financial employees prefer working in well-defined structures and have a preference for clear and rational solutions to complex problems. By examining cognitive style differences within particular finance sub-functions, we hope to derive more in-depth, fine-grained insights that can help the finance sector when making staffing or developmental decisions in their changing work environment. We subsequently define...
each of the key concepts of this research (i.e., cognitive styles, work environment preferences, and cognitive (mis)fit) before moving on to the method and results.

2. Cognitive styles

Cognitive styles are widely recognised as important determinants of individual behaviour in the psychology literature and have recently been defined as “individual differences in processing that are integrally linked to a person’s cognitive system… they are a person’s preferred way of processing… they are partly fixed, relatively stable and possibly innate preferences” (Peterson, Rayner, & Armstrong, 2009a, p. 11). Individual differences in cognitive styles have been found to have an impact on perception, learning, problem solving, decision making, communication, and creativity in important ways (Hayes & Allinson, 1994). Moreover, cognitive styles are considered to be independent of personality or cognitive ability and can, therefore, account for additional variance in performance. Streufert and Nogami (1989), for instance, suggested that cognitive styles can explain why some people continually perform well, while others with equal intelligence, experience, and training perform well in one situation but fail in other settings. Furthermore, cognitive styles are considered to be quite stable and not readily altered by training (Chan, 1996), which implies that they are an important factor to take into account in selection and recruitment situations.

Although researchers have developed various cognitive style models over the years, the unidimensional perspective on cognitive style is still most widespread, making a distinction between an analytic and an intuitive way of thinking (Hodgkinson & Sadler-Smith, 2003). However, as multidimensional views on style are gradually getting more important (e.g., Kozhevnikov, 2007; Sadler-Smith, 2009), we preferred to use the framework of Cools and Van den Broeck (2007) in our research. They identified a three-dimensional model and applied a flexible approach in which people can simultaneously score high or low on several styles, which fits the recent calls to establish a more flexible point of view in style research (Hodgkinson & Sadler-Smith, 2003; Miron, Erez, & Naveh, 2004). Cools and Van den Broeck (2007) distinguished a knowing style, planning style and a creating style. People with a knowing style look for facts and data. They want to know exactly the way things are and tend to recall many facts and details. They prefer clear and rational solutions to complex problems. People with a planning style are characterised by a need for structure. Planners like to organise and control and prefer a well-structured work environment. Finally, people with a creating style tend to be creative and like experimentation. They see problems as opportunities and challenges and they like uncertainty and freedom.

3. Work environment preferences

As mentioned before, individuals within particular occupational groups or work groups are assumed to hold quite similar cognitive styles, so-called cognitive climates (Kirton & McCarthy, 1988), since jobs within functional domains have certain information processing requirements in common. More specifically, people who operate in a relatively structured environment have been found to yield more toward the adaption or knowing style (Chan, 1996), while functional groups with more freedom of action and less structure showed a bias towards innovation or creative style (Cools et al., 2009). Similarly, Cools et al. (2009) identified a knowing-oriented cognitive climate in finance. In the same vein, studies found that accountants’ styles lean more towards linear thinking and adaptation than innovation (Armstrong et al., submitted), Hicks, Bagg, Doyle, and Young (2007), for instance, depicted how accountants are more analytical than intuitive, with a preference for MBTI sensing, thinking and judging.

However, research between different functional domains may mask differences that exist within a particular functional domain, related to the specific demands of particular sub-functions (Kirton, 2003). More specifically, within the finance domain certain functions are oriented more internally (e.g., accountants), while other functions have an external orientation either towards other organisations or towards other departments within the organisation (Cools et al., 2009). These different sub-functions require different task requirements, implicating varying approaches to data handling, conflict resolution, and decision making. For example, Fuller and Kaplan (2004) examined the effects of cognitive style on task performance of auditors and found an interaction effect between style and type of task. Analytic auditors performed better on analytic tasks and intuitive auditors performed better on intuitive tasks. In a study involving accounting students, Gul (1986) found that adaptors were interested in careers in auditing and banking, while innovators were interested in positions in management consulting. Furthermore, Summers, Sweeney, and Wolk (2000) described how the consulting function in public accounting operates in a less structured environment and is
often challenged by a more diverse set of problems than the audit function. Hence, we postulate that people with the same task requirements or sub-function will have similar cognitive styles (Smith, 1999) and that the cognitive problem solving styles of financial workers will vary according to their differing task requirements.

\[ H1: \text{Financial workers with an internal orientation will have a higher score on knowing style than financial workers with an external orientation.} \]

\[ H2: \text{Financial workers with an internal orientation will have a higher score on planning style than financial workers with an external orientation.} \]

\[ H3: \text{Financial workers with an external orientation will have a higher score on creative style than financial workers with an internal orientation.} \]

4. Cognitive fit

As work environments differ in the information-processing requirements that are placed on individuals (Cools, 2011), it seems logical that people seek towards congruence or fit between their cognitive style and their tasks and workplace requirements. Chan (1996) introduced the concept of cognitive (mis)fit to refer to the degree of (mis)match between an individual’s cognitive style and the leading style of the work context. A match between the job demands and one’s style preferences is expected to yield positive outcomes (e.g., job satisfaction, organisational commitment, career success), while a mismatch is expected to lead to negative outcomes (e.g., increased turnover, less motivation, higher levels of work-related stress, interpersonal conflicts) (Fuller & Kaplan, 2004; Sadler-Smith & Badger, 1998). Although the idea of cognitive fit received a lot of attention in theory (Chan, 1996; Chilton, Hardgrave, & Armstrong, 2005; Cools et al., 2009), only few studies up till now investigated whether cognitive fit actually leads to these assumed positive outcomes, in this study job satisfaction (Armstrong et al., submitted; Fuller & Kaplan, 2004). Moreover, previous research in the cognitive style field reported mixed results in terms of the relation between cognitive styles and job satisfaction (Cools et al., 2009), with some researchers referring to a positive effect of cognitive fit on people’s job satisfaction (e.g., Brigham, de Castro, & Shepherd, 2007) and others not finding any relation between them (e.g., Gryskiewicz, Taylor, & Fleenor, 1995). Following the majority of previous research in this area, we expect that people in cognitive fit will show higher levels of job satisfaction than people in cognitive misfit.

\[ H4: \text{A match between the cognitive demands of the work environment and the cognitive style of people will lead to higher job satisfaction.} \]

5. Method

Using a self-report questionnaire, employees of financial departments of a broad range of organisations and employees of public accounting firms were invited to participate in this study in the Spring of 2011. It was clearly explained to the participants that the survey was for research purposes only and that their participation was voluntary.

5.1 Sample

We distributed the online survey to 870 financial workers enlisted in our contact database, and up till now we received completed surveys from 55 respondents (6.3% response rate). The sample was comprised of 63 percent male and 37 percent female respondents, with an average age of 40.7 years and an average job tenure of 6.7 years. Among the respondents, 53 percent are currently employed at the senior manager level, 18 percent at the middle management level, 7 percent junior management and 22 percent employees. The sample included organisations with a varying number of employees: 25 percent of the organisations have less than 50 employees, while 38 percent of the organisations have more than 500 employees.

5.2 Measures

\textit{Cognitive styles.} Cools and Van den Broeck (2007) developed the Cognitive Style Indicator (CoSI), an 18-item questionnaire, to measure their three-dimensional cognitive style model. The CoSI distinguishes between three cognitive styles: a knowing style (4 items; \( \alpha = .66 \); e.g. “I like to analyse problems”), a
planning style (7 items; \( \alpha = .83; \) “I prefer clear structures to do my job”), and a creating style (7 items; \( \alpha = .84; \) “I like to extend the boundaries”). The response format is a 5-point Likert scale form 1 (totally disagree) to 5 (totally agree).

**Job satisfaction.** We used the three item scale of overall job satisfaction from the Michigan Organizational Assessment Questionnaire to measure the degree to which a person is satisfied and happy with his/her job (Cammann, Fichman, Jenkins, & Klesh, 1979, 1983). An example item read as follows: “All in all, I am satisfied with my job” (\( \alpha = .89 \)). The response format was a 5-point Likert scale from 1 (“totally disagree”) to 5 (“totally agree”). Higher scores indicated higher levels of job satisfaction (with one item reverse scored).

**Function.** To determine the different finance sub-functions specialisations, we invited three experts in the finance domain to discuss a framework that incorporated the different finance specialisations (e.g., accounting, controlling, treasury, financial advisor, administrative staff). Furthermore, these experts reached agreement about whether a specific specialisation was oriented rather internally towards the internal processes, or rather externally towards other organisations or other departments within the organisation. For example, ‘financial advisor’ and ‘investor relations’ were coded as externally oriented (=1), while ‘accounting’ and ‘administrative staff’ were recorded as internally oriented (=0). Respondents were asked to tick the box of the function title that gave the best description of their job.

6. Analyses and results

6.1 Descriptive statistics

Table 1 shows the correlations of the study variables, together with the corresponding means, standard deviations, and alpha reliabilities. Looking at the cognitive styles, we found a strong positive correlation between the knowing and the planning style (\( r = .76, p < .01 \)). Interestingly, we also found a moderate positive correlation between the creating style and job satisfaction (\( r = .29, p < .05 \)).

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowing style</td>
<td>(.66)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Planning style</td>
<td>.76**</td>
<td>(.83)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Creating style</td>
<td>.25</td>
<td>.16</td>
<td>(.84)</td>
<td></td>
</tr>
<tr>
<td>4. Job satisfaction</td>
<td>.01</td>
<td>.04</td>
<td>.29*</td>
<td>(.89)</td>
</tr>
<tr>
<td>Mean(^a)</td>
<td>3.92</td>
<td>3.66</td>
<td>3.84</td>
<td>4.19</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>.49</td>
<td>.63</td>
<td>.58</td>
<td>.71</td>
</tr>
</tbody>
</table>

\(^* p < .05, \text{**} p < .01, \text{***} p < .001\)

\(^a\) All scales used a 5-point Likert-scale format

6.2 Cognitive styles and work environment preferences

To test Hypotheses 1, 2 and 3, we performed independent sample t-tests. We compared for each hypothesis the orientations of the functions that are expected to score higher on a particular style. In addition, we conducted analysis of variance (ANOVA) to compare the mean CoSI score for the overall finance domain and the two orientations.

As shown in Table 2, we see that people who work in a finance job with a focus on internal processes score higher on the knowing style (internal: \( M = 3.94, SD = .48; \) external: \( M = 3.89, SD = .50; \) t(53) = .39, p = .70), and the planning style (internal: \( M = 3.78, SD = .55; \) external: \( M = 3.51, SD = .69; \) t(53) = 1.57, p = .12), whereas finance people with an external orientation score higher on the creating style (internal: \( M = 3.72, SD = .57; \) external: \( M = 3.99, SD = .57; \) t(53) = -1.73, p = .09). Although these differences point in the hypothesised directions, none of them were significant, which may be due to the small number of participants thus far. Full results will be reported during the conference presentation.
Table 2: Scores on the Cognitive Style Indicator for different functional domains (N = 55)

<table>
<thead>
<tr>
<th>Function</th>
<th>Knowing style</th>
<th>Planning style</th>
<th>Creating style</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Finance</td>
<td>55</td>
<td>3.92</td>
<td>.49</td>
</tr>
<tr>
<td>Internal</td>
<td>30</td>
<td>3.94</td>
<td>.48</td>
</tr>
<tr>
<td>External</td>
<td>25</td>
<td>3.89</td>
<td>.50</td>
</tr>
</tbody>
</table>

\(F\)-statistic

\[ F(1, 54) = .15 \quad F(1, 54) = 2.45 \quad F(1, 54) = 2.98 \]

* \(p < .05\), ** \(p < .01\), *** \(p < .001\)

6.3 Cognitive fit

To test Hypothesis 4, we conducted hierarchical regression analysis. For the regression model, the predictor variables (knowing style, planning style, and creating style) were entered first followed by the moderator variable (orientation). In the second step, we added the interaction terms between cognitive style and orientation. This technique was used before by Cools et al. (2009) to conceptualise the measurement of cognitive fit. All interaction terms were computed from standardised main effects variables, thus avoiding the problems of multicollinearity arising from correlations between product terms and their component parts. The moderator variable orientation is a categorical variable that consists of two categories (internal orientation and external orientation).

The results in Table 3 show that the hierarchical \(F\)-test was not statistically significant, suggesting that the interaction effect model was not better at predicting job satisfaction than the model with only the main effects. This implies that Hypothesis 4 was not supported. In other words, for this sample the relationship between people’s cognitive style and job satisfaction does not depend on the cognitive climate in which they work.

Although cognitive climate did not moderate this relationship, we found that the main effect of creating style on job satisfaction was marginally significant (\(\beta = .28, p = .06\)), which confirms the positive correlation we found in Table 1. No other (marginally) significant relationships were detected.

Table 3: Summary of hierarchical regression analysis of orientation and cognitive style on Job Satisfaction (N = 55)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Job satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(b)</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
</tr>
<tr>
<td>Knowing style</td>
<td>-.17</td>
</tr>
<tr>
<td>Planning style</td>
<td>.18</td>
</tr>
<tr>
<td>Creating style</td>
<td>.28</td>
</tr>
<tr>
<td>Orientation</td>
<td>.35</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
</tr>
<tr>
<td>Knowing style * orientation</td>
<td>.48</td>
</tr>
<tr>
<td>Planning style * orientation</td>
<td>.11</td>
</tr>
<tr>
<td>Creating style * orientation</td>
<td>-.07</td>
</tr>
</tbody>
</table>

* \(p < .05\), ** \(p < .01\), *** \(p < .001\)

7. Discussion

In this study, we examined two main research questions. Our focus was on cognitive style differences of people within one functional domain and on the potential impact of cognitive (mis)fit on job satisfaction.

Regarding the first research question, Cools et al. (2009) reported small effect sizes on cognitive style differences between functional domains, which they attributed to possible within-function variance in cognitive style demands. In response to this, the aim of our research was to examine cognitive (mis)fit in the...
finance sector focusing on the cognitive profiles of people in diverse finance-related sub-functions. As the data collection is still ongoing, we do not have full results yet, but preliminary findings already enable us to report some trends. Overall, finance workers score highest on the knowing style, which confirms previous research (e.g., Hicks et al., 2007). However, we also found that the scores on the creating style are nearly as high, so hard data are important in finance, but experimentation and innovation also seem crucial in contemporary finance jobs. Second, we see that jobs with an internal orientation and jobs with an external orientation differ on the creating style and the planning style, with a higher score on planning in internally oriented jobs and a higher score on creating in externally oriented finance jobs. These findings are in line with Hypothesis 1, 2 and 3, but, as mentioned, these trends are not significant. Figure 1 visualises the differences between the cognitive profiles of internal and external oriented finance jobs.

Our second focus was on the potential impact of cognitive (mis)fit on job satisfaction. In general, previous research on cognitive styles and job satisfaction did not find significant correlations, the only study that confirmed a positive correlation between the two variables is that of Brigham et al. (2007) in their study with entrepreneurs. In line with previous research findings, we did not find that people in cognitive fit are more satisfied with their jobs. This suggests that more research is needed to investigate the process that is behind it, as there may be underlying mediating variables (Summers et al., 2000). We did find a marginally significant effect of the creating style on job satisfaction in our preliminary results, indicating that people who like innovation and experimentation experience more satisfaction with their jobs.

This study raises some implications for recruitment, selection and training policies of finance departments and public accounting firms. As cognitive styles can account for extra variance in job performance (in addition to ability, personality and other possible measures), it may be useful to consider the demands of the functional role and the cognitive profiles of individuals when making hiring or developmental decisions (Streufert & Nogami, 1989; Summers et al. 2000).

To conclude, the uniqueness of this study lies in its focus on within-functional variance rather than between-functional variance in terms of cognitive profiles. Further research is certainly needed in this area, as studies that merely examine differences between functional domains might neglect significant cognitive style differences within functional domains.

8. References


**Acknowledgement**

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A New Model of Entrepreneurial Behaviour: Early Predictors of Entrepreneurial Competencies and the Impact of Entrepreneurship Education

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Abstract

A fundamental assumption that underlies entrepreneurship education is that entrepreneurial behaviour can be taught or educated. Studies from different research domains (e.g., genetics and psychology) indicate that this is a plausible assumption. Literature also suggests that middle childhood is a crucial period in the development of personality and fundamental (entrepreneurial) competencies. However, theoretical models of the potential early predictors of entrepreneurship have not been empirically tested to date. Drawing on these findings, we think it is important to develop such a model, as today researchers and practitioners cannot rest on a scientific basis for the design and evaluation of entrepreneurship education programmes in elementary school. Hence, this paper proposes a methodology by which an explorative model of the early predictors of entrepreneurial behaviour can be tested.

Keywords: entrepreneurship education; middle childhood; entrepreneurial competencies; nature versus nurture

1. Introduction

Entrepreneurship has been associated with diverse societal benefits, such as economic growth, job creation, and innovation (van Praag & Versloot, 2007). As a consequence, many initiatives and efforts are made to promote entrepreneurship. The role of education herein is heavily emphasised (Verheul, Wennekers, Audretsch, & Thurik, 2002), because:

“to a greater or lesser degree in just about every culture there are sceptical or even hostile attitudinal barriers to entrepreneurship. (...) And hence the need for entrepreneurship education aimed specifically at young people, who are typically more open to self-exploration and usually more willing to challenge received wisdom and societal prejudice than are most adults” (Volkmann et al., 2009)

It is assumed that entrepreneurial competencies, defined here as competencies that are predictive for entrepreneurial behaviour, are to some extent present in every individual (Bal et al., 2007; van der Kuip & Verheul, 2003) and can be developed (Hannon, 2006). Especially in middle childhood (approximately ages 6 to 10), entrepreneurship programmes are assumed to be effective (van der Kuip & Verheul, 2003; Wilson, Kickul, & Marlino, 2007). However, most educational initiatives that aim to stimulate entrepreneurship focus on students in secondary school and higher education; widespread entrepreneurship programmes developed by educational authorities are still rare at elementary school level (European Commission, 2004; Hytti & Kuopusjärvi, 2004). In addition, prior research on entrepreneurship education has mainly concentrated on university-based entrepreneurship curricula (Heilbrunn, 2010; Hytti & Kuopusjärvi, 2004). As a result, the ideal context to undertake educational efforts to foster entrepreneurship at an early age still remains unclear. Questions that are at the heart of a growing, yet very young domain of research are for example related to the role education has to play in stimulating entrepreneurship; and if it does, then how should it? What contextual and personal variables need to be accounted for when engaging with potentially effective programmes? Given the potential importance of primary education on entrepreneurship, why do so few initiatives exist? The answer can probably be found in the fact that many methodological and practical
challenges may deter researchers dedicating their efforts to this research domain, as only sound longitudinal research can provide convincing evidence that entrepreneurship can be effectively influenced through educational programmes (Peterman & Kennedy, 2003). In addition, practical challenges such as the reading abilities and cognitive limitations of children in middle childhood heavily limit the validity and reliability of self-report assessments. Research showed that only by age 10, self-ratings on a wide array of competences relate strongly to actual performance (Eccles, 1999).

Following this knowledge gap, the current study has two main aims. (1) First, we want to address the gaps identified above by reviewing current insights about the link between competencies in middle childhood and entrepreneurial behaviour in adulthood. To this purpose, we start with the fundamental question whether entrepreneurship can be taught or whether it is part of the innate personality of an individual. Next, we briefly discuss insights about when entrepreneurship education might be most effective, how it is best organised, and which competencies should be developed in entrepreneurship education. (2) Second, we propose a methodology using a longitudinal approach as a potential way to explore the early antecedents of entrepreneurship and to evaluate the effectiveness of entrepreneurship education programmes.

2. The (non)sense of entrepreneurship education

Focusing on the link between childhood and entrepreneurial behaviour in adulthood, and the potential role of entrepreneurship education herein, we first dig into the following fundamental question: are entrepreneurs born or made? Second, we give a clear definition of competencies and focus on why effective entrepreneurship education in elementary school probably would make sense. Finally, we describe different perspectives on the kind of competencies in middle childhood that are thought to be predictive for entrepreneurial behaviour in adulthood.

2.1 The antecedents of entrepreneurship

The nature-nurture debate finds it origins in Darwin’s The origin of species (1859). Nowadays, it is clear that an extreme perspective on the origin of human behaviour is scientifically outdated. As we will demonstrate below, entrepreneurial behaviour can probably be explained by both genetic and environmental factors. Nature and nurture almost always work together (Ridley, 2003).

Nature. A revived debate has emerged in entrepreneurship research on whether entrepreneurs are born or made (van der Kuip & Verheul, 2004), spurred primarily by some recent research investigating the impact of genetic profiles of twins on the propensity to become entrepreneur or not. These studies do not imply any kind of determinism, but have provided empirical evidence that the tendency to become an entrepreneur can at least be partially attributed to biological differences. One of these studies was conducted by White, Thornhill, and Hampson (2006), who found that higher testosterone individuals seek dominance through entrepreneurial behaviour, which leads to a reproductive advantage. In another study of Nicolaou et al. (2008), it was demonstrated that 48 percent of the variance in the propensity to become self-employed could be explained by genetic factors. Zhang and colleagues (2009) even estimated that up to 60 percent of the variance in entrepreneurship could be accounted for by genetic factors in females, whereas entrepreneurship in males was not shown to be heritable at all. However, the figures above are most probably ‘upper bounds’ for the relevance of genes in explaining entrepreneurship, as there are some important shortcomings in the design of twin studies (Koellinger et al., 2010). In such studies it is assumed, for example, that identical twins experience equivalent environment and the same genes; assumptions that were recently disconfirmed (Bruder et al., 2008; Rutter, 2006). There are some new research designs that could be more appropriate in this regard, but even if one finds an indication of genetic predisposition for entrepreneurship, the general conclusion in most genetic studies is that a predisposition only materialises in the presence of appropriate environmental conditions and a conscious choice. This brings us to the role of the environment in nurturing entrepreneurship.

Nurture. In linking the human genome with entrepreneurship, one thing is clear: everything started and ended with fertilisation. Researchers who study environmental influences on entrepreneurship do not have that fortune; they do not have absolute certainty about the period of life that is most influential for entrepreneurship or certain entrepreneurial competencies. However, and as was outlined in the introduction, middle childhood could be considered a crucial period for nurturing entrepreneurship. Although researchers have mainly focused on the school as the critical place in which children’s futures are shaped (Eccles, 1999), it is reasonable to assume that there are alternative influential environments and important others such as
parents and families (Brownlow, 2007; Henley, 2007; Kourilsky, 1995), friends, youth organizations, etc. Nonetheless, experts in education and training for entrepreneurship argue that education can greatly contribute to the creation of a more entrepreneurial culture, starting with young people and at school (European Commission, 2004; Verheul, Wennekers, Audretsch, & Thurik, 2002). It is plausible that entrepreneurship education can substitute for the learning that also happens out of school. In the opinion of Kourilsky (1990), fundamental entrepreneurial competencies can be promoted in education mainly through two strategic initiatives. First, an entrepreneurial environment should be implemented throughout the schooling process. According to Rotefoss (2004), this is a real challenge for effective entrepreneurship education as most teachers are lacking entrepreneurial attitudes, skills and knowledge. In the end, teachers are role models, so it is important that they carry out a positive attitude towards entrepreneurship. A recent study from Heilbrunn (2010) validated this assumption by comparing pupils from a school with a strong focus on entrepreneurial activities with a sample from a more conventional school. Data revealed that the former sample rated significantly higher on proactive disposition, preference for innovation, achievement motivation, and non-conformity. A second initiative that should be implemented are programmes that enable pupils to experience entrepreneurial thinking and behaviour through integrated and experiential ways of learning (Gibb, 1987; Hailey, 1995; Kourilsky, 1990; Rabbior, 1990). Again, the importance of sufficient training of the teachers in stimulating entrepreneurial behaviour cannot be underestimated herein (European Commission, 2004), especially in elementary education (Norwegian Ministry of Education and Research, 2004). Yet, a key question that is left unanswered is what should be taught: which entrepreneurial competencies should be nurtured in middle childhood? We zoom in on this question in the next section.

2.2 A pyramid model of competencies

To design entrepreneurship education programmes at elementary school level, we need to know first which competencies should and can be developed. A competency is defined here as a latent quality of a person, which can be a motivation, a trait, a skill, or an aspect of a person’s self-concept, social role, or knowledge (Boyatzis, 1982). Spencer and Spencer (1993) used this definition to construct an iceberg model of competencies (see Figure 1).

Figure 1: An iceberg model of competencies

![Figure 1: An iceberg model of competencies](image)

Note. Adapted from Lievens (2008) and Spencer and Spencer (1993)

In this model, the definition of a competency is split up and ranked on two dimensions: learnability and importance. According to this model, traits are only one part of the puzzle in explaining observable behaviour. Moreover, one can expect that entrepreneurship education that focuses on the development of specific skills and knowledge will be less effective (on the long term) when the more important, fundamental competencies such as entrepreneurial attitudes and a ‘healthy’ self-concept are not present in the schoolchildren. Only as a second goal, specific business skills and micro knowledge on entrepreneurship should be developed. However, related to the need for fundamental entrepreneurial competencies, we can predict from this model that the most important competencies are the most difficult to teach, hence it is key to break in in the development of these fundamental competencies at the right time. Following Eccles (1999), the right time for this is middle childhood. However, predictions that cannot be made from this model are related to the stability of the competencies in the long term. Are certain competencies in middle childhood predictive for entrepreneurial behaviour in the long term, and if so, which competencies are most predictive? These are the two main questions that we will address below, starting with a literature review on the stability of competencies.
The number of studies that have traced children’s personalities from early and middle childhood to their later years is very limited. A major problem here are maturation processes from childhood to adulthood. Nevertheless, there have been some successful attempts in pointing out the long-term continuities of entrepreneurial competencies. For example, Caspi et al. (2003) demonstrated a significant relationship between observed behaviour at a very early age and self-reported personality in late adulthood: self-confident children at age 3 were the least conventional and most agentic members in adulthood. Remarkable was that these relationships were stronger at age 26 (when most people step into the labour market) than at age 18 (when most people leave high school), implicitly showing the inhibiting and fugitive nature of compulsory education programmes. However, what is the theoretical explanation for this observed relationship? And are there more predictive entrepreneurial competencies in middle childhood? These are the two main questions that will be stressed in the next paragraph. For an overview of the entrepreneurial competencies that were most covered in the literature, see Table 1.

Comprehensive models on early predictors of entrepreneurship are nearly unfindable. Many authors refer to early antecedents of entrepreneurial behaviour, without embedding them in a clear theoretical framework (e.g., Rushing, 1990; van der Kuip & Verheul, 2003). An exception here is the model from Laevers and Bertrands (2004), who consider creativity and self-discipline as the cornerstones of the future entrepreneur and distinguish four major cluster components that can influence the entrepreneurial spirit of the child: a healthy emotional basis, energy and direction, domain specific competencies (e.g., social and communication competencies), and personality. A straight asset from this model is its face validity and comprehensiveness. Unfortunately, to our knowledge no longitudinal data in support of this model are available, which brings us to the next section.

There have been several attempts in determining the impact of entrepreneurship education programmes at elementary school level, albeit seldom published in peer reviewed journals. In our search for articles, we first turned to the Web of Science and EBSCO, which resulted in only a marginal number of search results. In the end, the bulk of relevant articles were obtained from organisations that offer entrepreneurship education programmes. Because of the popular nature of most of these reports, results should be interpreted with some caution. Nevertheless, the literature review below gives an initial idea of the constructs that we should consider in building a model of early antecedents of entrepreneurship. Because of the numerous different constructs that were proposed by various authors (more than 100), a referenced outline of the constructs that we found in our literature review is summarised in Table 1. This table was put together based on the readings of two independent researchers. Initially, the researchers listed the competencies (in middle childhood) that were put forward as predictive for entrepreneurship for every document independently. Next, the readers merged similar constructs into umbrella constructs (e.g., achievement motivation and success motivation became ‘need for achievement’). Finally, based on the number of times a predictive competency was cited, a ranking was composed by both readers. Due to the limited space available to us, only the top 10 of the most cited competencies are presented in Table 1 (a comprehensive table can be obtained upon request). The percentage of agreement between the top-10 rankings of both researchers was .70. In the next paragraph, we will discuss in more detail the reports and studies that led to Table 1.

Table 1: Early predictors of entrepreneurship

<table>
<thead>
<tr>
<th>Competency</th>
<th>Reader 1 N₁</th>
<th>Reader 2 N₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Independence</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Self-confidence</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Sense of responsibility</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Need for achievement</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Spirit of initiative</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Persistence</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Collaboration skills</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Communication skills</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Goal commitment</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

One of the more rigorously conducted impact studies that we found, stems from Rotefoss, Johnsen, and Nyvold (2005), who asked about 900 teachers to rate the extent wherein they thought that certain entrepreneurial competencies were stimulated in elementary school. In particular, responsibility, dealing with the consequences of choices and actions, self-trust, and independency were put forward. A similar peer-reviewed study in Croatia (Baranović, Štibrić, & Domovic, 2007) showed that teachers thought that especially openness about changes and new experiences, readiness for cooperation and dialogue with peers, and motivation for achievement were enhanced by activities and teaching methods that aim to develop children’s entrepreneurial skills.

Besides the insights gained from teacher surveys, a dozen of authors drew on the responses from students. Especially notable are the impact measures that were conducted by the Schools Enterprise Programme (Scotland) and Junior Achievement (Worldwide), two well-established programmes that aim to encourage entrepreneurial competencies in schoolchildren through experiential, hands-on programs. For example, in a study from Brownlow et al. (2004), Scottish pupils that followed an entrepreneurship programme had grown in confidence, had learned to identify their own and other’s strengths and weaknesses, and had learned to take responsibility for their own decisions. However, although impact has been observed, effect sizes tend to be small (Culver, 2005; JA Worldwide, 2004a). Interesting in this regard is the finding that pupils benefit most from a continued immersion in entrepreneurial programmes throughout the years (JA Worldwide, 2004b).

In sum, there are some studies that can give us a preliminary perspective on the conditional effects from entrepreneurship education programmes in an elementary school setting. In general, these studies indicate that children who participate in entrepreneurship education programmes only slightly differ from control groups with regard to gained knowledge, but not in terms of attitudes or other competencies. Drawing on these findings, we now propose a methodology wherein a theoretically founded model of early predictors of entrepreneurial behaviour can be tested.

3. Discussion and future recommendations

In this study, we questioned whether entrepreneurial behaviour in adulthood can be stimulated through entrepreneurship education in middle childhood. To substantiate this hypothesis, we started with a review of studies about the biological fundaments of entrepreneurial behaviour, which showed that in optimal environmental conditions the influence of genetic elements was heavily reduced, providing us with a first indication that entrepreneurship can be developed in a social environment. Next, we argued that middle childhood is the crucial period wherein fundamental entrepreneurial competencies can be developed. The school environment and more specifically teachers can significantly contribute to this development process. In this regard, we mentioned some recommendations about how an ideal school environment and education programme that aims to promote entrepreneurship should look like. We also checked whether such efforts make sense on the long term and found some indications that the latter could be the case.

A question that remains unanswered is the following: which fundamental competencies in middle childhood are causally related to entrepreneurial behaviour in adulthood? In our literature research, we found about 17 articles and reports wherein suggested answers to this question were made. Yet, to date, this research question attracted only very limited academic notice. This clearly showed off in the multitude of perspectives that researchers pulled from in setting up research. Nevertheless, our literature review gives food for thought and can be an impetus for a new stream of research in the domain of entrepreneurship (education). As argued above, we assume that middle childhood is an important phase in the development of entrepreneurial competencies and that formal education can have a major influence on this development process if certain conditions are met. Moreover, several governments share this perspective and have already implemented programs that aim to develop entrepreneurial competencies in elementary school children. As the effects of such initiatives on entrepreneurial activity have not been underpinned in a true scientific manner, it will be important for future research to start from a longitudinal perspective on this matter (Peterman & Kennedy, 2003). This does not mean that such a longitudinal study has to be enormously long. It is possible that one only wants to know the impact of entrepreneurship education in a limited time span, for example before, during and after a one year programme.

More importantly, irrespective of the time span, if one wants to follow up the development of entrepreneurial competencies from childhood to adulthood, the competencies that are measured should fit in a theoretical model on the early development of entrepreneurial behaviour. A comprehensive methodology to realise such
a design could be to operationalize all the constructs that we found in the literature (more than 100 constructs were identified) into scales and check which ones are significantly related to entrepreneurial behavior over the years, which is nearly impossible given the scope. Hence, the biggest theoretical challenge that we are facing in setting up a realisable research agenda, is to select and define a comprehensive, but limited number of competencies in middle childhood that is predictive for entrepreneurial behavior in adulthood. Gartner (1989) is probably right in arguing that researchers should hereby not (solely) focus on traits that differentiate entrepreneurs from non-entrepreneurs, as this approach has shown to be unfruitful. In testing a theoretical model, especially competencies such as attitudes, values, motivations, and the self-concept are likely to be relevant and should be further explored. Competencies that can be categorized or viewed as skills, knowledge or traits should only be deliberated as a second option. In concrete, a methodology to develop such a theoretical model could be to compare the findings from our literature review with the literature on important entrepreneurial competencies in adulthood. Meta-analyses could also be of great help here. More specifically, the approach could be as follows. (1) First, adopt a prospective view and check whether relevant competencies that were often cited in articles and reports from our literature review (see Table 1) are also significantly associated with entrepreneurial behavior in studies with adult subjects. (2) Second, adopt a retrospective view and check whether constructs that are significantly associated with entrepreneurial behavior in adulthood can be viewed as, or are highly interrelated with attitudes, values, motivations, or the self-concept. Competencies that meet one of these criteria should then be considered for selection in an explorative model of early predictors of entrepreneurial behavior. (3) Next, instruments should be identified or developed to assess the extent wherein the selected competencies are present in children in elementary school. An additional challenge herein is that if one wants to follow up the development of the children from childhood to adulthood, the validity of the instruments over time has to be assured. In the development of such instruments, teachers, parents and other third persons could be helpful in the identification of behavioral indicators for the selected constructs, as assessments in elementary school will have to be conducted by third parties as self-assessments in middle childhood proved to be unreliable (Eccles, 1999). (4) A following step should be a prospective longitudinal study, wherein data collection takes place for the same subjects at different time points, and ideally from multiple data sources, as reliability and validity of reporting is usually higher when ratings of multiple informants are taken into account (Loeber & Farrington, 1994). A good sample for a longitudinal study that aims to measure the impact of entrepreneurship education in elementary school should consist out of two groups: one group of children from a school with a strong focus on entrepreneurial activities, and one group of children from a more conventional school, similarly to an approach recently taken by Heilbrunn (2010). Ideally, new longitudinal studies should be started up every two to three years to rule out cohort effects in the data.

To conclude, if all these recommendations and the right control variables are taken into account, we are convinced that one will be able to draw conclusions on early predictors and their causal effects on entrepreneurial behavior. Moreover, drawing on the insights from this literature review, we are currently gathering data in support of a first model of early predictors of entrepreneurial behavior. We hope that this paper will be an impetus, and can serve as a sound starting point for more studies on the fundamentals of entrepreneurial behavior. Entrepreneurship education research agendas should shift away from research in higher (and secondary) education towards a more comprehensive approach of the domain, wherein entrepreneurship education in elementary schools takes a (prominent) place.

4. References


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**Acknowledgement**

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Visualising Styles in N-Dimensional Spaces.

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Abstract

This paper takes two problems common in the field of styles research, namely 1) the difficulty to identify a coherent integrative framework for the numerous metrics of style and their theoretical underpinnings, and 2) the difficulty of providing a useful representation of what the metrics of style actually mean in practice. Data mining and visualization techniques are offered as a solution and we present some examples of how such methods could provide useful way to understand the styles literature and inform the practitioners with data-driven approaches to identify ‘types’ from the metrics.

Keywords: learning and cognitive styles, data mining, academic performance, use of e-learning

1. Introduction

A hotly debated issue in the research on styles has been how to put order in the theoretical framework behind instruments measuring cognitive and learning styles. For example, Desmedt and Valcke (2004) termed the landscape in the literature a ‘styles jungle’ and Cools (EL SIN 2007) referred to the problem as the ‘elephant in the room’ whilst Peterson and colleagues (2008, see also table 1), reviewing the core conceptualization of the terms, were only able to identify a relative consensus amongst researchers.

In the literature there are a number of valiant attempts to achieve coherence using a number of different methods (examples like Curry, 1983; Messick, 1976; Miller, 1987; Riding & Cheema, 1991; Coffield, Moseley, Hall, & Ecclestone, 2004; Zhang & Sternberg, 2005; Kozhevnikov, 2007; Peterson, Rayner and Armstrong 2009, to name a few). Some of these are purely theoretical, deducing constructs by association; some used the literature as a starting point and analysed citations. Others used multiple instruments and attempted to create correlation models.

In this paper we suggest two methods of representing styles grounded on data mining methods both based on a large study spanning over 5 years (Vigentini 2009, 2010) and looking at cognitive and learning styles in relation to academic performance in higher education, and e-learning and learning technology use. The first one is a visual representation of the literature on styles. This generated maps of the existing literature affording useful insights on the grouping of theories and instruments starting from the published research.

The second method is an example of how visualization applied directly to the metrics of styles used (from the same source) could provide a better way to identify ‘types’ of individuals and allow a useful application for a variety of contexts.

2. Why styles and what styles?

According to Sternberg (Sternberg & Grigorenko, 1997), one reason for the sense people have that styles exist, may be:

“(…) that they account for variation in performance that abilities do not account for, and that they may be important in a variety of real-world settings, such as the school, the workplace, and even the home” (Sternberg & Grigorenko, 1997, p. 147).

This idea that intelligence and personality do not explain the full range of performance has been presented in models such as Chamorro-Premuzic and Furnham (2005), Busato, Prins, Elshout & Hamaker (2000) or Diseth (2003). Motivation has also been used in the attempt to justify the interaction between abilities and achievement. Mayer (1955), and Vroom (1966), for example believed that general performance is a multiplicative function of intelligence and motivation, where motivation can be conceptualized in terms of
personality characteristics (Rindermann & Neubauer, 2001). However, motivation is not equating to personality (even though it might be strongly driven by traits as Conscientiousness or Openness) and it is believed to be interacting with styles (i.e. Chamorro-Premuzic in the motivational learning cycle or Witkin’s (Witkin & Goodenough, 1981) field dependence and the social sphere).

Even though research on styles can be identified as far as Galton (Galton, 1883) who investigated tendencies to use imagery strategies as opposed to verbal strategies at recall, it is with Allport, that research in this area proliferated with a variety of models and definitions, often with little coherence or clear structure. Allport and Odbert (Allport & Odbert, 1936) defined cognitive styles as a person’s innate, habitual or preferred mode of information processing.

This definition, however, is not the only one and would only be able to obtain a partial consensus, as demonstrated in the Delphi study conducted by Peterson and colleagues (2009). In table 1 the core elements of the definitions follow straight from the original wording of Allport (Allport & Odbert 1936) and Messick (1976). Whilst there seems to be a certain majority consensus in the definition of cognitive and learning styles not everyone means the same thing stressing a fundamental issue in the theoretical underpinnings about assumptions and the understandings of the terms used.

Some comfort derives from some empirical evidence in research like Sadler-Smith (2001) and Zhang & Sternberg (2000; 2005), showing that measures of cognitive styles and learning styles (at least for the instruments they used to measure them) were independent constructs. However, an undeniable fact is the impact that the early research had on the implicit assumptions in the field.

The first systematic study of the variation cutting across the boundaries between personality and intelligence resulted from the work of Klein (1951) and Witkin (Witkin et al., 1954). Klein distinguished two types of individuals: sharpeners, who notice contrasts and maintain a high degree of stimulus differentiation, and levellers, who notice similarities among stimuli and ignore differences (Klein, 1951; Klein & Schlesinger, 1951). Witkin also classified two types of people in his perceptual tasks: field dependent (FD) people who exhibit high dependency on the surrounding, and field independent (FI) who exhibit a low dependence. It is notable that Witkin’s types can be considered as opposite poles of a continuum, and it was pointed out by Witkin and colleagues that a large number of individuals didn’t fall distinctively in either category. It was also found that FI and FD people present significant relations between perceptual tasks, personality characteristics and social behaviour. For example people in the FD group made greater use of external social referents and were more attentive to social cues than people in the FI group (Witkin & Goodenough, 1981).

These first two major contributions set the stage for most of the following research: they inspired other researchers to fill the gap in the overlapping areas of personality and intelligence already advocated by Cronbach (1957), but also left some major issues open for debate and confusion, which characterised the following evolution of the research on styles.

In particular, both authors agreed that styles were stable over time and should be related to personality (also fairly stable). Witkin’s ideas strongly impacted upon later research in cognitive styles arguing that a ‘style’ is a “broad bipolar dimension”, which, in principle, allows for a value-free construct/categorization. Klein, on the other hand, even if supporting the idea of a value-free construct, seemed to imply that two separate orthogonal dimensions were more suitable to measure the extent of the presence of styles.

In much the same way in which the optimal number of personality traits dominated personality research, the 1950s were characterised by a proliferation of measures of styles capable of capturing individual differences in performance. Such trends continued up to the 1980s and became reason for concern for many researchers (Curry, 1983; Messick, 1976; Miller, 1987; Riding & Cheema, 1991 to name a few).

The creation of new measures of styles was mainly characterised by a number of independent and often entrenched interpretations. In her review, Kozhevnikov is critical of the fact that there were very few attempts to integrate the numerous cognitive styles:

“the main experimental paradigm was as follows: a simple task with two or more possible ways of solving it was offered to a subject. In situations of uncertainty about the “right way” of performing the task, the subject would choose his or her preferred way. Because all ways of solving the task were considered to have equal value, it was assumed that the subject’s choice revealed a preference, not an ability. A group of subjects was then divided on the basis of their performance via a median split, forming two opposing poles
of a particular style. This approach led to a situation in which as many different cognitive styles were described as there were researchers who could design different tasks.” (Kozhevnikov, 2007, p. 466)

Just to provide a timeline justifying such critique, Messick counted 19 styles in 1976, Keefe listed 40 in 1988, Coffield et al. selected 78 in 2004. It is not a surprise then that this proliferation makes it impossible to go from a systematic review (typical of a number of integrative papers) to a meta-analytic study: the methods used are different, samples are not homogeneous and the theoretical frameworks are beset by an ever growing number of models, theories and instruments.

It is also notable that the term styles is rarely used by itself, and is mainly associated with the labels cognitive, intellectual, thinking and learning styles. Depending on the model considered, the overlap with aspects or facets of personality and levels of abilities is more or less assumed or implied (see for example Riding & Cheema, 1991; Zhang & Sternberg, 2000), often ignoring the clear definition of the terms, which also contributes to the growing confusion (Desmedt & Valcke, 2004).

Table 1: Summary of definitions given for cognitive and learning style. Source: Peterson, Rayner and Armstrong 2009. The survey and the votes received in round 1 of the Delphi study. *percentage of the sample (N=44) that strongly or mostly agreed with these definitions

<table>
<thead>
<tr>
<th>Definitions Cognitive Style</th>
<th>% *</th>
<th>Definitions Learning Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive styles are individual differences in processing that are integrally linked to a</td>
<td>66.0%</td>
<td>Learning styles are an individual’s preferred ways of responding (cognitively and behaviourally) to learning tasks which change depending on the environment or context. Therefore a person’s learning style is malleable.</td>
</tr>
<tr>
<td>person’s cognitive system. More specifically, they are a person’s preferred way of</td>
<td></td>
<td>40.9%</td>
</tr>
<tr>
<td>processing (perceiving, organising and analysing) information using cognitive brain-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>based mechanisms and structures. They are partly fixed, relatively stable and possibly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>innate preferences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive styles are complex, multifaceted psychological variables that affect the way a</td>
<td>34.0%</td>
<td>A learning style is an individual’s psychological repertoire of preferred learning</td>
</tr>
<tr>
<td>person prefers to process information. In particular, they refer to the way people solve</td>
<td></td>
<td>processes and strategies that are used when learning. These preferred processes can be</td>
</tr>
<tr>
<td>problems, make decisions and undertake tasks. They are not tied to a particularly</td>
<td></td>
<td>cognitive, affective, motivational and behavioural and they shape the social and personal</td>
</tr>
<tr>
<td>cognitive mechanism or structure. They are partly fixed, relatively stable and possibly</td>
<td></td>
<td>aspects of an individual’s learning performance.</td>
</tr>
<tr>
<td>innate preferences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive styles are relatively stable super-</td>
<td>23.4%</td>
<td>Learning styles are individual differences in the way a person processes information (i.e.,</td>
</tr>
<tr>
<td>ordinate psychological structures and processes (possibly innate) that determine a</td>
<td></td>
<td>their cognitive style) which determines their typical or preferred response (cognitive</td>
</tr>
<tr>
<td>person’s preferred way of thinking.</td>
<td></td>
<td>and behavioural) in a learning context. A person’s learning style is relatively stable.</td>
</tr>
<tr>
<td>Cognitive styles are trait-like individual differences in the way people think. They are</td>
<td>15.2%</td>
<td></td>
</tr>
<tr>
<td>strongly linked, or possibly the same as, personality traits.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A useful starting point to make sense of the literature is to identify variations in the use of different terms/labels. For example, Peterson (2002) summarised key differences between cognitive style, cognitive ability, learning strategies and cognitive skills (table 2 top) integrating work from Messick (1984) and Tiedemann (1989). This approach provides a further differentiation grounded on a more detailed specification (table 2). However it is lacking in a number of aspects: the dimensions and labels were condensed, and the categories for comparisons don’t seem adequate enough to convey subtle differences. For this reason we propose an enhanced version (table 2, bottom): this takes into consideration a wider spectrum of sources and provides a contextualization of terms informed by the psychological theory and the order of the hierarchical system which interfaces with the label. Based on the definition of cognitive and learning styles in Peterson (2002) and Peterson et al. (2009) as well as the reviews carried out in the past 5 years
(particularly Zhang & Sternberg 2005, Coffield et al. 2004, Desmedt & Valcke 2004 and also Miller 1987, Rayner & Riding, 1997; Riding & Rayner, 1998), her original representation (2002) can be expanded by specifying a number of categories. In particular, it should be possible to visualize the relations with each other and create inter-dependencies between constructs both at the level of measurements, scope and functions. At the interface level we refer to Ackerman’s hierarchical model of cognitive abilities (Ackerman & Heggerstad 1997) which is informed by the literature in cognitive psychology and research on intelligence.

The most important feature of the enhanced table is the clear semantic differentiation of cognitive, learning and thinking styles as well as the associated terms styles, abilities and skills (or strategies) which all appear in the literature, but never together. Approaches to learning (as in Entwistle et al.) are also problematic to place as some aspects belong more to ‘style’ whilst others can be identified as ‘strategy’.

3. A novel method for organizing the literature on styles

From the review papers like Curry (1983), Miller (1987), Riding & Cheema (1991), Zhang & Sternberg (2005) and Coffield et al. (2004) it is evident that idiosyncrasy and partiality are two core features of the various integrative attempts. Coffield et al. attempted to propose a systematic review, but they were strongly criticised (Rayner 2007). Only Desmedt and Valcke made an effort to undertake an impartial assessment based on objective indicators. However, their search was limited to the Social Sciences Citation Index and the result individuated only 1091 records from 1972 onward.

The citation index reflects only a subset of the published literature, which is basically grounded on popularity and the cross- (or co-) citation only increases the bias of popularity of certain references/authors. Furthermore, the citation index used by Desmedt and Valcke limits the analysis to authors’ names, reducing the analysis to a pre-set dual categorization between cognitive and learning styles which can only re-confirm this broad distinction. Their effort is useful to position and categorise some authors as important within the conceptual spheres, but as we noted earlier, such distinction is not so straightforward and it is necessary to reconsider the narrow differentiation between terms, especially if the terms are contextualised in their domains of application.

Following a similar method, but exploiting the wider accessibility of search engines and databases available to date, in the next section we try to provide a broader and more systematic perspective of the literature concerned with styles, instruction and e-learning. This is based on the semantic and topical organization of the sources and modern visualization techniques. The aim is to provide a more impartial selection of the sources and replicable results. The exercise of re-organising the literature on styles using data mining and information visualization (InfoVis) methods, demonstrates that visualization can provide some insight in the theoretical confusion and helped us to select particular instruments to provide a broader perspective on our participants.

“Data mining is the science of finding unexpected, valuable, or interesting structures in large data sets. It is an interdisciplinary activity, taking ideas and methods from statistics, machine learning, database technology, and other areas.” (Hand, 2000, p. 442)

It is feasible to comment that whilst statistics attempts to reduce the complexity of data using pre-specified models (with their assumptions and constraints), data mining is focusing on the algorithms (methods and techniques) to individuate interesting patterns in the data. Because of the exploratory nature of data mining, this technique is more suited to uncover interesting and useful patterns in the literature database than providing a model, and, as we will see in later chapters, to explore the relations between behaviours and individual differences.

3.1. Methods for the literature search

At the core of any data mining procedure is the preparation of a database in a format that the computer software can read and process. The first step was to identify and collate all possible papers available from the body of published literature related to the following keywords: “cognitive styles”, “learning styles”, “thinking styles” and “e-learning”. The latter was associated with a Boolean OR operator with “instruction”, “instructional technology” “education” and “personalization”. As customary in search patterns, the asterisk symbol allows to include all combinations from the same stem.
<table>
<thead>
<tr>
<th>Cognitive Styles</th>
<th>Cognitive Ability</th>
<th>Learning Strategies</th>
<th>Cognitive Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question</strong></td>
<td>the manner or mode of processing</td>
<td>what is processed</td>
<td>general skills used to help processing</td>
</tr>
<tr>
<td><strong>Measure</strong></td>
<td>typical performance</td>
<td>maximal performance</td>
<td>general strategy use</td>
</tr>
<tr>
<td></td>
<td>measured on a bipolar scale</td>
<td>unipolar scale (usually 0 upward)</td>
<td>unipolar scale (usually 0 upward)</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>value differentiated</td>
<td>value directional</td>
<td>value directional</td>
</tr>
<tr>
<td></td>
<td>cannot be learned</td>
<td>can be learned</td>
<td>can be learned</td>
</tr>
<tr>
<td></td>
<td>domain-specific</td>
<td>domain-specific</td>
<td>domain-specific</td>
</tr>
<tr>
<td><strong>Functions</strong></td>
<td>as an organising variable</td>
<td>as enabling variable</td>
<td>as enabling variable</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td>wholistic or analytic</td>
<td>verbal or spatial abilities</td>
<td>acrostics, puzzles</td>
</tr>
</tbody>
</table>

Table 2: A summary of labels used in styles research.

At the top Peterson’s (2002) summary
The search was performed using five major databases for all available dates: PsychInfo on OVID, ISI Web of knowledge, PubMed, Elsevier ScienceDirect, and the IEEE Xplorer. Data was collected either using a direct export of full records from the web interface of the respective search engines or fetched directly using EndNote™ X2. All records were collated into a single EndNote database.

**Table 3: The distribution of references from the various databases after the pruning process.**

<table>
<thead>
<tr>
<th>Database Source</th>
<th>No of Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEEE Xplorer</td>
<td>605</td>
</tr>
<tr>
<td>ISI</td>
<td>8713</td>
</tr>
<tr>
<td>PsychInfo</td>
<td>13590</td>
</tr>
<tr>
<td>PubMed</td>
<td>7219</td>
</tr>
<tr>
<td>ScienceDirect</td>
<td>902</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>26029</strong></td>
</tr>
</tbody>
</table>

The search generated a total of 45108 entries: results were automatically pruned of duplicates reducing the dataset to 43691 entries. Then, the database was cleaned to remove any further non-relevant record. ‘Non-relevant’ means that all articles with a connection to clinical and/or medical conditions in the samples used by each study were pruned. The following keywords (in the combination of title, abstract and keywords fields) were used to exclude papers as non-relevant: clinical, therapy, psychotherapy, preclinical, prenatal, menopause, cancer, autistic, autism, asperger, tumour, biochemical, chemical, crystal, endoscopic, alcohol, depress*, anorex*, bulim*, eating, disease, toxic, schizophrone*, pathology, amino acid, anaesthesia, ADHD, blind, deaf, dislex*, counsel*, patient, health. Finally all entries with incomplete data (i.e. author(s), date or abstract) were removed from the database.

The preparation step is essential: on one hand it was necessary to remove non-relevant records; on the other it provided interesting and unanticipated breadth of the type of research papers containing the target keywords.

At this point 26029 records were considered suitable from the database, but a further manual pruning of duplicates was necessary to remove entries, which has been missed by the automatic procedure due to small typographical differences in the records. The final dataset contained 23388 usable records, which is the largest number of entries in any review or meta-analysis performed on cognitive and learning styles to date.

### 3.2. Using clustering techniques to mine the literature

To organise the large number of records, the dataset was processed using OmniViz™ (Pospisil, Iyer, Adelstein, & Kassis, 2006; White, Cruz, Cameron, & Drabinski, 2008). This is a software tool written in Java which is normally used to support the semantic analysis and visualization of large datasets in chemistry and genetics. The software uses a range of clustering algorithms based on the semantic similarity (topicality) of list of keywords built from predefined fields. In our case, the list of keywords was created from the combination of the title, keywords and abstract of each entry. The software performs a cluster analysis with a pre-selected algorithm on the key terms listed in the pre-processing stage and identifies commonalities between records based on deviations.

Data can be plotted using a **matrix-style heat map** (which represents the correlations between clusters and key terms), a **theme map** which also adds the strength (significance or p value of the relations) and a **galaxy-style configuration** (which is a topicality map of the clusters).

Clustering was performed using a k-means algorithm: this aims to partition n observations (each reference) into k clusters (organised by major terms) in which each observation belongs to the cluster with the nearest mean (similarity index based on keywords). The optimal number of clusters is automatically defined by the system to provide a suitable distribution of clusters based on the sample size and which also differentiates between different sources, however the adequate number can be manipulated iteratively according to an in-depth review of the clusters content and keywords.

An initial solution was generated with 152 clusters, (see Figure 1), but by inspecting the content of the clusters (Figure 1, middle) it is easy to see overlaps between the preliminary groups. An alternative solution was forced with 22 clusters: the choice was made based on the high correlations emerging from the heat map (red areas) which provides a rough estimate of the points of interests. The new solution was then evaluated and key terms promoted or demoted according to relevance: for example terms such as “nurse” or “energy”
which are featured in a fairly high number of entries were demoted to the list of minor terms, but terms such as “CSI” or “approaches to learning” were promoted as more important as well as associated with their synonyms and spelling variations (see figure 2 for an example of the evaluation of two different solutions). After any change in the terms clustering is re-computed and data plotted again. The resulting solution (Figure 3) is a satisfactory and informative visualization of the literature on styles.

The core difference between the integrative reviews examined earlier and this approach is in the scope, breadth and depth of the analysis. In fact, the visualization of the literature allows us to put into evidence some intuitive patterns as well as unexpected ones. For example, in Fig 2 and 3 it is possible to pinpoint very accurately the correlations and the strength of the relations between clusters and the major terms in the pre-processed vocabulary. From the galaxy plots (proximity of terms) it is easy to confirm the overall intuitive split between cognitive and learning styles as well as the practical association of learning skills and strategies with education, e-learning and learning technology.

This, however, does not imply that the distinction is so clear-cut: in fact the visual inspection of the galaxy plot (Figure 4) and the respective frequencies shows that the use of the various terms is widely spread and the distribution of the conceptual labels defined in tables 1 and 2 is confirming the divide emerged from the Delphi study by Peterson et al. (2009). The concept of “cognitive style” seems to be more easily found in papers which examine aspects of cognition, abilities, perception, academic performance and specifically “individual differences” rather than “personality”. The term “learning style” is more easily found associated with education, student, personality and e-learning.

The flexibility afforded by the ability to query terms, concepts and topics is the most powerful tool for the researcher, but is quite difficult to render statically on paper. What makes the process most insightful is the actual interactivity of the visual representation and the images provided in the next few pages are able to capture snapshots, very much like photographs are only able to elicit the memory of an event which we witnessed.

Furthermore, the database was used to identify more effectively all existing published work on specific areas: i.e. individual differences and e-learning (1460 papers in the database), on data-mining related to styles (140 papers). The technique also uncovered patterns of relations highlighting the fact that most papers talking about e-learning are associated with learning strategies or learning styles.

The visualization of the galaxies of individual authors (Figure 5) identified similarities and overlapping topics between authors. Some authors, which in Desmedt & Valcke’s representation look far apart, in reality have explored conceptually similar grounds and are represented in clusters with very similar keywords.
Figure 1: Three modes to visualise an initial clustering solution with 152 groups.

On the left the topic distributions (similar topics are closer to each other). Below, in the heat map of the key terms (X axis) and clusters (Y axis). In red are the highest correlations which allow to identify about 25 interesting ‘spots’ used to refine the clustering. At the bottom a 3d representation of the galaxy with the strength of key terms (topicality) represented as peaks.
Figure 2: A direct comparison for two 22-clusters solutions after revisiting the importance of key terms: at the top the final solution (also characterised in the next page)

The middle group is highlighted in orange in a fairly compact cluster. At the bottom, the corresponding records in a previous iteration in which the terms “student”, “learn” and “educate” are separated across a number of clusters (also in orange)
Figure 3: A more detailed overview of the final solution with a 22-clusters solution. Topicality and heat map with related key terms is shown in both graphs.
Figure 4: Frequencies and topicality distribution of the key style labels summarised in Table 4.2 and their associated clusters (with major terms for each cluster). The pages icons show the centroids of the clusters.
Figure 5: Distribution of the publications associated with the various authors/theories. Use the matrix at page 135, fig 4.8 to individuate topics related to each cluster.

Note that in this page we also included reference to other popular models which will be examined in more details in the following chapters.
Table 4: Basic features and relations between the measures of styles selected for this research.

<table>
<thead>
<tr>
<th></th>
<th>ASSIST</th>
<th>VICS-WA</th>
<th>MSG</th>
<th>CSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of measure</td>
<td>Preference</td>
<td>Preference (RTs)</td>
<td>Preference</td>
<td>Preference</td>
</tr>
<tr>
<td>Type of instrument</td>
<td>Self-reported questionnaire</td>
<td>Computerised task</td>
<td>Self-reported questionnaire</td>
<td>Self-reported questionnaire</td>
</tr>
<tr>
<td>Degree of external validity</td>
<td>Some</td>
<td>Much</td>
<td>Some</td>
<td>Debated</td>
</tr>
<tr>
<td>Reliability (test-retest)</td>
<td>Some</td>
<td>Some</td>
<td>Much</td>
<td>Some/stable (factor structure issues)</td>
</tr>
<tr>
<td>Amount of research</td>
<td>Some</td>
<td>Much</td>
<td>Much</td>
<td>Some</td>
</tr>
</tbody>
</table>

Table 4 outlines their relations between each other and to theoretical grounds providing a complete picture justifying the choice made.

4. Picking styles measures and representing types.

The visual exploration of the literature, as well as the integrative reviews already mentioned, lead the researchers to identify four different instruments are used to characterise styles: ASSIST (Approaches to learning, Entwistle & McCune 2004), CSI (Cognitive Styles Inventory, Allinson & Hayes 1996), TSI (Thinking Styles Inventory and the mental self-government theory, Sternberg 1999) and VICS-WA (Verbal/Imager and Wholistic/Analytic Cognitive style, from Riding CSA, Peterson 2002). These were intentionally selected to provide a varied set of tools and a broad set of metrics.

The selection of appropriate styles measures was ultimately informed by five basic criteria:

- Well known, measures of styles with a strong theoretical background;
- Metrics which have been used in the literature in relation to both academic performance or e-learning;
- Styles spanning across the spectrum (from proximal to distal measures and from relatively stable to malleable)
- Styles tested using different methods (i.e. self-reported inventory to cognitive-like experiments)
- Metrics providing a ‘profile’ report which could be interesting for psychology students to find out more about themselves.

Table 4 outlines their relations between each other and to theoretical grounds providing a complete picture justifying the choice made.

4.1. Mining styles metrics.

The full details of the methodology and the sample is available elsewhere (Vigentini 2010). Data was collected over a period of 5 years and the metrics of styles, academic performance and online usage behaviour were collected for a large sample (over 1200, but subsets were smaller for each individual instrument). This provided some longitudinal data as well as multiple metrics for different participants.

One of the key problems, however, is the rapid growth of data points (i.e. scales and sub-scales) and how to make sense of so many metrics. To exemplify we will use two of the tools (VICS-WA and ASSIST) to demonstrate how a data-driven approach generates practically useful outcomes. Originally, the need for using clustering techniques was dictated by the fact that both Pearson and McCune and colleagues stressed the fact that the scores should not be used prescriptively as normative measures, nor adopted to typify people. Furthermore, we identified differences in our yearly samples, making it difficult to provide a simple representation of the styles and approaches without a more analytic study of the context. Statistical methods
tend to ‘flatten’ the within-sample variation, however, the question was whether styles, as measured by these tools, could be useful in practice as a tool to discriminate between different types of students.

The first example is provided by the VICS-WA and figure 6 shows the problem. On the left panel the ratio scores generated for the W/A and V/I (Wholistic/Analytic and Verbal/Imager) dimensions are plotted in the graph and most people are clustering in the middle. This means that traditional median cut or arbitrary allocations of scores into groups are not able to identify subtle differences in the composition of the sample.

Figure 6: Classification of cognitive styles using the V/I and W/A ratios. On the right the centroids of the clusters with frequencies (mean distance from centroids is ranging between .1 and .21)

A first attempt to provide a meaningful categorization was achieved running a two-steps cluster analysis on scores which resulted in 4 clusters (figure 6, right panel). The clustering takes both metrics and provides a grouping which turned out to produce significant differences in AP (academic performance) in the psychology courses despite the very small variation in the VICS-WA scores.

As a second example we present the scores of the ASSIST. This produces a set of 15 subscales which unlike the VICS-WA cannot be easily represented in a Cartesian plane with orthogonal axes. As in the case of the VICS-WA, we applied a two-steps cluster analysis on scores which resulted in the 6 clusters (table 7 provides details of the mean scores for each cluster). Then, we opted for a spider graph (Figure 7). This representation is useful to plot key differences in the magnitude of the difference between the types identified by the 6 clusters, some of which are quite stark.

Table 6: Average scores (standardised scales) for the three approaches to learning in the different clusters.
Figure 7: Characterisation of the means scores for the ASSIST subscales in the six clusters emerging from the data in our sample. The values represented are the means of the subscales for each cluster (table 6).
As it was the case for the VICS-WA, the 6 clusters produced significant differences in AP and online usage in our sample.

The two cases demonstrate the discriminatory power of data-driven types which emerge from the metrics of styles which are not apparent using statistical methods. The potential in practical applications is very promising and more research is needed to fine-tune the clustering techniques used as well as the replicability of the findings in other samples.

5. Conclusion

The data mining techniques applied provide a novel evaluation framework based on a rich profile of the learner, which in turn offers a valuable alternative to regression methods as a mean to interpret relations between styles metrics. Patterns, or types, emerging from styles proved to be valuable in discriminating differences in academic performance and were useful in this context to identify significant group differences in both online usage and academic performance. The relevance of individual differences for learning technology is apparent and two core applications should be explored in more details: customization of the learning experience and the personalization of the learning paths enhancing learning processes.

The understanding of the relations between e-learning usage, styles and academic performance has important practical implications to enhance students’ learning experience, in the automation of learning systems and to inform policymakers of the effects of learning technology has from a user and learner-centred approach to learning and studying.

The success of the application of data mining methods offers an excellent starting point to explore further a data-driven approach to evaluation, support informed design processes of e-learning and to deliver suitable interventions to ensure better learning outcomes and provide an efficient system for institutions and organization to maximise the impact of learning technology for teaching and training.

6. References

Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality, and interests: evidence for overlapping traits. Psychological Bulletin, 121(2), 219-245.


What Core Competencies Are Related to Teachers’ Innovative Teaching?

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Abstract

The purpose of this study is to investigate which core competencies are related to teachers’ innovative teaching performances. Based on the literature and discussions in the field, four competencies (learning competency, educational competency, social competency and technological competency) are theorized as core competencies for teachers’ innovative teaching. A questionnaire was developed and the validation of the instrument was tested. The psychometric properties of the instrument were reported. The findings confirmed that educational competency, social competency and technological competency were significantly related to teachers’ innovative teaching performances. The theoretical and practical implications are discussed.

Keywords: Core competency; Innovative teaching; Performance

1. Introduction

Teachers’ innovative teaching is a main source to nurture students’ innovation. Recent trends on innovative teaching have been focused on constructivist and social-constructivist learning theory and student-centred learning (Brandon, 2004). Instead of just listening to the lectures, students are now actively involved in the learning processes, and participate in the simulations and collaborate in real learning situations. The connection between learner-centred teaching and facilitating innovation and innovative thinking has been found (Daniel Fasko, 2000).

Despite the importance of teachers’ innovative teaching strategies and performance, little is known about the competencies underlying teachers’ innovative teaching. Some research points out that many teachers lack competencies for innovative teaching in general (Lin et al. 2009). Both the theoretical and the empirical base are not sufficiently developed to be able to define the core competencies for innovative teaching from the views of teachers.

1.1 Core competencies for innovative teaching

A general definition on competency is that the level of integration of knowledge, skills, and attitudes (Tigelaar et al., 2004). By reviewing related literature and integrating the main findings and results from previous research, we postulate that four core competencies are considered important to underline teachers’ innovative teaching: learning competency, social competency, educational competency and technological competency.

Learning competency

Research results indicate learning competency is very important for innovation (Mackinnon, 1978; Chen, 2002). Learning competency refers to that teachers are willing to learn for innovating teaching and improving the teaching effectiveness. And the most important is they know how to learn. They know how to solve teaching problems through study. They include teachers’ ability to critically reflect upon their educational
impact and value system, as well as a readiness to take the initiative and take responsibility for their professional development (Pantic & Wubbels, 2010).

**Social competency**

Social competency refers to that an innovative teacher should have the ability to communicate with students from different backgrounds (Koster et al., 2005). They also need to be able to build positive human relationships and be dedicated to the profession and their students (Pantic & Wubbels, 2010). They should have the ability to tolerate confusion and frustration, and not to give up prematurely (Claxton et al, 2006).

**Educational competency**

In order to make education more effective with the integration of every kind of elements, educational competencies of teachers are required (Sahin-Izmirli & Kurt, 2009). An innovative teacher is well aware of the innovative educational concepts and can guide students learning innovatively based on innovative teaching principles. They have the passion for the education career (Bi, 2003). And they should have a wealth of knowledge, and the ability of integrating them into the teaching practices effectively and to promote student development (Cowen, 2002).

**Technological competency**

Technological competency is crucial for successful innovative performance (Cohen & Levinthal, 1990). An innovative teacher is aware of how to integrate modern educational technology to enhance reasoning, provoke critical thinking, and deepen student understanding. It fits very well with modern instructional theories that focus on the performance of real-life tasks as the driving force for learning. In the current society, it is also critical for teachers to be able to find the desired information among the vast amount of information available on the internet, and to effectively use this information to solve teaching problems (Segers & Verhoeven, 2009).

### 1.2 Innovative teaching performance

Some of previous research describes performance features of innovative teachers related to various elements of the teaching process. More specifically, innovative teaching can be displayed in the following five aspects: application of innovative thoughts in teaching, the use of innovative teaching methods and teaching strategies, the innovative use of teaching content, the innovative use of teaching resources, and innovative evaluation (Chen, 2009).

**Application of innovative thoughts in teaching**

Application of innovative thoughts refers to the behaviour to take new perspectives on problems and be persistent to the exploration of new pathways to solve problems. Teachers who are amenable to change and who model divergent thinking themselves seem to be the most effective in stimulating innovation competency in students (Karnes et al., 1961). He or she integrates the trends of teaching and curriculum development into the teaching practice. In addition, they apply the new innovative learning theories, such as social-constructivist learning and student-centred learning in their actual teaching practices.

**The innovative use of teaching content**

The innovative use of teaching content refers to that the teacher adds, adapts, integrates, enriches and innovates on teaching content based on the needs of students and the learning tasks. In addition, materials in daily life can be incorporated into the course content innovatively to develop more suitable teaching content to the teaching context and student learning. Teachers design and transform their teaching in a flexible way based on the characteristics and requirements of the students rather than being restricted to the specific and pre-set content materials in the class.

**The use of innovative teaching methods and teaching strategies**

The use of innovative teaching methods and strategies refers to that the teacher utilizes a variety of teaching methods and strategies based on the needs of students and situations to activate students to think. The teacher breaks through the teaching inertia and uses cooperative learning, inquiry learning, and independent study to
help students think actively and construct knowledge by themselves through learning activities. Applying these innovative teaching strategies can enhance students’ innovative competency and improve their academic achievement (Feldhusen & Treffinger, 1980).

**The innovative use of teaching resources**

The teacher collects teaching resources from a variety of channels and uses them in the classroom properly to enhance students’ interests in learning, stimulate students to think innovatively and encourage divergent learning activities (Feldhusen & Treffinger, 1980). So the teacher provides teaching aids and equipments from a variety of types for learning.

**Innovative evaluation**

Innovative evaluation behavior refers to that the teacher uses multiple concepts and methods of evaluation to evaluate students. With regard to student evaluation, teachers should support and reinforce unusual ideas and responses of students, handle failure or mistakes in a positive manner to help students realize errors and meet acceptable standards in a supportive atmosphere. In addition, teachers allow time for students to think about, develop their innovative idea (Feldhusen & Treffinger, 1980) and give students’ opportunities to express themselves.

**Supportive teaching environment**

Although individual competencies are essential for innovative teaching, the mere presence of these competencies might not suffice. Innovation performances are stimulated by environment context (Sternberg & Lubart, 1991). A supportive organisational environment can contribute to teaching innovations by strengthening and encouraging the development of individual competencies. Bharadwaj (2000) also stresses that the organizational environment for innovation is established through providing correct methods, tools and resources to encourage innovative behavior. School environment factors such as leadership support and collegial relationship are important factors that influence teachers’ attitudes and implementation of educational innovations (Harris, 2002). Based on the theoretical and empirical evidence, we expect that a supportive and innovative school environment will be positively related to teachers’ innovative teaching behaviors.

**1.3 Objectives of this research**

The main objectives of this research are 1) to develop and test an instrument to examine teachers’ core competencies that are related to teachers’ innovative teaching, 2) to examine the contribution of these core competencies to the display of teachers’ innovative teaching performance, 3) to examine the relationship between factors of the school environment and teachers’ innovative teaching performance.

We hypothesize that the four core competencies mentioned above are critical for teachers’ innovative teaching, with higher scores of the four competencies predict better innovative teaching performance. The theoretical model of this research is present in Figure.1.

![Fig.1: Theoretical framework of this research](image)
2. Method

2.1. Participants

Participants of the study were 200 teachers from six secondary schools from Beijing, China. The teaching subjects of the teachers included mathematics, language, English, physics, chemistry, politics, geography, and biology. The nature and composition of the samples are presented in Table 1.

Table 1: Composition and background variables of sample teachers

<table>
<thead>
<tr>
<th>Characteristics /Categories</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>40.9</td>
</tr>
<tr>
<td>Female</td>
<td>59.1</td>
</tr>
<tr>
<td>Years of Teaching</td>
<td></td>
</tr>
<tr>
<td>0-5 years</td>
<td>54.8</td>
</tr>
<tr>
<td>6-10 years</td>
<td>15.8</td>
</tr>
<tr>
<td>11-15 years</td>
<td>7.9</td>
</tr>
<tr>
<td>16-20 years</td>
<td>9.0</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>12.4</td>
</tr>
<tr>
<td>Educational Level</td>
<td></td>
</tr>
<tr>
<td>Associate degree</td>
<td>9.7</td>
</tr>
<tr>
<td>Bachelor</td>
<td>68.8</td>
</tr>
<tr>
<td>Master</td>
<td>21.6</td>
</tr>
<tr>
<td>Teaching Subject</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>28.6</td>
</tr>
<tr>
<td>Language</td>
<td>24.7</td>
</tr>
<tr>
<td>English</td>
<td>17.6</td>
</tr>
<tr>
<td>Other</td>
<td>29.1</td>
</tr>
</tbody>
</table>

Note: Missing values are excluded in percentage calculations.

2.2 Development of the instrument

Process

Phase 1: Based on literature review and extensive discussions with experts in the field of education and teacher education, we developed an instrument Core Competencies for Innovative Teaching (CCIT) measuring teachers’ four core competencies from the dimensions of attitudes, knowledge, and skills and an instrument Innovative Teaching Performance (ITP) to measure teachers’ reported actual performance in innovative teaching. In addition, relevant school environment factors and teacher individual factors were measured. All items were self-compiled based on the understanding of the concepts and references from related literature (eg. Burt et al., 2008; Lin, 2008). Phase 2: Consultations were conducted with 10 teachers and educational researchers. Phase 3: A small-scale pilot test was conducted to check the understanding of the instrument. Phase 4: The validation study was conducted to test the reliability and validity of the instrument.

Measures

Four parts of questions were included in the instrument. All respondents were asked to complete these four parts of questions. The Likert-type scale was used to collect responses of teachers to the items.

The first part measures teacher’s four core competencies. The amount of items and sample items of the scales are presented in Table 2.
Table 2: Sample items of CCIT

<table>
<thead>
<tr>
<th>Competencies (No. of Items)</th>
<th>Scales</th>
<th>Sample Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Competency (15)</td>
<td>Attitude</td>
<td>I actively learn new things related to new teaching concepts, new methods, etc.</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>As a teacher, I know how to learn to improve my teaching.</td>
</tr>
<tr>
<td></td>
<td>Skill</td>
<td>I am capable of learning independently.</td>
</tr>
<tr>
<td>Social Competency (15)</td>
<td>Attitude</td>
<td>I am willing to share teaching problems with others.</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>I have the knowledge on how to cooperate with others.</td>
</tr>
<tr>
<td></td>
<td>Skill</td>
<td>I am capable of maintaining a dynamic interaction with my students.</td>
</tr>
<tr>
<td>Technological Competency (14)</td>
<td>Attitude</td>
<td>I am willing to integrate modern multimedia technology into the teaching practice.</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>I know the recent development of teaching technology.</td>
</tr>
<tr>
<td></td>
<td>Skill</td>
<td>I am proficient in using modern multimedia teaching technologies.</td>
</tr>
<tr>
<td>Educational Competency (16)</td>
<td>Attitude</td>
<td>I am willing to spend more time on teaching issues.</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>I have sufficient knowledge about the subjects that I teach.</td>
</tr>
<tr>
<td></td>
<td>Skill</td>
<td>I am capable of mobilizing students’ learning enthusiasm and interests in the class.</td>
</tr>
</tbody>
</table>

The second part includes the performances of innovative teaching in five educational aspects. Each item referred to teacher performance exhibited in the daily teaching activities. The amount of items and sample items are presented in Table 3.

Table 3: Sample items of ITP

<table>
<thead>
<tr>
<th>Innovative Teaching Performance (No. of Items)</th>
<th>Sample Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application of Innovative Thoughts in Teaching (4)</td>
<td>I solve teaching problems from divergent thinking and do not limit myself to fixed and existing models.</td>
</tr>
<tr>
<td>Teaching Methods and Teaching Strategies Innovation (7)</td>
<td>In my class, I organize learning activities that are based on students’ inquiry and exploration of solutions.</td>
</tr>
<tr>
<td>Teaching Content Innovation (6)</td>
<td>I adjust teaching content according to the learning tasks in my class and do not restrict to the pre-set teaching content.</td>
</tr>
<tr>
<td>Teaching Resource Innovation (7)</td>
<td>In my class, I use various resources to stimulate students’ innovative thinking.</td>
</tr>
<tr>
<td>Evaluation Innovation (5)</td>
<td>I use open questions in order to evaluate my students’ progress in this course.</td>
</tr>
</tbody>
</table>

The third part inquires about relevant school factors, including leadership support (5 items), colleague support (7 items), and school material and administrative support (8 items).

In the fourth part, demographic factors were measured. It included teaching subject, teaching grade, gender, educational level and years of teaching.

Data analyses

To test the relationship between teachers’ core competencies, school environment and teacher background factors and the displayed performance of teachers’ innovative teaching, hierarchical regression analyses were conducted.
3. Results

3.1 Validity and reliability analysis

Validity

As for the Exploratory Factor Analyses, following a discriminate effect of the items, items scoring lower than 0.30 on all factors were removed. As a result, one item originally included in the Technology Competency Scale and one item included in the Social Competency Scale were deleted. These two items were not included in further analysis. In addition, one item which was previously included in the Social Competency Scale loaded much higher on the Learning Competency, and was therefore moved to the Learning Competency Scale. For the Learning Competency, the factor loadings of the 16 items ranged from 0.410 to 0.712. For the Educational Competency, the factor loadings of the 16 items ranged from 0.512 to 0.752. For the Social Competency, the factor loadings of the 13 items ranged from 0.379 to 0.752. For the Technological Competency, the factor loadings of the 13 items ranged from 0.482 to 0.766.

In the next stage, Confirmatory factor analyses (CFA) were conducted for each scale of the core competency for innovative teaching. Base on the standardized regression weights, one item in “the attitude of learning competency sub-scale” was a too low and was eliminated. As a result, 57 items of the core competency scales remained. Table 4 presents the final model fit data of each scale. The three factor model (attitude, knowledge and skill) for each competency fitted the data reasonably well, with the group invariance fit statistics in acceptance range. With a satisfactory validation of each competency scale, confirmatory factor analysis was conducted for the whole model with the four core competencies. The CFA results show that the fit of the whole model of the four competencies for innovative teaching was also acceptable ($\chi^2$/df <3; GFI>0.90; CFI>0.90; RMSEA<0.07).

<table>
<thead>
<tr>
<th>Competencies (N of Items)</th>
<th>$\chi^2$/df</th>
<th>GFI</th>
<th>CFI</th>
<th>RMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Competency (15)</td>
<td>1.669</td>
<td>0.904</td>
<td>0.938</td>
<td>0.061</td>
</tr>
<tr>
<td>Educational Competency (16)</td>
<td>1.674</td>
<td>0.895</td>
<td>0.961</td>
<td>0.062</td>
</tr>
<tr>
<td>Social Competency (13)</td>
<td>1.953</td>
<td>0.911</td>
<td>0.945</td>
<td>0.073</td>
</tr>
<tr>
<td>Technological Competency (13)</td>
<td>2.032</td>
<td>0.909</td>
<td>0.938</td>
<td>0.076</td>
</tr>
<tr>
<td>Model four core competencies</td>
<td>1.762</td>
<td>0.931</td>
<td>0.979</td>
<td>0.065</td>
</tr>
</tbody>
</table>

Reliability

Reliability of each scale was analyzed using Cronbach’s alpha coefficients (see table 5). The reliabilities of the four core competencies were all greater than 0.80 and regarded as very good. The alpha coefficients for the scales of innovative teaching performance were greater than 0.70, which were regarded as adequate. The reliability of the school environment factors were acceptable with coefficients greater than 0.65.

3.2 Means, standard deviations, correlation and regression analysis

Table 5 presents the means, standard deviations of the study variables. The correlation analyses show that all four core competencies were significantly correlated to the five innovative teaching performance scales, as well as the overall mean score of the innovative teaching performance (Table 5). Among the teacher background and school environment variables, the results revealed that years of teaching and colleague support were significantly positively related to the five scales of innovative teaching performance, including the overall performance score. This implies that teachers who had more years of teaching showed somewhat higher innovative teaching performance and teachers who got more support from colleagues also showed somewhat higher innovative teaching performance. Therefore, in the following regression analyses, the core competencies, years of teaching and colleague support were included as independent variables, and the innovative teaching performance as dependent variables. The other demographic characteristics and school environment factors were not significantly related to innovative teaching performance and therefore were not included in the regression analyses. In this regression model, the independent variables explained 63 percent of the variances in the whole innovative teaching performance, which was highly significant ($F$=51.08, $p < .001$).
Table 5: Means, standard deviations and reliability coefficients of the scales

<table>
<thead>
<tr>
<th>Scale</th>
<th>Sub-scale</th>
<th>N of Items</th>
<th>M</th>
<th>SD</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Competency</td>
<td>Learning Competency</td>
<td>15</td>
<td>5.10</td>
<td>0.57</td>
<td>0.867</td>
</tr>
<tr>
<td></td>
<td>Educational Competency</td>
<td>16</td>
<td>4.50</td>
<td>0.63</td>
<td>0.936</td>
</tr>
<tr>
<td></td>
<td>Social Competency</td>
<td>13</td>
<td>5.07</td>
<td>0.61</td>
<td>0.910</td>
</tr>
<tr>
<td></td>
<td>Technological Competency</td>
<td>13</td>
<td>4.82</td>
<td>0.70</td>
<td>0.897</td>
</tr>
<tr>
<td>Innovative Teaching Performance</td>
<td>Application of Innovative Thought</td>
<td>4</td>
<td>3.97</td>
<td>0.62</td>
<td>0.766</td>
</tr>
<tr>
<td></td>
<td>Teaching Methods and Teaching Strategies Innovation</td>
<td>7</td>
<td>3.89</td>
<td>0.61</td>
<td>0.843</td>
</tr>
<tr>
<td></td>
<td>Teaching Content Innovation</td>
<td>6</td>
<td>3.94</td>
<td>0.54</td>
<td>0.834</td>
</tr>
<tr>
<td></td>
<td>Teaching Resources Innovation</td>
<td>7</td>
<td>3.83</td>
<td>0.67</td>
<td>0.864</td>
</tr>
<tr>
<td></td>
<td>Evaluation innovation</td>
<td>5</td>
<td>3.93</td>
<td>0.59</td>
<td>0.761</td>
</tr>
<tr>
<td>School Environment Factors</td>
<td>Leadership Support</td>
<td>5</td>
<td>4.11</td>
<td>0.89</td>
<td>0.655</td>
</tr>
<tr>
<td></td>
<td>School Material and Administrative Support</td>
<td>8</td>
<td>4.26</td>
<td>1.12</td>
<td>0.821</td>
</tr>
<tr>
<td></td>
<td>Colleague Support</td>
<td>7</td>
<td>4.64</td>
<td>0.86</td>
<td>0.900</td>
</tr>
</tbody>
</table>

Table 6: Pearson’s Correlation between variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>TT</th>
<th>TM</th>
<th>TC</th>
<th>TR</th>
<th>TE</th>
<th>SUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Competency</td>
<td>0.52**</td>
<td>0.42**</td>
<td>0.44**</td>
<td>0.40**</td>
<td>0.52**</td>
<td>0.49**</td>
</tr>
<tr>
<td>Educational Competency</td>
<td>0.73**</td>
<td>0.67**</td>
<td>0.72**</td>
<td>0.62**</td>
<td>0.74**</td>
<td>0.75**</td>
</tr>
<tr>
<td>Social Competency</td>
<td>0.69**</td>
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<td>0.62**</td>
<td>0.57**</td>
<td>0.52**</td>
<td>0.67**</td>
</tr>
<tr>
<td>Technological Competency</td>
<td>0.56**</td>
<td>0.59**</td>
<td>0.51**</td>
<td>0.61**</td>
<td>0.53**</td>
<td>0.62**</td>
</tr>
<tr>
<td>Years of Teaching</td>
<td>0.16*</td>
<td>0.18*</td>
<td>0.18*</td>
<td>0.20**</td>
<td>0.21**</td>
<td>0.21**</td>
</tr>
<tr>
<td>Colleague Support</td>
<td>0.51**</td>
<td>0.51**</td>
<td>0.44**</td>
<td>0.52**</td>
<td>0.42**</td>
<td>0.53**</td>
</tr>
</tbody>
</table>

Note: *p < .05; **p < .01; ***p < .001. TT= Application of innovative thoughts; TM= Teaching methods and teaching strategies innovation; TC= Teaching content innovation; TR= Teaching resources innovation; TE= Evaluation innovation; SUM=overall mean of innovative teaching performance.

The hierarchical regression analysis results are presented in Table 7. Three regression models were analyzed. In Model 1, the four core competencies were considered as predictors. In Model 2, the four core competencies and teacher background variables were considered as predictors. In Model 3, the four core competencies, teacher background variables and school environment factors were considered as predictors. The results show that Educational Competency was strongly related to the five aspects of teachers’ innovative teaching performances. This implies that teachers showed more innovative teaching behaviors when they had innovative educational beliefs, a wealth of knowledge. Social Competency showed a positive significant relationship with “Application of innovative thoughts”. It indicates that teachers were more inclined to take new perspectives on problems and apply persistence to the exploration of new pathways to solve problems in teaching when they had a good communication skill as well as the persistence in solving teaching problems. Additionally, Technological Competency was significantly related to four aspects of innovative teaching performance in Model 1, and three aspects of innovative teaching performance in Model 2. In Model 3, Technological Competency was significantly related to “Teaching methods and teaching strategies innovation” and “Teaching resources innovation”. This indicates that teachers who were technologically competent were more capable to find the desired information, use this information effectively to solve teaching problems, and apply educational technology in teaching practices would have better innovative performance in innovating teaching methods and strategies. Although among the teacher background
variables, years of teaching was significantly related to the innovative teaching, when considering all the factors together in Model 2 and 3, it did not have a significant contribution to the innovative teaching performance. With regard to colleague support, it was significantly related to “Application of innovative thoughts”, “Teaching methods and teaching strategies innovation”, “Teaching resources innovation”. This implies that when teachers got more support from colleagues, they could be more inclined to have innovative thoughts, teaching methods and strategies, and use of resources. Although Learning Competency was significantly correlated with the innovative teaching behaviours (see Table 6), in the regression models, it was not a significant predictor for the innovative teaching performance. The results show that Social Competency, Educational Competency, Technological Competency and colleague support were significant predictors for the overall innovative teaching performance. Furthermore, the hierarchical regression analysis models show that Model 3 had the most contribution to the innovative teaching performance of teachers ($R^2$adjusted from .51 to .63). However, considering the small differences of contributions between Model 1 and Model 3, we can well conclude that the four core competencies had a great contribution to teachers’ innovative teaching performance ($R^2$adjusted from .47 to .61).

Table 7: Hierarchical regression analysis on innovative teaching performances

<table>
<thead>
<tr>
<th></th>
<th>TT</th>
<th>TM</th>
<th>TC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M1</td>
<td>M2</td>
<td>M3</td>
</tr>
<tr>
<td>β</td>
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<tr>
<td>Learning</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.01</td>
</tr>
<tr>
<td>Competency</td>
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<tr>
<td>Educational</td>
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<td>0.37***</td>
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<td>Social</td>
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<td>0.15*</td>
<td>0.09</td>
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</tr>
<tr>
<td>Years of</td>
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<td>-0.00</td>
<td>0.07</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colleague</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R^2_adjusted</td>
<td>0.56</td>
<td>0.56</td>
<td>0.59</td>
</tr>
<tr>
<td>F</td>
<td>65.89***</td>
<td>46.07***</td>
<td>42.39***</td>
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</table>

Table 7: continued

<table>
<thead>
<tr>
<th></th>
<th>TR</th>
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<th>SUM</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>β</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning</td>
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<td>-0.05</td>
<td>-0.06</td>
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<td>Competency</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>0.31***</td>
<td>0.23*</td>
</tr>
<tr>
<td>Competency</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Social</td>
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<tr>
<td>Colleague</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R^2_adjusted</td>
<td>0.47</td>
<td>0.48</td>
<td>0.51</td>
</tr>
<tr>
<td>F</td>
<td>39.93***</td>
<td>32.96***</td>
<td>31.44***</td>
</tr>
</tbody>
</table>
4. Discussion

The findings support our research model to a large extent, showing that three of the four core competencies identified in the theoretical model were significant predictors for teachers’ innovative teaching performance. Especially educational competency and technology competency were strongly related to innovative teaching performance.

The findings indicate that educational competency is one of the key competencies that are necessary for innovative teaching. This is in line with the argument that new educational beliefs, subject knowledge and comprehensive and new educational knowledge are critical for innovative teaching (Jin, 2008). A deep understanding and knowledge base of the discipline should be emphasized for innovation (Sternberg, 1997). The present study provides empirical evidence about the core competencies for innovative teaching, which can contribute to the literature of teacher education and teacher professional development.

Teachers’ technological competency contributed to the prediction of “Teaching methods and teaching strategies innovation” and “Teaching resources innovation”. Several studies have shown that the term ‘innovation’ is mainly associated with change in practice using educational technology (Hannon, 2008). Teachers with high technological competency can effectively find the desired information, teaching resource in the current technologically advanced society and solve problems. Modern educational technology can also help the teachers achieve many new teaching methods and strategies.

Social competency showed a positive and significant relationship with “Application of innovative thought”. The innovative inspiration and passion is activated during communication. Multi-cultural thinking, teaching ideas and some innovative elements in teaching processes are learned during communication and exchange. Teachers who are more capable of social communication and have the courage to face challenges tend to have better performance in applying the innovative thoughts in teaching practices. Therefore, supporting teachers to work in teams, sharing knowledge and insights can be conducive for teachers’ development of innovative teaching.

In addition to the importance of teachers’ core competencies, this study also shows the importance of a supportive school environment, especially the support from colleagues. Teachers could be encouraged to engage in innovative teaching behaviors more when they perceived an environment that stimulated and supported this behavior from colleagues. This direct effect was uniform for all teachers, independent of their competencies. Therefore, the construction of a supportive organization culture is very important for schools to encourage innovative teaching behaviors.

Although previous research suggests that learning competency is very important for innovation (Mackinnon, 1978; Chen, 2002), the current results indicate that Learning Competency was not a significant predictor for innovative teaching performance. This seems to be not consistent with previous argument that teachers’ willingness to learn is a crucial factor for implementing educational innovations (Konings et al, 2007). It might be possible that although teachers’ willingness and capability to learn is very important, the time they could actually be able to invest in learning and whether the school and external environment could be supportive for their learning could have played a role in their actual performance in innovative teaching.

The validated four-factor model of core competencies for innovating teaching can be used as an important framework for future research in this filed. The tested model can provide a sound basis for future studies and add to theories and models of educational innovations. The results can also provide insights for teacher professional development and can help schools with their efforts to enhance the innovative teaching of teachers.

A couple of limitations need to be noted for the study. First, the sample size was relatively small in this study. A larger sample size with a greater number of participants per group will give opportunity to measure the stability of the instrument. Secondly, the variables were measured only with one method and only from the teachers’ perspectives and self-reported results. In future research, other research methods such as qualitative method and evaluation by other actors (colleague-evaluation, student-evaluation and school leaders) can be used to study the importance of key competencies and the display of innovative teaching performance in an objective and deep manner. In-depth studies using qualitative research methods (interview and observation) can further confirm or extend our understanding about the core competencies for innovative teaching and provide deeper insights about the possible predictors for teachers’ innovative teaching performance regarding teachers’ individual variables and the school environment factors. In addition, Cross-validation of the instrument in different countries or cultures would also be an essential next step.
In conclusion, this study has contributed to the theoretical construction of a competency-based approach for teachers’ innovative behavior in teaching. The study also proves that an empirical investigation approach to teaching innovation is a valuable way to understand the real situation and perspectives about innovative teaching and learning of teachers in schools. The identified four core competencies provide a sound basis for future studies and can offer some guidelines for schools with their efforts to develop and enhance teachers’ relevant competencies and foster their innovative teaching in practices. Based on the competencies that were found to be related to innovative teaching performance, teachers can be stimulated, trained, evaluated, and possibly rewarded by their advancement in some of the core competencies.

5. References

Cowen, R. (2002), “ Socrates was right? Teacher education systems and the state In T. Elwyn (Ed.)”, *Teacher education: Dilemmas and prospects*, 3-12.


Prospective Teachers’ Cognitive Style and Ability in Geometry Tasks of Axial Reflection

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Demetra PITTA-PANTAZI (University of Cyprus, Cyprus) – dpitta@ucy.ac.cy

Abstract

This study aimed to explore prospective teachers’ cognitive style and its relation to the ability in solving transformation geometry tasks of axial reflection. Cognitive style was measured based on the object-spatial-verbal model proposed by Blazhenkova and Kozhevnikov (2009). Our objectives were to investigate whether prospective teachers’ cognitive style is related to ability in axial reflection tasks and if so, which of the three dimensions predict performance. Thirty-nine prospective primary teachers in their third year of studies were given the following instruments: a) a Greek translation of the self-report Object-Spatial Imagery and Verbal Questionnaire (Blazhenkova and Kozhevnikov, 2009), to assess cognitive style. The questionnaire includes three scales assessing the object imagery, spatial imagery and verbal cognitive styles. Each scale consists of 15 self-rating statements. The object, spatial and verbal ratings were averaged to create corresponding scores, and b) a geometry test, which was developed for the study, to assess ability in axial reflection. It was designed based on the hierarchical levels of the van-Hiele (1986) model of geometrical understanding development and it included four types of tasks: 1) drawing the axis between a given pre-image and its image, 2) drawing the image of a given pre-image, 3) finding the coordinates of a shape’s point when reflected and 4) informal proving of a theorem based on the properties of reflection. The scores were calculated for each type of task and for overall ability. The prospective teachers’ group had a significantly higher object score, and a significantly lower spatial score. Spatial score was positively correlated to the tasks of a) drawing the image of a given pre-image, b) finding the coordinates of a shape’s point when reflected and c) informal proving of a theorem based on reflection properties and, d) to overall ability (p<0.05). Drawing the axis between a given pre-image and its image was the only task that did not significantly correlate to the spatial score, however it was negatively correlated to the verbal score (p<0.05). Stepwise regression analyses with spatial, object and verbal scores as depended variables, confirmed that overall ability in the axial reflections test can be predicted by spatial score (p<0.05). Our results about the relationship between the object and verbal cognitive styles and ability in axial reflection, a geometric concept taught in primary grades, raise questions concerning some prospective teachers’ ability to understand and moreover to teach this concept.

Keywords: cognitive style, object, spatial, prospective teachers, axial reflection

1. Introduction

During the last decade, there seems to be some growing emphasis on transformation geometry in the area of mathematics education (Hollebrands, 2003; Naidoo, 2010; Portnoy, Grundmeier & Graham, 2006; Poswolsky, 2006; Yanik & Flores, 2009). Some of the main reasons are, first, that it is considered important in supporting children’s development of geometric and spatial thinking (Hollebrands, 2003) and second, that it is related to a variety of activities in academic and every-day life, such as geometrical constructions, art, architecture, carpentry, electronics, mechanics, clothing design, geography and navigation (Boulter & Kirby, 1994). Transformation geometry is the kind of geometry that refers to the mental or physical transformation of shapes. The most common types of geometric transformations in literature and in elementary education textbooks are translation, axial reflection and point rotation. This paper focuses on a specific type of geometric transformation, namely axial reflection.

Performance in geometric transformations in general has been previously connected to the holistic-analytic types of processing (Boulter & Kirby, 1994) and visual-analytic strategies (Naidoo, 2010). It has also been connected to spatial ability (Dixon, 1995; Kirby & Boulter, 1999). There are studies focusing specifically on axial reflection and its relation to spatial abilities (Xistouri & Pitta-Pantazi, 2006). However, despite this rather obvious relation between transformation geometry and visual imagery, and its connection to spatial abilities in literature, we have not come across any studies that examine abilities in any of the geometric
transformations and their relation to the visual-verbal cognitive style proposed by Paivio (1971). This study aspires to examine the relation between ability in axial reflection tasks and a new three-dimensional cognitive style model proposed by Blazhenkova and Kozhevnikov (2009) that distinguishes between Object Imagery, Spatial Imagery and Verbal dimensions. Specifically, the aim of the paper is to investigate the relationship between prospective primary teachers’ cognitive style and their ability in transformation geometry tasks of axial reflection.

2. Literature review

2.1. Mathematics education and cognitive styles

The construct of cognitive style has been widely researched in psychology (for a review, see Rayner & Riding, 1997). It can be defined as “an individual’s characteristic and consistent approach to organising and processing information” (Tennant, cited in Riding, 1997). Although there appear to be various conceptualisations of cognitive styles (for a classification, see Sternberg & Grigorenko, 1997), most of the researchers agree that cognitive style is a construct which is relatively stable over domain and time.

In the field of mathematics education, the verbaliser/imager distinction was the one that attracted most attention. However, it needs to be noted that this distinction was not referred to as “cognitive style” but as preferred type/mode of thinking, or type of students (Krutetskii, 1976; Lean & Clements, 1981; Presmeg, 1986a, 1986b). The broad idea documented by a number of researchers was that visual-spatial processes are distinct from verbal processes and that mathematics involves not only verbal processes but also visual reasoning (Presmeg, 1986a; Sfard, 1991).

Nevertheless, the results of the relationship between visualisation and mathematical performance are unclear (Pitta-Pantazi & Christou, 2009). Some studies found that visual–spatial memory is an important factor which explains the mathematical performance of students (Battista & Clements, 1998), while other studies showed that students classified as visualizers do not tend to be among the most successful performers in mathematics (Presmeg, 1986a). Axial reflection, although has not yet been linked to the verbalizers/visualizers distinction, it has often been connected to high spatial abilities (Dixon, 1995; Xistouri & Pitta-Pantazi, 2006).

Recently, Blazhenkova and Kozhevnikov (2009) suggested that there exist two distinct imagery subsystems that help individuals’ process visual information in different ways. Specifically, they suggest that there is an object imagery system and a spatial imagery system. The object imagery system processes the “visual appearance of objects and scenes in terms of their shape, colour information and texture”, while the spatial imagery system processes “object location, movement, spatial relationships and transformations and other spatial attributes of processing” (p. 1475). Thus, recent research identified two distinct types of visualizers. Object visualizers who use imagery to construct images of objects and process visual information globally and holistically as whole perceptual objects and spatial visualizers who use imagery to represent spatial relations, make complex spatial transformations and process visual images analytically and sequentially, part-by-part (Kozhevnikov, Kosslyn & Shephard, 2005). Rosenberg (1987) and Kozhevnikov, et al. (2005) also found that object imagery can be beneficial for visual art tasks, whereas Kozhevnikov, Hegarty & Mayer (2002) found that spatial imagery can be beneficial for physics, mechanical engineering tasks, technical drawing and mathematics.

2.2. Transformation geometry and axial reflection

There has been a growing emphasis on teaching transformation geometry in the last few decades (Yanik & Flores, 2009). Studies on transformation geometry have shown that pre-service elementary school teachers have a lack of understanding in the concepts of transformations including translations, reflections, rotations and compositions of transformations (Edwards & Zazkis, 1993; Harper, 2002; Law, 1991; Thaqi, Gimenez & Rosich, 2011). Although past research focused on describing difficulties in the understanding of geometric transformations, and with emphasis on prospective teachers’ difficulties specifically, few studies have attempted to examine these difficulties from the scope of individuals’ different types of information processing.

Such studies view these differences in the sense of strategies applied when solving a task. Moreover, they have related them to performance in geometric transformation tasks. For instance, Boulter & Kirby (1994)
analyzed elementary school students’ strategies based on the holistic/analytic distinction, when solving geometric transformation tasks, including reflections. Students’ strategies were classified as holistic when the task was solved with the visualization of the whole shape as an entity and as analytic when the shape was visually fragmented and transformed piece by piece. The results of this study indicated that some students showed preference for either the holistic or analytic processing, and that use of analytic strategies was associated with success. On the contrary, a recent study by Naidoo (2010) suggests that learners who have a visual (versus analytic) understanding could be better in understanding the effects of transformations on whole figures, rather than focusing on isolated points.

Nevertheless, it seems that it is not clear in the literature which type of processing, visual or analytic, can lead to better understanding and performance in geometric transformations, such as axial reflection. Since there are indications that spatial ability is positively related to performance in geometric transformations generally (Dixon, 1995; Kirby & Boulter, 1999) and in axial reflection specifically (Xistouri & Pitta, 2006), we believe that the cognitive style model proposed by Blazhenkova & Kozhevnikov (2009) which distinguishes between two types of visualizers, object and spatial, can lead to a better understanding about the relation between different types of processing information and ability in a geometric transformation, namely axial reflection. Our hypothesis is that performance in axial reflection will relate more to the spatial imagery style.

3. Methodology

3.1. Participants

The participants were thirty-nine prospective primary teachers in their third year of studies. The participants had already followed the “Foundations and Fundamental Concepts of Mathematics” course in their first year of studies and were just finishing their “Teaching of Mathematics” university semester course. The topic of teaching and learning all geometric transformations, including axial reflection, was part of the syllabus of this course.

3.2. Procedure and materials

All the participants were administered a self-report questionnaire to assess their cognitive style and a geometry test to measure their ability to solve transformation geometry tasks of axial reflection.

The self-report questionnaire was the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ), developed by Blazhenkova and Kozhevnikov (2009). It was translated in Greek for the needs of this study. The OSIVQ is used to assess individual differences in spatial imagery, object imagery and verbal cognitive style. The prospective teachers were asked to read 45 statements and rate each item on a 5-point Likert scale with 1 indicating total disagreement and 5 total agreement. Ratings 2 to 4 indicated intermediate degrees of agreement/disagreement. Fifteen of the items measured object imagery preference and experiences, fifteen items measured spatial imagery preference and experiences and fifteen items measured verbal preference and experiences. These items addressed qualitative characteristics of the images (My images are colourful and bright), preferences to specific types of visual images or verbal thinking (When remembering a scene, I use verbal descriptions rather than mental pictures), habitual and learning preferences (I usually do not try to visualize or sketch diagrams when reading a textbook), professional preferences (If I were asked to choose among engineering professions or visual arts I would choose visual arts) and individuals’ estimations of their abilities in using spatial or object imagery or verbal processing (My verbal skills are excellent) (Blazhenkova & Kozhevnikov, 2009).

The prospective teachers were given this questionnaire at home and were asked to complete it in their own time and return it within a week. For each participant, the fifteen item ratings for each factor were averaged to create object imagery, spatial imagery and verbal scale scores.

The geometry test, which was developed for the needs of this study, aimed to assess the prospective teachers’ ability in transformation geometry tasks of axial reflection. The test was designed based on the hierarchical levels of the van-Hiele (1986) model of geometrical understanding development. It included the following four types of tasks: 1) drawing the axis between a given pre-image and its image (20 sub-tasks), 2) drawing the image of a given pre-image (28 sub-tasks), 3) finding the coordinates of a shape’s point when reflected (1 task) and 4) informal proving of a theorem based on reflection properties (1 task). Examples of the tasks are given in Table 1.
Table 1: Types of axial reflection tasks and examples

<table>
<thead>
<tr>
<th>Type of task</th>
<th>Example tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Drawing the axis between a given pre-image and its image</td>
<td>Draw the line of reflection for each pair of images.</td>
</tr>
<tr>
<td>2. Drawing the image of a given pre-image</td>
<td>Draw the image of each shape after reflection over the given line of reflection.</td>
</tr>
<tr>
<td>3. Finding the coordinates of a shape’s point when reflected</td>
<td>Find the coordinates for the new position of point A (2, 5) when the quadrilateral ABCD reflects over the horizontal axis of x.</td>
</tr>
<tr>
<td>4. Informal proving of a theorem based on reflection properties</td>
<td>When John tried to find the reflection of letter A in a vertical line of symmetry, he observed that the image looks exactly the same as the pre-image. He then observed that the same happens for some other letters and shapes. Can you explain when and why a shape looks exactly the same after reflection?</td>
</tr>
</tbody>
</table>

The geometry test, which was developed for the needs of this study, aimed to assess the prospective teachers’ ability in transformation geometry tasks of axial reflection. The test was designed based on the hierarchical levels of the van-Hiele (1986) model of geometrical understanding development. It included the following four types of tasks: 1) drawing the axis between a given pre-image and its image (20 sub-tasks), 2) drawing the image of a given pre-image (28 sub-tasks), 3) finding the coordinates of a shape’s point when reflected (1 task) and 4) informal proving of a theorem based on reflection properties (1 task). Examples of the tasks are given in Table 1.

The prospective teachers were administered this test during one of their mathematics education sessions. They were given approximately thirty minutes to complete the tasks. The coding for the geometry test was 0 for each incorrect response and 1 for each correct response. The scores were calculated for each type of task and for overall ability.

4. Results

The aim of this study was to explore prospective teachers’ cognitive style and its relation to the ability in solving geometry tasks of axial reflection. Cognitive style was measured based on the object-spatial-verbal model proposed by Blazhenkova & Kozhevnikov (2009). The OSIVQ questionnaire developed by Blazhenkova & Kozhevnikov (2009) was translated in Greek and was administered to thirty-nine prospective teachers.
Since this study used a translation of the original version of the OSIVQ, we considered it important at first to confirm the internal reliability of the Greek translated version of the questionnaire. For this purpose, the Cronbach’s α coefficient of each scale and of the overall questionnaire were calculated. For the spatial scale Cronbach’s α was 0.80, for the object scale Cronbach’s α was 0.81 and for the verbal scale Cronbach’s α was 0.81. According to Nunnaly (1978), values of α above 0.7 are acceptable. Moreover, these values are almost equal to the corresponding values found by Blazhenkova & Kozhevnikov (2009).

Table 2: Minimum, maximum, means and standard deviations for spatial, object and verbal score

<table>
<thead>
<tr>
<th>Cognitive style scale</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial scale score</td>
<td>1.93</td>
<td>4.20</td>
<td>3.07</td>
<td>.59</td>
</tr>
<tr>
<td>Object scale score</td>
<td>3.00</td>
<td>5.00</td>
<td>3.90</td>
<td>.50</td>
</tr>
<tr>
<td>Verbal scale score</td>
<td>2.47</td>
<td>4.73</td>
<td>3.49</td>
<td>.56</td>
</tr>
</tbody>
</table>

Table 2 presents the prospective teachers’ minimum and maximum values, means and standard deviations in the three scales of the questionnaire. The values suggest that the prospective teachers’ group had a significantly higher object score \((t=3.72, p<0.01\) compared to verbal), and a significantly lower spatial score \((t=-2.84, p<0.01\) compared to verbal, \(t=-5.91, p<0.01\) compared to object). This may mean that prospective teachers tend to be more object imagery thinkers, although they come from a field of studies that is mostly considered as a social science, and our expectation was that their highest rate score would be in the verbal scale. However, Blazhenkova and Kozhevnikov (2009) mention that it is common for people to rate theirselves higher on the object scale.

Our first objective was to investigate whether prospective teachers’ cognitive style is related to ability in axial reflection tasks. Bivariate correlation analyses were performed between spatial, object and verbal scores and prospective teachers’ scores in the four types of tasks, as well as their overall ability score in the test. Table 3 presents the Pearson’s correlation coefficients between these variables.

Table 3: Pearson’s correlation coefficients between variables

<table>
<thead>
<tr>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
<th>Task 4</th>
<th>Overall ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial scale score</td>
<td>.135</td>
<td>.367*</td>
<td>.323*</td>
<td>.384*</td>
</tr>
<tr>
<td>Object scale score</td>
<td>.127</td>
<td>.157</td>
<td>.019</td>
<td>-.175</td>
</tr>
<tr>
<td>Verbal scale score</td>
<td>-.404*</td>
<td>-.197</td>
<td>-.210</td>
<td>-.121</td>
</tr>
</tbody>
</table>

(*) \(p<0.05\).

As can be seen in Table 3, the spatial scale score was the only cognitive style scale score that was positively related to the axial reflection tasks at a level of significance \(p=0.05\). Specifically, the spatial score was positively correlated to the tasks of Type 2: drawing the image of a given pre-image \((r=.367, p<0.05)\), Type 3: finding the coordinates of a shape’s point when reflected \((r=.323, p<0.05)\) and Type 4: informal proving of a theorem based on reflection properties \((r=.384, p<0.05)\). Moreover, the spatial scale score had a significant positive correlation to overall ability in the geometry test of axial reflection \((r=.354, p<0.05)\). This means that the higher the spatial cognitive style one reports to have, the higher their performance will be in axial reflection tasks. Type 1 task of drawing the axis between a given pre-image and its image was the only task that did not significantly correlate to the spatial score. However, it was the only task with a significant negative correlation to the verbal scale score \((r=-.404, p<0.05)\). It is important to note that while not all tasks’ correlations with the verbal scale score are significant, they are all negative. This means that the higher the verbal cognitive style dimension one reports to have, the lower their performance in axial reflection tasks is likely to be.

The second objective of this study was to investigate whether and which of the three cognitive style dimensions – spatial, object and verbal – can predict performance in geometric tasks of axial reflection. Based on the connection found in literature between spatial ability and axial reflection, as well as by the indications of the significant correlations in the bivariate correlation analysis, our hypothesis was that performance in axial reflection tasks will be predicted by the prospective teachers’ spatial scale score. Stepwise multiple regression analysis with spatial, object and verbal scores as predictive variables were performed to confirm our hypothesis. Table 4 presents the results of the multiple regressions.
Table 4: Multiple regression analysis coefficients for overall ability in axial reflection tasks

<table>
<thead>
<tr>
<th></th>
<th>b</th>
<th>p</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial scale score</td>
<td>.354*</td>
<td>.027</td>
<td>2.30</td>
</tr>
<tr>
<td>Object scale score</td>
<td>.284</td>
<td>.078</td>
<td>1.81</td>
</tr>
<tr>
<td>Verbal scale score</td>
<td>-.191</td>
<td>.240</td>
<td>-1.20</td>
</tr>
</tbody>
</table>

(*) p<0.05.

The results presented in Table 4 confirm our hypothesis that overall ability in axial reflection tasks can only be predicted by the prospective teachers’ spatial scale score. Spatial scale score is a statistically significant predictor of prospective teachers’ overall ability in geometric tasks of axial reflection (b= 0.354, p<0.05), and explains a rather medium proportion of variance (12.5%). The other two variables, object and verbal scale scores, are not statistically significant predictors of ability in axial reflection.

5. Discussion

The aim of this paper was to explore prospective teachers’ cognitive style and its relation to the ability in solving transformation geometry tasks of axial reflection. It was based on the object-spatial-verbal model proposed by Blazhenkova & Kozhevnikov (2009). Our objectives were: 1) to investigate whether prospective teachers’ cognitive style is related to ability in axial reflection tasks, and 2) to explore which of the three dimensions predict performance in axial reflection tasks. In this section, the results of this study are discussed from the aspect of elementary teacher education. Additionally, some possible teaching implications and further research questions are addressed.

The results of this study confirm the reliability of the Greek translated version of the questionnaire. The indicators of reliability were very good and almost equal to the ones referred to by Blazhenkova & Kozhevnikov (2009) in the original version of the questionnaire. Moreover, our study suggests that this group of prospective teachers had a significantly higher score in the object imagery scale, even though they come from a field of studies that is mostly considered as a part of social sciences. According to Blazhenkova & Kozhevnikov (2009), people who come from a humanistic/social science occupational area tend to rate themselves in the verbal scale higher than average. However, similar studies found that people usually rate themselves higher on the object scale, compared to the other two scales (spatial and verbal) (Blazhenkova & Kozhevnikov, 2009; Blazhenkova, Kozhevnikov & Motes, 2006; Chabris, et al., 2006). Although gender is not considered as a factor explaining cognitive style, it has been reported in research that females typically tend to score higher on the object-imagery scales in contrast with males, who score higher on the spatial imagery scales (Blazhenkova & Kozhevnikov, 2010; Kozhevnikov, Blazhenkova & Becker, 2010). Perhaps the fact that 89.7% of the participants were females could have resulted to the higher object score, in relation to the other two. Nevertheless, further research is required comparing prospective or in-service teachers’ cognitive style to average and/or to other professions’ cognitive style scores in order to come to a more coherent result on their cognitive style profile. It should also be noted that the sample had the lowest score in the spatial scale. According to Blazhenkova & Kozhevnikov (2009), high spatial scale score indicates tendency for preferring scientific work activities, such as mathematics and hence, geometry. This may suggest that the prospective teachers would have a low interest in geometry activities.

The spatial cognitive style dimension seems to relate to performance in almost all tasks of axial reflection. This means that people who rate themselves higher in the spatial imagery scale are more likely to succeed in solving axial reflection tasks. Moreover, spatial imagery scale score has proved to be the only significant predictor for ability in axial reflection tasks. Transformation geometry tasks generally involve the mental or physical manipulation of shapes to new positions or orientations in space (Boulter & Kirby, 1994). The same applies for axial reflection, as part of transformation geometry. It is possible that spatial visualizers tend to shift their attention in decomposing the shape into smaller parts, analytically locate the positions of the image for each part of the shape when reflected, and then reconstruct the shape based on their schematic representation. Object visualizers on the contrary, are likely to focus on maintaining the shape as a single perceptual unit and try to position it as a whole on the other side of the line of reflection by considering all point simultaneously, instead of breaking it into smaller parts of information. According to Blazhenkova & Kozhevnikov (2009), this ability of object visualizers to maintain a large amount of pictorial details in their images sometimes impedes effective spatial transformations. Of course one cannot say for sure that this kind
of strategy always leads to failure in axial reflection tasks. Research studies that describe secondary school students’ strategies in geometric transformations seem to present contradictory results. While Naidoo (2010) suggests that learners with a visual/holistic understanding may be better in understanding transformations and their effects, Boulter & Kirby (1994) suggest that different strategies serve better for different types of tasks. Specifically, they describe that while the analytic strategy was more successful for tasks that required carrying out quantitatively described transformations, the holistic strategy was more successful for tasks that required describing a transformation in qualitative terms and some other tasks could be successfully solved by either analytic or holistic strategy. This can explain the fact that in the present study, type 1 tasks of drawing the line between a given pre-image and its image was the only type of task that did not relate to spatial imagery score. Further studies can qualitatively look into the different strategies used by spatial and object visualizers, in order to understand what kind of strategies they apply and under which conditions (i.e. types of tasks) these are successful.

Another important issue in this study is the fact that performance in all types of tasks was negatively related to the prospective teachers’ verbal scale score. This means that prospective teachers with higher verbal abilities, than object or spatial, are less likely to succeed in axial reflection tasks. Perhaps their strategies are different than the strategies that spatial and object visualizers apply, or perhaps the case could be that they attempt to apply the same strategies unsuccessfully. This raises some serious questions regarding their understanding of axial reflection. Axial reflection is a geometric concept taught in primary grades, that most, if not all, prospective teachers will be called to teach. In order to promote children’s understanding, teachers should have strong content knowledge background to create classroom environments where students develop reasoning and justification skills (Leinhardt & Smith, 1985; Parsons, 1993). Teacher education program studies should take into consideration that prospective teachers have different cognitive styles that could inhibit their understanding of certain concepts, such as axial reflection. There is a need to investigate how to support verbal learners’ understanding of axial reflection.

In summary, as we pointed out, there is a relation between prospective teachers’ cognitive style and their ability in axial reflection. Future studies can qualitatively examine the different strategies applied in solving axial reflection tasks by subjects with different cognitive styles. Such research could provide insight to teacher educators on the best way to support effective understanding of this concept by prospective teachers, and to learners in general. Additionally, the current study supports the reliability of the Object-Spatial Imagery Verbal Questionnaire, and also the predictive nature of the spatial-object-verbal cognitive style model, by confirming that performance in a scientific matter of knowledge such as axial reflection is strongly related to a distinct kind of imagery, the spatial imagery cognitive style.

6. References


Impact of Learning Styles on Learning-Skill Development in Higher Education

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Abstract

The aim of this study was to examine how learning styles impact the development of 12 skills in higher education by using Kolb’s learning theory. His theory shows that learning styles are composed of four key components as learning abilities: concrete experience, abstract conceptualization, reflective observation, and active experimentation. It also proposes a competency model that includes 12 skills such as relationship, helping, sense making, information gathering, information analysis, theory building, quantitative analysis, technology, goal setting, action, initiative, and leadership. However, very few researchers have tested the impact of learning styles on the development of 12 skills. The present study focuses on it.

This study was part of a 2-year longitudinal project on the relationships between learning environment, student learning, academic skill development, and attitudes at a research university in the United States. There were 881 undergraduate students who had just entered the university as freshmen and were asked to participate in this research project. The students who showed interest in this project initially consisted of 310 freshmen with majors in 43 academic disciplines. Of these 310 students, 22 were eliminated because of missing data or lack of a consent form to participate in the research project. The rate of return was 35.2%, and 288 students were finally included for data analysis. The Learning Style Inventory and the Learning Skill Profile were used as measures in the study. These two instruments were designed to be conceptually consistent with Kolb’s learning theory.

Results revealed that two specialized learning abilities in the dialectical learning dimension of concrete experience and abstract conceptualization significantly affected development in 9 skills such as leadership, relationship, helping, information analysis, theory building, quantitative analysis, technology, goal setting, and initiative. However, two specialized learning abilities in the other dialectical learning dimension of reflective observation and active experimentation had a significant influence on only 3 skills such as leadership, goal setting, and initiative. These results suggest that the former dialectical learning dimension in learning styles is more influential to skill development than the latter one. Further, this study also highlighted a question of how balanced learning styles impact the development of 12 skills. Results showed that more balanced learning orientation in the dialectical learning dimension of concrete experience and abstract conceptualization hindered the development of 4 skills such as information analysis, theory building, qualitative analysis, and technology, while it increased the development of 2 skills of relationship and helping.

This study showed us what learning abilities should be used for development of certain learning skills. If university students wish to develop leadership, relationship, and helping skills, they should use more concrete experience. If they wish to improve theory building, quantitative analysis, and technology, they need to employ abstract conceptualization. Finally, they should use more active experimentation to develop goal setting and initiative skills. Further, in order to develop skills, this study suggested that university students should not learn by balancing dialectical learning abilities but by specializing in learning abilities. Unless otherwise, they less develop skills, especially 4 skills of information analysis, theory building, quantitative analysis, and technology in higher education.

Keywords: Learning styles, learning-skill development, Kolb’s learning theory, higher education

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Students’ and Teachers’ Thinking Styles and Preferred Teacher Interpersonal Behaviour: Convergence or Divergence?

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Di WANG (Vrije Universiteit Brussel, Belgium) – wangdisister@126.com

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Abstract

Both students and teachers bring their own individual characteristics and styles to the learning environment. This study examines both students’ and teachers’ thinking styles and their preferences for teacher-student interpersonal behaviours. Three hundred and twenty-five students and 146 teachers from two secondary schools were involved in this study. The results showed that in general, the students seem to reflect a higher level of Type I and a lower level of Type II thinking styles than the teachers. Both students and teachers had preferences for cooperative teacher interpersonal behaviour, while the students had a lower level of preference for the dominant teacher interpersonal behaviour. The relationship between thinking styles and preferred teacher-student interpersonal behaviour was also analyzed for the teacher and student group respectively.

Keywords: thinking styles; teacher interpersonal behaviour; secondary school

1. Introduction

Both students and teachers bring their own individual characteristics and styles to the learning environment. Among the personal characteristics, thinking styles are relevant to the ways teachers teach and students’ preferences for learning. At the same time, a learning environment can shape students’ specific styles in learning and teachers’ teaching styles. Teaching and learning is a reciprocal process. Students’ learning styles can be developed by teachers’ teaching styles, and teachers’ teaching styles may be influenced by students’ learning preferences. Previous research has argued that a convergence between teachers’ teaching styles and students’ learning styles can enhance student learning outcomes (Adderley, 1987; Malinsky, 2001; Zhang, 2006). In addition, another key variable that contributes to the success of a learning environment is the nature of the student-teacher interaction. Teacher-student interaction is a powerful force that can play a major role in influencing the cognitive and affective development of students (Arends, 2001). Educators believe that good relationships between teachers and students are important in the learning process. For example, when teachers demonstrate supportive and helpful interpersonal behaviours, students could be more actively involved in learning and develop deep learning approaches (Brekelmans, Wubbels & den Brok, 2002; Dart, et al., 2000).

In this light, two issues come into our major concern: what are teachers’ and students’ thinking styles and their preferred teacher-student interpersonal behaviour and whether there is convergence or divergence between teachers and students. Although there has been a series of studies conducted to investigate either teachers’ or students’ thinking styles, and their perceptions of teacher interpersonal behaviour, there are not sufficient studies to examine the convergent or divergent styles and perceptions of interpersonal behaviours of both teachers and students at the same time. Therefore, this research aims to empirically examine teachers’ and students’ thinking styles, as well as the convergence or divergence between students’ and teachers’ preferences of interpersonal behaviour and the possible associations between their thinking styles and preferred teacher-student interpersonal behaviour.

1.1 Thinking styles of students and teachers

The Theory of Mental Self-government (Sternberg, 1997) describes 13 thinking styles referring to people’s preferred ways of using the abilities that they have. Recent research conceptualize that intellectual style is an
overarching concept encompassing the meanings of all style constructs and distinguish three types of styles, namely Type I, Type II and Type III thinking styles (Zhang & Sternberg, 2005, 2006). Type I thinking styles include legislative, judicial, hierarchical, global and liberal thinking styles. Characteristics of people with dominant Type I thinking styles prefer to work on complex and creative-generating activities, and they are more effective in producing positive behaviour. People with dominant Type II thinking styles show a dominant tendency to engage themselves in more simplistic and norm-favoring activities. Type II thinking styles include executive, monarchic, local and conservative thinking styles. Finally, the last group of thinking styles is known as the Type III thinking styles which include oligarchic, anarchic, internal and external thinking styles. The characteristics of people with dominant Type III thinking styles are inclined to act in a more situational-dependent manner. They can sometimes exhibit behaviour that characterized the features of Type I thinking styles, and at other times, they may show the behaviour that characterized Type II thinking styles.

Preferred thinking styles can be applied to different types of activities, including teaching and learning. Relevant inventories can be used to assess thinking styles as manifested in teaching and preferred thinking styles in learning (Grigorenko & Sternberg, 1993; Zhang, 2007). Previous research has examined the features of teachers’ and students’ thinking styles. For example, the study of Yu and Zhu (2011) indicated that Hong Kong teachers showed a higher preference for legislative, hierarchic, executive, and external thinking styles than other thinking styles. The study of Zhu and Zhang (2011) found that Chinese university students had a higher preference for legislative, hierarchic, judicial, global, executive and external thinking styles than other thinking styles. In addition, studies have found that students’ with dominant preference for Type I intellectual styles show a strong commitment in learning, want to do well, and engage in higher cognitive level of processing information; whereas, students with dominant preference for Type II intellectual styles show less committed in learning, prefer to use lower level of cognition to handle academic work (Biggs & Tang, 2007). Type III intellectual styles basically manifest the behaviour of either Type I or Type II intellectual styles (Zhang & Sternberg, 2006).

1.2 Preferred teacher interpersonal behaviour
The Model of Interpersonal Teacher Behaviour was developed by Wubbels, Créton, & Hooymayers (1985) and the conceptualization is based on the perception of students or teachers of the behaviour of the teacher. The model maps interpersonal teacher behaviour along two dimensions: Influence (DS, Dominance – Submission) and Proximity (CO, Cooperation - Opposition) (Kiesler, 1996). The Influence dimension represents the degree of dominance or control displayed by the teacher, while Proximity describes the level of cooperation between teacher and students. The Questionnaire for Teacher Interaction (QTI) is developed and used to measure teaching styles in terms of teachers’ interpersonal behaviour in teaching. The QTI has been widely used in many countries for measuring secondary students’ and teachers’ perceptions of teacher interpersonal behaviour. The two-dimensional coordinate system represents the interpersonal behaviour map which shows the degree of cooperation between the individuals communicating on the horizontal axis, and the degree of control over the communication process of the communicator along the vertical axis (Wubbels, Créton & Hooymayers, 1992). The model identifies 8 different types of teachers’ interpersonal behaviours: leadership, helpful/friendly (helpfulness), understanding, student-responsibility/freedom (freedom), uncertainty, dissatisfaction, admonishment, and strictness. Previous researchers have argued that teachers need to ensure a balance between control and freedom for students (Khine & Atputhssamy, 2005). Within the systems perspective on communication, it is assumed that the behaviours of participants influence each other mutually (Brekelmans, et al., 2002). The behaviour of the teacher is influenced by the behaviour of the students and in turn influences student behaviour. As such, we can well predict that teachers’ preferred interpersonal behaviour is not only affected by their own characteristics such as thinking styles and teacher beliefs (Xin, Lin & Yu, 2000), but also affected by student behaviour.

1.3 Thinking styles of students and teachers and their preferred teacher-student interpersonal behaviour
According to the principles of student-teacher interaction (Wubbels, Créton, & Hooymayers, 1985; Wubbels & Levy, 1993), both teachers and students contribute to development of teachers’ teaching styles and students’ learning styles. An individual’s behaviour can be explained by the variances in their thinking. Previous research identified that teachers’ thinking styles are closely related to their preferred teacher-student interpersonal behaviour (Yu & Zhu, 2011). Similarly students’ thinking styles may also be associated with their preference for specific teaching and teachers’ interpersonal behaviour. Previous research has studied the
kind of teaching styles that students prefer that their teachers use (Zhang, 2008). The results indicate that students have a stronger preference for teachers to teach in Type I teaching styles over Type II teaching styles (Weng, 2002; Zhang, 2008). Although both students’ and teachers’ thinking styles and preferred interpersonal behaviour have been studied, available research on thinking styles and teacher interpersonal behaviour has focused on their influence on student achievement, etc. (Cano-Garcia & Hughes, 2000). Empirical research on the convergence/divergence between students’ and teachers’ thinking styles and preferred interpersonal behaviour perspectives is lacking and does not provide sufficient knowledge about the real gap between students and teachers, if any. The aim of this study is to examine what are the convergences/divergences between students and teachers with regard to their thinking styles and preferred teacher interpersonal behaviour and the relationship between them in secondary school settings.

2. Method

2.1 Participants

Participants in this study were 325 students and 146 teachers from two senior high schools in China, one in Guangzhou and one in Hunan province. The students were from 14-18 olds, and all participating teachers gave lessons covering all teaching subjects (language, maths, physics, chemistry, biology, history, etc.) for the senior secondary grades. Among them, 170 students and 76 teachers were from Guangzhou, and 155 students and 70 teachers were from Hunan province. The composition of the participants is presented in Table 1.

<table>
<thead>
<tr>
<th>Table 1: Composition of participants in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guangzhou sample</td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Average age</td>
</tr>
<tr>
<td>Age range</td>
</tr>
</tbody>
</table>

2.2 Instruments

Two instruments were used. The first inventory is the Thinking Styles Inventory-Revised II (TSI-R2, Sternberg, Wagner & Zhang, 2007) comprised of 65 statements, assessing 13 thinking styles: legislative, judicial, hierarchical, global, liberal (Type I), executive, monarchical, local, conservative (Type II), oligarchic, anarchic, internal and external (Type III). The teacher version and student version were used for teachers and students respectively. The TSI-R2 has been validated in other studies (e.g. Higgins & Zhang, 2009). The second instrument is the Questionnaire for Teacher Interaction (QTI) (Wubbels, Créton & Hooymayers, 1985). The Chinese version with 40 items was used (Chen & Chen, 2001). Eight preferred teacher-student interpersonal behaviours are assessed: leadership, helpful/friendly, understanding, student responsibility/freedom, uncertain, dissatisfied, admonishing, and strict. The QTI has been shown to be a reliable instrument (den Brok et al., 2006; Wubbels & Levy, 1993) and has been cross validated in different contexts and cultures. The reliability of the scales of the two instruments in this study is reported in Table 2 and Table 3 respectively.

3. Results

3.1 Thinking styles of students and teachers

The results show that students and teachers had significant differences with regard to their thinking styles (Table 2). Students displayed higher preferences for three of the five styles of Type I thinking style (legislative, judicial, liberal), however, teachers displayed higher hierarchic thinking style than students...
Students had lower preferences for three of the four styles of type II thinking style (executive, monarchic, conservative) \((p<.05)\). And students showed higher tendencies of Type III thinking styles compared to teachers. The results demonstrated that in general, compared to teachers, students were more creative-generating oriented (Type I) and situation-dependent oriented (Type III), and less norm-favoring oriented (Type II). The differences between male and female students and those between male and female teachers were not significant \((p>.05)\).

3.2 Students’ and teachers’ preferred teacher-student interpersonal behaviour

First of all, equal variances of the student and teacher group were checked with Levene’s test and showed that equal variances were assumed. T-test results indicate that students and teachers had convergent preferences for three types of teacher-student interpersonal behaviours \(\text{(helpful/friendly, understanding and freedom)}\) \((p>.05)\). However, they differed significantly in their preferences of the other five types of interaction behaviour. Compared to the students, teachers showed higher preferences for leadership, uncertain, dissatisfied, admonishing and strict interpersonal behaviours \((p<.05)\) (Table 3).

### Table 3: Students’ and teachers’ preferred teacher-student interpersonal behaviour

<table>
<thead>
<tr>
<th></th>
<th>Student sample ((n=325))</th>
<th>Teacher sample ((n=146))</th>
<th>Mean dif. S-T</th>
<th>Cronbach’s alpha</th>
<th>Mean (SD)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>.72</td>
<td>5.25 (1.04)</td>
<td>-.22*</td>
<td>.69</td>
<td>5.47 (.68)</td>
<td>.54 (.70)</td>
</tr>
<tr>
<td>Helpful</td>
<td>.83</td>
<td>5.67 (.93)</td>
<td>ns</td>
<td>.70</td>
<td>5.68 (.65)</td>
<td>ns</td>
</tr>
<tr>
<td>Understanding</td>
<td>.79</td>
<td>5.75 (.81)</td>
<td>ns</td>
<td>.65</td>
<td>5.74 (.58)</td>
<td>ns</td>
</tr>
<tr>
<td>Freedom</td>
<td>.58</td>
<td>4.48 (.88)</td>
<td>ns</td>
<td>.57</td>
<td>4.45 (.65)</td>
<td>ns</td>
</tr>
<tr>
<td>Uncertain</td>
<td>.71</td>
<td>1.89 (.76)</td>
<td>-.60***</td>
<td>.68</td>
<td>2.49 (.80)</td>
<td>-.60***</td>
</tr>
<tr>
<td>Dissatisfying</td>
<td>.81</td>
<td>1.85 (.90)</td>
<td>-.10*</td>
<td>.70</td>
<td>2.87 (.90)</td>
<td>-.10*</td>
</tr>
<tr>
<td>Admonishing</td>
<td>.66</td>
<td>1.99 (.76)</td>
<td>-.34***</td>
<td>.61</td>
<td>2.33 (.65)</td>
<td>-.34***</td>
</tr>
<tr>
<td>Strict</td>
<td>.58</td>
<td>3.69 (.87)</td>
<td>-.33***</td>
<td>.66</td>
<td>4.02 (.81)</td>
<td>-.33***</td>
</tr>
</tbody>
</table>

*** \(p<.001\), * \(p<.05\)
Table 4: Predictions of teacher-student preferred interpersonal behaviours from thinking styles: comparing students and teachers

<table>
<thead>
<tr>
<th>Scale</th>
<th>Leadership</th>
<th>Helpfulness</th>
<th>Understanding</th>
<th>Freedom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student</td>
<td>Teacher</td>
<td>Student</td>
<td>Teacher</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student</td>
<td>Teacher</td>
</tr>
<tr>
<td>R² (Type I styles)</td>
<td>.16</td>
<td>.24</td>
<td>.22</td>
<td>.31</td>
</tr>
<tr>
<td>R² (Type II styles)</td>
<td>.20</td>
<td>.06</td>
<td>.23</td>
<td>.22</td>
</tr>
<tr>
<td>R² (Type III styles)</td>
<td>.18</td>
<td>.16</td>
<td>.17</td>
<td>.19</td>
</tr>
<tr>
<td>R² (total)</td>
<td>.30</td>
<td>.25</td>
<td>.41</td>
<td>.32</td>
</tr>
<tr>
<td>F</td>
<td>3.04*</td>
<td>2.55*</td>
<td>4.88***</td>
<td>4.23***</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scale</th>
<th>Uncertain</th>
<th>Dissatisfying</th>
<th>Admonishing</th>
<th>Strict</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student</td>
<td>Teacher</td>
<td>Student</td>
<td>Teacher</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student</td>
<td>Teacher</td>
</tr>
<tr>
<td>R² (Type I styles)</td>
<td>.014</td>
<td>.03</td>
<td>.022</td>
<td>.05</td>
</tr>
<tr>
<td>R² (Type II styles)</td>
<td>.42</td>
<td>.02</td>
<td>.52</td>
<td>.13</td>
</tr>
<tr>
<td>R² (Type III styles)</td>
<td>.038</td>
<td>.03</td>
<td>.09</td>
<td>.05</td>
</tr>
<tr>
<td>R² (total)</td>
<td>.46</td>
<td>.10</td>
<td>.56</td>
<td>.14</td>
</tr>
<tr>
<td>F</td>
<td>7.68***</td>
<td>1.05</td>
<td>11.52***</td>
<td>1.15</td>
</tr>
</tbody>
</table>

*** p<.001, ** p<.01, * p<.05

3.3 Relationship between thinking styles and preferred teacher-student interpersonal behaviour: teachers and students

Multiple regression analyses were conducted to study the relationship between thinking styles and preferred teacher-student interpersonal behaviours (Table 4). The results indicate that both convergence and divergence occurred regarding the relationship between thinking styles and preferred interpersonal behaviours between students and teachers. As to the convergence, we found that for both students and teachers, Type I thinking styles were related to Proximity (leadership, helpful, understanding, and freedom) interpersonal behaviours, but not related to Influence (uncertain, dissatisfying, and admonishing) interpersonal behaviours. However, for teachers, Type I thinking styles were also related to strict interpersonal behaviour; but this was not the case for students. For both students and teachers, Type II thinking styles were related to helpful, understanding, freedom, dissatisfying, and strict interpersonal behaviours. However, the link between Type II thinking styles and leadership, uncertain, and admonishing interpersonal behaviours was not significant for teachers, while it was significant for students. For both students and teachers, leadership, helpful, understanding interpersonal behaviours could also be predicted from Type III thinking styles; however, divergence of predictions was detected between students and teachers. For teachers, Type III thinking styles were also associated with freedom and strict interpersonal behaviours, but this was not significant for the students.

4. Discussion

4.1 Convergence/divergence between students’ and teachers’ thinking styles and preferred teacher interpersonal behaviour

This research examined the thinking styles and preferred teacher interpersonal behaviours among senior secondary students and teachers; more importantly, the convergence/divergence between students and
teachers are investigated. The results show that on average, students are more inclined to use Type I and Type III thinking styles compared to teachers; and teachers seem to be more inclined to use Type II thinking styles compared to students. This finding seems to indicate that secondary school students are more free-thinking and more creative-generating than their teachers. In available literature, it seems it is not easy to find similar evidence to support this argument. However, in real educational contexts, as secondary school students have a lot of access to other sources of information and influence of Internet and other mass media, it could well explain that secondary school students can have a freer style than the teachers in average. On the other hand, as the life experiences of students are less rich than their teachers, the students seem to be more context-dependent than their teachers. The results indicate that the teachers are more norm-favouring than students; this could be related to the fact teachers are more inclined to take into consideration of the existing rules and regulations when making decisions or taking actions.

The results of the study also suggest significant discrepancies in the profile of preferred teacher interpersonal behaviour between teachers and students. Compared to students, teachers are more inclined to prefer dominant teacher interpersonal behaviours, although teachers’ preference for unfamiliar, dissatisfying and admonishing interpersonal behaviours were much lower than the other interpersonal behaviours with the mean scores lower than 2.5, while the other scales were scored higher than 4.0. It seemed logical that teachers are more inclined to prefer leadership and strict interpersonal behaviour towards students, at least in the Chinese context, as teachers believe that teachers need to take a leading role and give clear guidance to students and provide them with the knowledge base, and students need to be disciplined (Zhu, Valcke & Schellens, 2010). The research of Wei, den Brok and Zhou (2009) also stated that Chinese teachers are expected to be stern in front of students and students are expected to show absolute respect to their teachers. However, we found that students and teachers had consistent preferences for cooperative teacher interpersonal behaviours. This supports previous statement that teachers’ supportive and cooperative behaviours are conducive to student performance and are important for teachers to establish a harmonious relationship with their students (e.g. Wei, den Brok & Zhou, 2009). The pattern of preferences of both students and teachers are similar, showing higher preferences for helpful, understanding, leadership, freedom and strict styles over unfamiliar, dissatisfying and admonishing styles. Previous studies seem to have identified similar student perceptions of their best teachers, namely being strong leaders, friendly and understanding, but not unfamiliar, admonishing or dissatisfied (van Oord & den Brok 2004; Wei & Onsawad 2007; Wubbels & Levy, 1991). Additionally, the best interpersonal teacher provides some freedom to students and can sometimes be strict. Wettasinghe and Lourudusamy (2002) argued that students’ perceptions of their teachers’ behaviour should not be underestimated, rather it should be considered as an important mediator between the instructional characteristics and student academic achievement.

4.2 The relationship between thinking styles and teacher interpersonal behaviour

This study provides evidence that for both students and teachers, Type I thinking styles are associated with preferences for cooperative teacher interpersonal behaviours, but not dominant teacher interpersonal behaviours. The relationships between Type II and III thinking styles and preferred teacher interpersonal behaviours seem to be more mixed; however, we found that compared to Type I and Type III thinking styles, Type II thinking styles seemed to have higher associations with dominant teacher interpersonal behaviours. This finding is congruent with previous research indicating that Type I thinking styles had more correlations with cooperative or student centred interpersonal behaviours and Type II thinking styles had more significant correlations with dominant or teacher centred interpersonal behaviours (Yu & Zhu, 2011). The results are supportive to the argument of Zhang and Sternberg (2006, 2009) that intellectual styles are value-laden, in which Type I intellectual styles are more effective in producing positive behaviour than others.

4.3 Limitations and implications of this study

The results of this study needs to be interpreted with consideration of the following limitations. First of all, the student and teacher samples are from two secondary schools. They may not be representative of the population in other secondary schools. Secondly, this study measures students’ and teachers’ general preferred teacher interpersonal behaviours. We are aware that the students and teachers may not be in the same classroom environment, although they may be in the same school environment. Therefore, the perceptions of the students may not be directly convergent or divergent with their own teachers. Thirdly, the study investigated students’ and teachers’ preferred student-teacher interpersonal behavior, which may not be fully correspondent to the actual behaviours of the participants.
Nevertheless the results of this study provide us with rich insights about the characteristics of students and teachers with regard to their thinking styles and their general preferences for teacher interpersonal behaviour. This information is important for teachers, school leaders and researchers to enrich their understanding about the possible differences that exist between students and teachers and how certain thinking styles and student-teacher interpersonal behaviour could be adjusted, for example, from the teacher side to better accommodate students’ styles and preferences that could be more conducive for students’ achievement (MacNeil, 1980; Smutz, 2003). This research contributes to the research in the field of teacher interpersonal behaviour as it examines the issue from both students’ and teachers’ perceptions. This can lead to more accurate interpretations of the learning environment and the characteristics of teachers and students. In addition, the valuable information gathered by the TSI-R2 and the QTI can be used as a basis for reflective practice both by teachers and students.

The findings of this study can have educational implications for teachers. Teachers could use the outcome of this study to possibly adapt their interpersonal behaviour based on students’ preferences, for example by reducing some of the dominant interpersonal behaviours. Researchers have reported how teachers can use students’ perceptions or preferred teacher interpersonal behaviour as a basis for identification of discrepancies between preferred and teacher actual behaviours and a systematic attempt can be made to improve education (eg. Yarrow et al. 1997). Teachers have to endeavour to optimise circumstances so that a powerful learning environment can be developed. Based on this information, teachers might be capable of creating a more agreeable learning environment that is characterised by positive interpersonal relationships.

5. References


EL SIN XVI

POSTER PRESENTATIONS
Organisational Learning and Development – Paradigm Shift from Classroom to Virtual Environments

Alison BULBECK (Brunel University, United Kingdom) – alison.bulbeck@brunel.ac.uk

Abstract

The contribution of knowledge towards competitive advantage in today’s dynamic commercial environment is well understood. Corporate executives welcome the affordability and flexibility of digital technologies to continuously develop staff. A workplace Learning Paradigm Shift is happening, with traditional instructor-led training replaced by an “eTutor” in a virtual learning space. Despite wide-spread use of eLearning and Web2 tools for formal and informal learning, relatively little is yet known about impacts on human learning experience. The exponential usage increase of Mobile technology to aid end-user learning activities is an important consideration.

Research methods reflect the human-centric nature of the domain, with questionnaires, interviews and observations featuring strongly.

This poster reflects my early research proposal which has been compiled during the first 3 months of my 4 year PhD. The research will provide substantial insights which may inform investment and training policy decisions.

Keywords: Workplace Learning, Development, eLearning, Mobile Learning, M-Learning
Motivation, Learning Environment and Risky Profiles in First Year at the University: Development of an Integrative Understanding of Academic Achievement through the Investigation of These Constructs.

Mikaël DE CLERCQ* (Catholic University of Louvain-la-Neuve, Belgium) – mikael.declercq@uclouvain.be

Abstract

Over the years, many approaches of the question of student achievement in first year at the university have been proposed in the literature (Pekrun & al, 2002; Robbins et al., 2004). Up to now, many predictors of achievement have been documented: student’s background variables, attendance, study skills, self-regulated learning, self-efficacy, social support,...However, most studies evaluated the impact of these factors one by one without taking their interrelations into account. Recent surveys have underlined the insufficiency of single path analyses to understand the complex processes of academic achievement (Eccles & Wigfield, 2002; Neuville et al., 2007). Moreover, a preliminary study entitled “factors predicting ACHIEVEMENT among 1st YEAR UNIVERSITY STUDENTS: an integrative and contextualized approach” was set up (Galand, DeClercq, Dupont & Frenay). This study aimed at identifying predictors of academic achievement among first-year university students and showed the interest to include integrative and contextual approach in the comprehension of academic achievement at the university.

As a consequence, the first aim of this thesis is to develop an integrative view of the academic achievement considering for the interrelations between social, cognitive, emotional factors that influence achievement. In that perspective, our research will try to identify, at the beginning of the year, some “risky profiles” (clusters of variables) that could serve as “early warning signs” of failure in first year at the university. In addition, we also could wonder if some processes which take place during the academic year could moderate these profiles. On the one hand, the motivational process investigated by task value (Eccles & Wigfield, 2002) and intention to persist (Cabrera, Nora & Castaneda, 1993 ; Hausmann, Schofield & Woods , 2009), could have a significant impact on academic achievement. Thus, as second aim, our research will assess the moderating effect of these processes on students with risky profiles. On the other hand, some studies have looked at the relationships between perceptions of the learning environment and academic achievement, showing that perception of teaching was associated with grades and study time (Lizzio, Wilson & Simons, 2002; Patrick, Ryan & Kaplan, 2007). Thereby, we can draw the hypothesis that the learning environment moderates risks of failure of a student with “early warning signs”. So, the third aim of this thesis is to investigate this moderating effect.

Clusters analysis will be carried out on a large database in order to establish « risky profiles ». This database comes from a prospective survey of first year university student at the U.C.L. (Schmitz & al, 2010). The moderating effect of the learning environment will be investigated through multilevel analysis. These analyses would allow us to determine if moderating effect of learning environment on risky profiles is the same across different programs. Finally, the impact of task value and intention to persist will be assessed by hierarchical regressions.

Keywords: college freshmen, higher education, academic achievement, integrative conceptual framework, clusters analysis

References


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Katty ELIAS (Vrije Universiteit Brussel, Belgium) – kelias@vub.ac.be

Abstract

Given the current global economic climate, the upgrade, adaptation and growth of knowledge and skills and competence portfolio of individuals, who will fill the jobs of tomorrow, is one of the greatest challenges facing Europe and Belgium as a Member State. (Belgian Presidency of the Council of the European Union on Education and Training, 2010)

The strategic Framework for European cooperation in education and training (Education and Training 2020) (European Commission, 2009) outlines that « European cooperation in education and training for the period up to 2020 should be established in the context of strategic framework spanning education and training systems as a whole in a lifelong learning perspective ».

The focus throughout this study is on a micro level on the Master studies in Communication and on a macro level on Flanders aim to achieve the European targets. The Flemish Community of Belgium, Education Department acts upon this advice in the decree on the Flemish qualification structure (Vlaamse Regering, 2009) ; the coordination is in hands of the Flemish Interuniversity Council (VLIR) to define the learning outcomes for every discipline in higher education in Flanders. (Vlaamse Hogeschoolraad, 2010)

The title of this project reflects the key premise that a more integrated approach, adopted by all education and training systems, higher education included, makes lifelong learning a reality in the interest of learners and employers.

The central research question goes: “How can we optimize the development of career competences during work-based learning in a master program of Communication Studies?

In order to find an answer to the central research question we split up our study into four phases:

A. In the exploration phase we look for the concepts that are at the basis of the development of career competences. Therefore we will carry out a qualitative analysis of all sorts of material and sources in order to become a substantive frame that links up the empirical material with the theory and the central research question.

B. In the construction phase we will convert the substantive frame into a competence-maturation-model. This new model will be presented at several experts in form and content of the Delphi-method.

C. In the application phase we will do a trial run of the competence-maturation-model with master students in Communication Studies during two consecutive academic years. The participants will be questioned on the workability of the model by means of online focus group conversations. The portfolios, produced by the same participants, will be put to analysis of the content in order to measure the presence of career competences, which ones and how many. The outcome of both investigations will bring us to the development of an instrument of evaluation for the portfolios.

D. In the last phase of evaluation the competence-maturation-model will be once more applied by a new group of master students in Communication Studies during one academic year. These participants will be questioned through an online survey about the user-friendliness of the model and about the evaluation method, used on their portfolios.

The development of a competence-maturation-model could be an answer to the need of lifelong learning and the upgrade, adaptation and growth of knowledge and skills and competence portfolio of individuals, who will fill the jobs of tomorrow.

So far, European and Flemish recommendations concerning work-based learning go only as far as the professional bachelors in higher education. The need to develop career competences on a master level stays unfulfilled.

Keywords: Work-based learning, career competences, university education, learning outcomes
References


Learning Modes of Histrionic and Obsessive-Compulsive Personality Disorders

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Judith MALETTE (Saint Paul University, Canada)

Abstract

The aim of this poster is to describe the learning difficulties involved in the overspecialization of learning modes associated with two personality disorders (PD): histrionic and obsessive-compulsive personality disorders. The behaviour and cognitive attitudes of the two PDs are analyzed in connection with Kolb's learning experiential model. This comparative analysis show that individuals with histrionic PD and individuals with obsessive-compulsive PD prefer opposite learning modes that are also overspecialized and detrimental to the use of other learning modes. Clinical implications of those results are discussed.

Keywords: personality disorders, learning modes

While the cognitive-behavioural approach has identified certain dysfunctional schemas and behavioural, emotional and cognitive strategies associated with each of the personality disorders (PD) (Cottraux, 2004), it has failed to identify specific learning modes for each PD. The aim of our research is to identify whether there are difficulties and challenges associated with two PDs: histrionic (HPD) and obsessive-compulsive (OCPD). Abbey, Hunt and Weiser (1985) alluded to the possibility that Kolb’s model of experiential learning (1984) could shed some light on the learning difficulties of people suffering from severe psychopathologies. Based on clinical observations, they hypothesized that the overspecialization of one learning mode, to the detriment of all others, could characterize such pathologies. Taking these authors’ hypothesis further, we propose that such a learning pattern is present in HPD and OCPD. Kolb experiential learning model comprises four modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC) and active experimentation (AE). Each mode involves a set of skills: CE: the ability to involve fully in the new experiences; OR: the ability to observe the experiences from different perspectives; AC: the ability to create concepts in order to integrate the observations into theories; AE: the ability to use those theories to take decisions.

The choice of these two PDs is two-fold: 1) a variety of psychotherapeutic orientations, including psychoanalysis and CBT (cognitive-behavioural therapy), have described these two PDs in details; and 2) HPD and OCPD present significantly different, and even opposite, mental processes (Shapiro, 1965; Stone, 1993; 2005). As such, the more these two PDs are distinct, the more the experiential learning model should allow to demonstrate, at least theoretically, their different and opposite learning modes.

Using the description of HPD and OCPD as a starting point, we identified the attitudes and cognitive behavioural patterns that seem to dominate or to be lacking. We then compared the emerging patterns for each of the PDs to those characterizing each of the learning modes of Kolb experiential learning model as described by Chevrier and Charbonneau (2000). In order to identify the attitudes and cognitive behaviours of each PD, we considered not only the symptoms but also the cognitive processes, the emotional responses and the interpersonal behaviours, as well as the relationship between and among these three dimensions.

The results of this comparative analysis (see tables 1 and 2) show that HPD and OCPD predominantly use three learning modes of the experiential learning model: HPD overuses the concrete experience mode while OCPD overuses the reflective observation and abstract conceptualization modes. The attitudes and cognitive behaviours present in the HPD’s learning modes are clearly absent in the OCPD’s, which can be characterized as polarization. Since the two PDs use only certain learning modes, the overuse, and even overspecialization, speaks to the rigidity of the learning processes used by HPD and OCPD. As well, the cognitive and emotional rigidity characterizing the PDs seem to be present in the cognitive and emotional components of their preferred learning modes.
**Table 1: The relationship between the cognitive behaviours and attitudes present in the histrionic personality and those found in experiential learning.**

<table>
<thead>
<tr>
<th>Cognitive behaviours and attitudes found in the histrionic personality</th>
<th>Behaviours and attitudes found in experiential learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diffused thinking: looks at the big picture rather than at the details (holistic approach)</td>
<td>In the CE* phase, the learner tries to take in what is happening rather than spend time on specific information. His/her expectations are flexible. His/her attention is as broadly focussed as possible (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Emphasis on impressions and feelings: absence of deep thought, introspection</td>
<td>Feeling, recording the experience leads to behaviours that are in keeping with the CE* phase (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Attracted by new experiences, by the pleasure and thrills they offer</td>
<td>Getting involved in the experience, exploring, feeling – these are all cognitive attitudes and behaviours found in the CE phase (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Emphasis on people, as a result of the desire to be accepted (tendency towards the people rather than to the task at hand)</td>
<td>The learner who favours new experiences and emotions (CE*) is more oriented towards people than objects (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Ignores or fails to develop his/her competencies; because he/she is dependent, he/she finds ways to get others to do the tasks for him/her</td>
<td>The learner who favours only the CE* phase, thus neglecting the observation and reflection aspects, will often find himself/herself at a loss when faced with difficulties (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Acts impulsively; because he/she relies heavily on emotions, he/she does not take the time to reflect; he/she is not disposed to reflection</td>
<td>Actions are impulsive, guided by emotions rather than careful consideration. In such cases, action becomes a CE-related behaviour (Chevrier &amp; Charbonneau, 2000). Cognitive behaviours related to the RO** and AC*** phases seem to be neglected.</td>
</tr>
<tr>
<td>Expressiveness, spontaneity, imagination</td>
<td>In the CE* phase, the learner allows himself/herself to feel what is occurring, without blocking his/her emotions (Chevrier &amp; 2000).</td>
</tr>
</tbody>
</table>

*CE = Concrete experience  
**RO = Reflective observation  
***AC = Abstract conceptualization

These results help to better understand people suffering from one of those two PDs, i.e. why they think and behave the way they do and also to better choose specific interventions tailored to the needs of each of those two PD. For instance, with an individual with HPD, the counsellor could help the client become more aware of the cognitive dimension of his experience, by asking him to describe his experience in a factual way, instead of focusing solely on its emotional dimension. Conversely, the counsellor could ask an individual with OCPD to tune in the emotional dimension of his experience, by asking him to “stay with his emotions”, instead of “talking his way out” of them.

The next phase of this research will be to collect empirical data to verify the above analysis.
Table 2: The relationship between the cognitive behaviours and attitudes present in the obsessive-compulsive personality and those found in experiential learning.

<table>
<thead>
<tr>
<th>Cognitive behaviours and attitudes found in the obsessive-compulsive personality</th>
<th>Behaviours and attitudes found in experiential learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emphasis on a specific detail (rumination); ignores the big picture (analytical approach)</td>
<td>In the RO** phase, the learner focuses on his/her observations and tries to understand what has happened (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Emphasis on thinking, reasoning, reflection, objectivity; ignores emotions The obsessive personality seeks to objectify reality, to understand it so that he/she can establish principles and rules. In order to do this, he/she will expend considerable energy in analyzing and interpreting.</td>
<td>Analyzing, evaluating, trying to determine patterns and to understand – these are all behaviours and attitudes in keeping with the RO** phase (Chevrier &amp; Charbonneau, 2000). Interpreting, explaining, developing a principle or rule are behaviours consistent with the AC*** phase (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Prefers routine, because he/she feels threatened by new experiences. Given his/her fear of failure and of new experiences, as well as his/her preference for the known and familiar, the obsessive does not seek out new experiences.</td>
<td>The obsessive lacks an emotional openness to the experience and to getting involved in the experience – attitudes and behaviours found in the CE* phase (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Emphasis on the task rather than the people. His/her relentlessness when faced with a task is linked to his/her perfectionism and fear of making mistakes. The RO** mode of behaviour is characterized by a distancing, a pulling back (Chevrier &amp; Charbonneau, 2000).</td>
<td>The RO** mode of behaviour can be identified by gathering exhaustive data and through reflection (Chevrier &amp; Charbonneau, 2000).</td>
</tr>
<tr>
<td>Restraint, control, rumination, lack of imagination and creativity</td>
<td>In the RO** phase, the learner takes a step back, distances himself/herself; he/she analyzes, evaluates (Chevrier &amp; Charbonneau, 2000). The obsessive seems to use this type of reflective mode of behaviour.</td>
</tr>
</tbody>
</table>

*CE = Concrete experience  
**RO = Reflective observation  
***AC = Abstract conceptualization

(This poster is a résumé of an article which has been accepted for publication in La Revue Québécoise de Psychologie under the title «les modes d’apprentissage des personnes présentant des troubles de la personnalité histriionique et obsessive-compulsive»)

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Design-Based Research Focusing on the Influences of a Pedagogical Three-Field Methodology in Students’ Learning Outcomes.

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Johnny DE BRUCKER (Artesis University College, Belgium) – John.Debrucker@artesis.be
Willy BELMANS (Artesis University College, Belgium) – Willy.Belmans@artesis.be

Abstract

This design-based experimental study was set up to explore the extent to which split-class teaching (SCT) in a three-field methodology variant is successful in training teacher trainer students’ four skills in language learning in this specific type of blended learning setting. The experiment is of a pre-, post-, post- post-test design. Participants are 65 teacher training students, between 18 and 22 years old, with a pedagogic curriculum and an average of 8 hours of English per week. Data are collected using formative and summative testing covering a 3-year time span. Afterwards, the participants’ learning environment perceptions are gauged in a 14-item questionnaire. Preliminary findings tend to show that the research groups significantly perceived the split-class as more motivating and more effective measuring the language learning environment perception in general. This paper presents a thorough general overview concerning the use of ICT in a three-field methodology and suggests hand-on solutions to implement the methodology in your institute. Results are premature but in line with other recent research findings. Nevertheless, this research focuses on a new approach linking communicative language teaching (CLT), self-sustained learning (SSL) and focus on from (FonF) with ICT in a novel language training environment. The paper ends with some advice on SCT implementation and new directions for further research are proposed.

Keywords: computer assisted language learning (CALL); split-class teaching (SCT); self- sustained learning; blended learning & technology (ICT)

1. Introduction

Due to a very heterogeneous student intake and a newly developed interest in the teaching profession, teacher training colleges have to show enormous creativity to respond to this new and challenging situation.

1.1 Pedagogic educational considerations

According to the administrative Bamaflex system the Artesis Teacher Training College student input is very heterogeneous. In the past, students that graduated mostly from a general secondary education (ASO) were attracted to the teacher training colleges. Nowadays there seems to be an ongoing shift to students with a more technical (TSO), vocational (BSO) and artistic (KSO) secondary training background. There is a strong inflow of TSO students and with nearly 50% they form the biggest group (Artesis data, 2009). This is significantly higher than argued by the research by Rombout (2006), where the full Artesis University College scores 37.1% for TSO students commencing their higher education. The Artesis screening project from the PWO-diversity research (2009) concludes that 42.7% ASO, 11.6% BSO, 2.2% KSO and 43.4% TSO students stream into the college.

The teacher training department for professional bachelors consists of nursery education, primary education and secondary education. The last group has a more specific subdivision for general subjects (languages, sciences, ideology), physical education, music education and technical subjects.

Attention in this paper is given to secondary education teacher training students majoring in English. The Bamaflex tables 1 and 2 show a significant amount of students come from an ASO-oriented secondary school training but most have a KSO/TSO/BSO background. First year nursery education is represented by 1K, primary education is 1O, secondary education general studies are 1AV, music, physical education and technical subjects are 1MO, 1LO and 1TV respectively.

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Table 1: summary of input 1st year students teacher training college

<table>
<thead>
<tr>
<th></th>
<th>1K</th>
<th>1O</th>
<th>1AV</th>
<th>1MO</th>
<th>1LO</th>
<th>1TV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASO</td>
<td>16</td>
<td>37</td>
<td>40</td>
<td>9</td>
<td>37</td>
<td>1</td>
<td>140</td>
</tr>
<tr>
<td>KSO</td>
<td>3</td>
<td>12</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>22</td>
</tr>
<tr>
<td>TSO</td>
<td>48</td>
<td>61</td>
<td>46</td>
<td>8</td>
<td>62</td>
<td>24</td>
<td>249</td>
</tr>
<tr>
<td>BSO</td>
<td>38</td>
<td>13</td>
<td>16</td>
<td>2</td>
<td>13</td>
<td>11</td>
<td>93</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>106</td>
<td>123</td>
<td>110</td>
<td>23</td>
<td>113</td>
<td>36</td>
<td>511</td>
</tr>
<tr>
<td>Check</td>
<td>106</td>
<td>123</td>
<td>110</td>
<td>23</td>
<td>113</td>
<td>36</td>
<td>511</td>
</tr>
</tbody>
</table>

*Source: Artesis data recorded on 22nd October (2009).*

Table 2: summary of input 1st year students teacher training college in percentages

<table>
<thead>
<tr>
<th></th>
<th>1K</th>
<th>1O</th>
<th>1AV</th>
<th>1MO</th>
<th>1LO</th>
<th>1TV</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASO</td>
<td>15%</td>
<td>30%</td>
<td>36%</td>
<td>39%</td>
<td>33%</td>
<td>3%</td>
<td>27%</td>
</tr>
<tr>
<td>KSO</td>
<td>3%</td>
<td>10%</td>
<td>4%</td>
<td>13%</td>
<td>0%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>TSO</td>
<td>45%</td>
<td>50%</td>
<td>42%</td>
<td>35%</td>
<td>55%</td>
<td>67%</td>
<td>49%</td>
</tr>
<tr>
<td>BSO</td>
<td>36%</td>
<td>11%</td>
<td>15%</td>
<td>9%</td>
<td>12%</td>
<td>31%</td>
<td>18%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
<td>0%</td>
<td>4%</td>
<td>4%</td>
<td>1%</td>
<td>0%</td>
<td>1%</td>
</tr>
</tbody>
</table>

*Source: Artesis data recorded on 22nd October (2009).*

Because of this mechanism the intake in this specific branch of teacher training is of a very heterogeneous kind during the first year of higher education. Amongst these students there are quite a number who had a lot of English during secondary school (modern languages) or elsewhere (studying abroad, travelling,...) and others who only acquired a basic knowledge of English in a non-language oriented secondary school study or were confronted with the subject long ago within or out of an educational context. The previously acquired knowledge is very diverse and by times worrying.

1.2 Economic considerations

Next to the fact of heterogeneous considerations there is the issue of enrolment multiplication. In 1988 there were only 6 starters and more than 20 years onward (2009) 65 students found their way to teacher training college and the English department. Only a small number of these students graduate. Unfortunately a large percentage of students drop out and this cannot be the aim of a professional bachelor course in higher education. Training this large and heterogeneous group of students to become full-blown English teachers is a painstaking and difficult job. Teaching a group of such diversity calls for a new pedagogic approach, which takes into account the heterogeneity and the magnitude at the same time.

2. Theoretical-pedagogical foundations

In a study by Tynjälä & Gijbels ‘Changing World – Changing Pedagogy’ the authors state that in today’s rapidly evolving society, we are confronted with an exponential increase in information, a growing need for innovation and the requirement to develop new and sufficient skills.

A quintessential challenge for today’s higher education remains the development and implementation of teaching and learning practices that nurture the skills in students to acquire and apply their knowledge in an efficient and effective way, think critically, analyse, synthesise and form opinions and attitudes (Segers, Dochy & Cascallar, 2003).

We need to train students who are being prepared for a future that is mainly unknown (Bowden & Marton, 1998). Employers report that students with a vocational training do not have enough adequate and transferable knowledge and skills in order to be productive (Streumer & van de Klink, 2001). Researchers as
Resnick (1987) argue that knowledge gathered at schools is too far away from the fieldwork and that therefore fresh school-leavers are not fully applicable when dropped onto the labour market. The same is very much true about higher education. Too little knowledge can be used to solve complicated problems. Heading for and implementing instruction that develops the students’ communicative skills is crucial. More skills we argue to be capital for students are: make them think in an efficient and effective way, learn students to evaluate the quality of internet information, solve complex problems, work in team(s),... just to name the most evocative ones. All of the mentioned skills stay important challenges in higher education of the 21st century.

During the first year of higher education students witness that collaboration as a didactic format is not often introduced by lecturers. Memorising and reproducing knowledge during examinations is still the most ‘encouraging’ way to pass your tests. Traditional ex-cathedra teaching produces inert knowledge (Mandl, Gruber & Renkl, 1996). Society needs experts who can communicate, work in teams, share knowledge with colleagues in order to reach common aims and apply new knowledge in new situations (Tynjällä, 1999).

2.1 Integrative pedagogy

The model of integrative pedagogy (Tynjälä, 2009) describes the principle of integrating key elements of learning and the development of expertise. Professional expertise consists of three basic elements which are intertwined: theoretical knowledge, practical knowledge and self-regulative knowledge.

While old school pedagogy or traditional education has treated them separately, modern pedagogy emphasises the unity of theory and practice. Besides theoretical and practical knowledge, the third component of expertise is referred to as self-regulative knowledge which includes meta-cognitive and reflective skills (e.g. Bereiter and Scardamalia 1993). Actions that belong in this category are e.g. discussing with lecturers, tutors and peers; writing analytical essays, building portfolios and doing tasks with self-evaluations. Writing a blog during a training period or learning how to reflect are also part of this category. The process of integrating the theoretical and practical knowledge topped with self-regulation can be seen as the problem-solving model.

As mentioned above, the integrative pedagogy and problem-based learning are closely related. Barrows (1996) recognises 6 basic characteristics that link both.

- Learning is student-centred: the student is central in the learning process and can make decisions related to what/how/when to study, ...;
- Learning happens in small groups under guidance of a coach or tutor;
- Coach or tutor facilitate and guide the process;
- Learning starts out of an authentic problem, prior to studying;
- Authentic problems stimulate learning as a tool to activate problem-solving skills;
- Acquiring knowledge is managed by self-sustained learning.

2.2 Design-based research

Although the three-field methodology is argued by the Integrative pedagogy model, the research project also supports on the design-based research paradigm (Baumgartner et al., 2003).

Researchers, stakeholders and lecturers involved in educational research agree that problems and topics from the fieldwork are often separated from the research itself. Design-based research mixes empirical data with theoretical models from learning environments, because it is essential when using this methodology to understand how education and innovation work in practice.

3. Pedagogic Methodology

3.1 Unravelling the Three-field methodology

The three-field methodology is based on the split-classes approach (Hargreaves, 2005; Hargreaves, 2009) and is characterised by working in small groups while focusing on the four skills activities (reading, writing,
listening and speaking). This approach is being implemented using design-based research where the how, when and why questions of this educational research project in practice are being charted. This design creates the opportunity to fine-tune the pedagogical input while the project is in full development. Split-class teaching research indicates significantly strong scores related to motivation and deep learning with students (Hargreaves, 2009).

During the 2009-2010 academic year the three-field methodology was introduced for the English courses oral and written English. A year later it was also introduced for English didactics. All 65 English students who respectively have 8 contact hours per week in semester 1 and 7 contact hours in semester 2, attend 4/5 hours of English in a plenary session and a period of 3 contact hours using the three-field methodology for oral and written English. English didactics is a semester 2 course and has only 1 contact hour per week and uses the virtual variant of the three-field methodology.

During a split-class session (3 hours) in the three-field methodology the lecturer tries to support, coach and train the students but focuses on the skills where s/he is needed in order to have an effective lesson. The class group of approximately 65 students is split up into 3 smaller groups and distributed across the 3 fields i.e. ‘communication’ (CLT), ‘self-sustained learning’ (SSL) and ‘focus-on-form’ (FonF).

The four skills are activated across the 3 fields but the lecturer integrates extra attention and care in the ‘communication’ field (CLT; Harmer, 1983; 2001) for the speaking skill is of major importance. Role-playing, giving presentations and micro-teaching are some of the actions being dealt with in this field. In the ‘focus-on-form’ field (FonF; Doughty & Williams, 1998; Long, 1991: in Boers et al., 2007) we highlight structures such as grammar, vocabulary and pronunciation in context and recognise individual learning differences related to pick-up time and prior knowledge. The 3rd slot in the learning carousel is the self-sustained learning field (SSL), which deploys the didactic concept of the WebQuest-model (Dodge & March, 1996) and stresses activities on reflective, meta-cognitive skills and self-regulation. All fields are closely intertwined and there is a relevant link in topic(s) between them. The screening at the beginning of the academic year gives a direct input to all fields, the FonF and SSL in particular. Every student is allocated to a group and each group gathers 1/3 of the total group of students. After every 3-hour session in the three-field methodology each student will have undergone communication practice, focus on form with its structural training and the self-sustained learning field using the WebQuest model aiming for the optimisation of the self-regulative skills.

Figure 1: visualisation of the fields and carousel mechanism in the three-field methodology

WebQuests are authentic and highly structured problem-based learning tasks (Boud & Feletti, 1991) which encourage students to collaborate and solve complicated problems in a way they learn more than when executed individually (Vygotski, 1978; De Corte, 1998; Laevers, Van den Branden & Verlot, 2004 in Nicaise & Desmedt, 2009). This socio-constructivist approach using technology as a learning stimulator and challenging lesson materials that fit the students’ learning world runs through the entire course design. Students are encouraged to work together and use technology as a learning stimulator: they don’t learn from a computer but using a computer (Jonassen, 1991). Each field gets and is given feedback by the lecturer or/and the peers. This approach creates a synchronous (contact hours), an asynchronous (VLE i.e. virtual learning environment and WebQuest assignments) and a powerful collaborative learning environment (everyone works on the same tasks at different periods in time) in one go. Students each hold a part of a pedagogic jig-saw puzzle through which motivation and involvement are optimised.
These cohorts of students differ from earlier cohorts (pre 2009-2010) in particular because of the strong, curriculum implemented ICT-component they experience and the fact that because of the three-field methodology they also benefit from the working in small groups. Pre 2009-2010 graduates were educated in large auditoriums and large groups in ICT-poor learning environments using passive and theoretical approaches being not student-centred.

4. Research questions

The main research question we would like to address while developing the three-field methodology are:

- Can the three-field methodology optimise the success rates of this heterogeneous group of professional bachelor students studying English when compared with pre-2009 graduate output?
- What is the motivation and perception of the students undergoing this methodology?
- How do the lecturers involved experience this approach when focusing on workload? Where does this pedagogy generate an asset? Is this approach transferable within the training department?

5. Research methodology

5.1 Cohort research

In the academic year 2009-2010 the kick-off was given for this new cohort research. The three-field methodology research logs students’ output in their higher education career focusing on their study as a professional bachelor secondary education in English. Three aspects of the students’ development in function of their success rate in this research are central:

- The communicative development (CLT): knowledge and 4 skills mastery;
• The development of the self-regulative skills in function of FonF (Focus-on-Form);
• The development of the meta-cognitive and reflective skills by using the WebQuest model.

To monitor the students for the above mentioned qualities they will be exposed to interviews, tests and questionnaires. Previous schooling, SES i.e. socio-economic status, formative and summative evaluation, age... are all scrutinised. This information is gathered through coupling the cohort information with the Bamaflex files which are administered by the Artesis central office. Three moments of information gathering have been planned. A first round (2010-2011) for the above described group of students. In the 2nd and 3rd round (2011-2012 and 2012-2013), these groups will be examined once more and will be compared with the new and old cohorts (pre 2009-2010) of graduates and will function as the reference group. The students’ success rates and studying time will be monitored.

6. Preliminary results

Findings:

Although the kick off for the project was given only in September 2010 there are already some useful preliminary indicators. Students describe the methodology as intense but fruitful. Learners use the English language intensively in various contexts. Amongst the three-field methodology first learning environment perception impressions responded by the students are the active learning ingredients, the variety of instruction and freedom to develop skills, the fixed week-by-week repetitive approach (rhythm and structure). Further impressions are: working at your own pace and communicating in small groups. All students addressed the high FUN level as principal motivator.

Researchers and lecturers underpin these first impressions and are aware that the clarity of the SSL-tasks and answer templates are important pivots in the whole approach. Heavy workload and time management are always in (re-)consideration. First drop-outs are a fact but this means we keep the more motivated budding teachers. In the near future on the other hand we should shift the focus from material development to process mechanisms that optimise the self-regulative skills of students.

7. Discussion

Relevance:

In this research we focus on a methodology called split-class teaching (SCT) in its three-field variant. It is a pedagogical approach combining the pros of communicative language teaching (CLT), self-sustained learning (SSL) and Focus-on-Form (FonF) in a computer-assisted language learning (CALL) format. The first being recognised as a quality instrument for stressing the significance of language functions in a variety of contexts and for a variety of purposes, involving realistic communication aiming at successful language simulation and performance, the 2nd (SSL) captures the meta-cognitive, self-regulative knowledge and reflective skills using the WebQuest model as conceived by Dodge & March and the 3rd (FonF) for highlighting a task-based learning approach where adequate time and effort is spent on formal grammatical, vocabulary, pronunciation,... structures using all available multimedia components, thus eliminating the vague language framework and obscure word pick-up. While previous studies had already provided ample evidence of the ICT, CALL and CLT benefits, the present study is intended to explore potential benefits of the split-class three-field teaching technique to improve students’ quantitative and qualitative output i.e. obtaining a degree in the end. We are investigating the three-field methodological impact on students' four skills performance, their learning environment perceptions and how self-regulating skills can influence the path towards successful studying.

8. Conclusions

Because research data are not yet available we consider it premature to draw conclusions. While previous studies had already provided ample evidence of the ICT, CALL and CLT benefits, the present study is intended to explore potential benefits of the split-class teaching technique in its three-field variant. Forecasts and first impressions are looking promising, though.

"Education is not the filling of a bucket, but the lighting of a fire." W.B. Yeats (1865-1939)
9. References


The Impact of Dyslexia on Learning and Creativity in the Visual Arts

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Abstract

The aim of this study is to reach conclusions on the thinking approaches of Dyslexic artists in their visual creative production to inform Continuous Professional Development in post 16 education.

The objectives are:
1. To context set by investigating the needs of Dyslexic learners and the gaps in provision for learners in mainstream education.
2. To examine Dyslexic arts practitioners learning styles and ways in which they impact on the production of work and the visual arts
3. To investigate frameworks for learning and teaching that could be developed from any research findings (outcome)

My research is essentially a qualitative investigation that is embedded within action research methodology as an active process of exploration (McKernan.J 1996). Rooted in case study ethnographical perspectives and with a critical-participatory approach the research focuses on social justice in mainstream education (Hammersley M and Atkinson P 2007).

The research uses a mixed method approach drawing on qualitative and quantitative methods. The qualitative methods, include semi-structured interviews, focus groups and an exhibition to profile the creative practice and are designed to be empathetic to the participant’s voice and practice. The quantitative methods will include an online survey to benchmark data to provide an objective contextual view to the qualitative enquiry.

The research aims to explore cognitive learning through a series of participant case study investigations. This research is an active process with ongoing feedback obtained from the case study artists within the changing circumstances in which they produce their work (Carr and Kemmis 1986). An element of the research will include creative practice informed by the research enquiry. This creative practice will culminate in an exhibition to build on the formative process of the case study work.

With this research I expect contributing to a gap in knowledge through the investigation of a range of creative Dyslexic practitioners who have navigated mainstream education with a set of learning strategies drawn from life experience. Through a series of case studies (including my own):

the purpose will be to find out what are the approaches to the thinking and intelligences acquired by these practitioners and how this might usefully inform continuous professional development (CPD) in relation to post 16 mainstream education. The research results will map different learning routes to provide findings for a range of teaching and learning approaches.

I will set out to investigate -what do different styles of learning mean ? in connection with creativity and the possibility of a further learning style, that of ‘intuitive creativity’.

The case study practitioners each have their own way of producing their visual work and it is the patterns of this production that this research investigates. The use of a visual symbolic language (Austerlitz.N, 2008) that renders a thinking process and the action of that production that includes exploration and critical reflection. (Steffert.B, 1999)

The poster session will look at the implications of an aural and visual learning style for teaching and management by outlining the research aims and the social justice context within which the research is set.

Keywords: Learning, action research, dyslexic, creativity, visual

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The Role of Educational Places to the Construction of Business Students’ Professional Identity

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Abstract

The aim of this poster presentation is present my ongoing PhD work that is in early phase. It presents the state-of-art literature review of relevant literature and narrows down the research question for PhD-study.

A mosaic of places influences most people over the lifetime. In a modern Western society people tend to shift places through residential mobility and also the places themselves change rapidly through economic development and migration (Hay 1998).

Relph (1976: 22) defines places as centers of meaning. Indeed, people transform abstract spaces to defined and bounded places by giving them meaning (Smaldone et al. 2005). Thus, people create places and place creation and meaning flow from continual process of interaction between person, the social surroundings and the physical setting. This process results to socially constructed sense of place (Greider & Garkovich 1994). Thus, as Smaldone et al. define: “place is a complex concept, whose reality is constructed as people attach meaning to a physical setting in a variety of ways.” (2005).

Moreover, Prohansky (1983) has demonstrated the importance of place to personal identity. Indeed, the process of place creation serves to reinforce and shape individual and collective identity (Low & Altman 1992, Greider & Garkovich 1994, Stokowski 2002)

Person’s self- and place-identity is not a static one, but evolves during growth and changes over the course of individuals’ lifecycle. Other people are important in shaping the place-identity of a person and each major stage during the lifecycle as well as other critical periods in life, such as death of a close-one, brings changes to self-identity of a person. (Prohansky et al. 1995). Indeed, when people are studying for some occupation or profession, the places have strong influence on place identity. “We can expect place identity to occur with respect to the places and of educational training.” (Prohansky et al. 1995: 95)

The place research shows that places have strong influence on persons’ development of identity. Within higher education, the aim is to develop students’ professional identity to meet the expectations in the future working environments. Thus, it is interesting and important, how the educational places can support the growth and development of professional identity.

In this poster, the state-of-art literature review on place research and professional identity research is conducted and research gaps are analysed. The special interest in given to the context of higher education, especially business studies.

The literature review gathers together the relevant literature on the topic area, analyses the relevant concepts of place attachment, place dependence, place identity, sense of place and professional identity and eventually narrows down the research question. At the time of submitting the abstract, based on the literature review the preliminary research question for the PHD-study is to analyze the role of multiple places in business students’ professional identity construction. In the poster presentation the preliminary theoretical framework on how places influence identity construction is presented and methodological approach is discussed.

Keywords: Place research, place identity, professional identification

References


Looking at Learning Approaches from the Angle of Student Profiles

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Abstract

This study starts with investigating the relation of three variables with students’ approaches to learning. The first variable is the contextual variable perceived workload. Based on prior research, our hypothesis is that workload will relate negatively to students’ deep approaches to learning and positively to surface approaches to learning (e.g. Diseth, 2007; Kember, 2004). Secondly, the relationships between two student characteristics and approaches to learning will be examined, more specifically, motivation for learning and WMC have been selected. It is expected that autonomous motivation will relate positively with a deep approach to learning and negative with a surface approach. Controlled motivation is expected to relate oppositely to students’ approaches to learning. The relation between WMC and approaches to learning will be explored. In order to gain more insight in the interplay between the ability and non-ability student characteristics in student learning (Chamorro-Premuzic & Furnham, 2008), this study aims at investigating if different student profiles differ in their approaches to learning. Student profiles will be identified based on the WMC and motivation of the student. It will be examined if these different profiles differ in their approaches to learning. Finally, we will explore if the different student profiles experience a different influence of workload on their approaches to learning. Based on the research of Nijhuis, Segers & Gijselaers (2008) who found that differences in variability were related to course characteristics, it is expected that different profiles experience a different impact of workload on their approaches to learning.

In total 108 second year bachelor students studying educational sciences participated. This quasi-experimental study was conducted within the course “Theory and practice of group work”. At the beginning of the course, students’ typical approaches to learning, their motivation for studying the course and their WMC were measured. Students were given two assignments designed to have a different workload. After each assignment they filled out a questionnaire regarding their perceived workload and approaches to learning. To investigate the relations between the variables several statistical analysis were performed: paired samples t-test, correlations, cluster analysis and ANOVA.

Results show a relation for workload and motivation but not for working memory capacity. By means of a cluster analysis 3 student profiles were identified based on working memory capacity and motivation. Students characterised by high working memory capacity and average motivation scored higher on surface approaches and lower on deep approaches than students with high autonomous motivation. These latter students also score higher on deep approaches than students characterised by low working memory capacity. Finally, it was found that all student profiles responded the same to the influence of workload. In contrast with prior research, deep approaches were higher when workload was high.

The person-centred approach in this study is likely to yield more diagnostic and detailed information concerning students approaches to learning, because it allows an examination of the additive or interactive effect of WMC (ability) and motivation (non-ability student characteristics) (Vansteenkiste, Sierens, Soenens, Luyckx & Lens, 2009).

Keywords: Student profiles, approaches to learning, motivation, workload, working memory capacity

References


Approaches to Teaching in Vocational Adult Education. Validation through a Multimethod Design

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Abstract

This poster gives an overview of the research questions and planned activities in my PhD project.

In the past decades, the teaching approach concept was mainly studied in a university context. This research discerns two teaching approaches: a student or learning-centred approach on the one hand and a teacher or content-centred approach on the other hand. Thus far, however, research into other contexts than the academic is rather limited. We pose the question whether the teaching approach concept and its dimensionality can be generalized towards teaching contexts that focus less on knowledge. In other words: do the two approaches (student vs teacher-centred) apply to a teaching context that focuses on vocational skills or should the teaching approach concept be implemented differently in that context?

Another limitation is the so far almost exclusive use of the self-report study technique as a means of researching the teaching approach. This self-report technique, however, does not always provide the researcher with authentic information. There is a difference for instance between what the teachers say and what they actually do (Robson, 2002). For further enquiry, therefore, other research designs and techniques are required, that lead to more valid and reliable data to define the teaching approach.

Considering the shortcomings and gaps of the available research, we will endeavour to answer the following research questions.

RQ1: Analysis of the teaching approach concept applied by university teachers shows two approaches, which the most researchers confirm, viz. a learning-centred and content-centred approach. Studies of the teaching approach in a university context show no unequivocal image of how conceptions on teaching and the teaching approach are related to one another.

- Are these two approaches also to be found in a context of vocational adult education and training? Which components can be distinguished?

- How do these approaches relate to one another in the context of vocational adult education and training?

- How does the teaching approach concept relate to conceptions on teaching in this context?

RQ2: In previous studies, the teaching approach concept was largely highlighted by teachers applying self-report techniques. Will the same results come out if we analyze the teaching approach concept with other methods?

We will use mixed method research techniques in order to describe the teaching approach concept profoundly. In the first phase we will carry out a replica study. Based on the findings of the replica, we will develop in phase 2 an instrument to map the teaching approach of teachers in vocational adult education. We will develop an instrument that measures the teaching approach in a rather classical way, viz. via self-reporting by the teachers. In the third phase we will try to validate the teaching approach concept as found in phase one, by means of a mixed method design. We will then translate the measuring instrument developed in phase two in an instrument for students: how do they perceive the teaching approach of their teacher? Based on the measuring instrument of phase two, we will also develop an observation instrument.

By presenting this poster at ELSIN, I hope to be able to discuss my research-plans in view of my PhD project with scholars in the field.

Keywords: Teaching approach, mixed method design, student-centred, teacher-centred
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Explicit Teaching of Reading Strategies: Its Effects on Reading Comprehension and Motivation in English for Legal Purposes Course

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Abstract

In order to explain the reading process, scientists have developed several theoretical models including bottom-up (Gough, P. B., 1985; LaBerge, D. and Samuels, S. J., 1985), top-down (Goodman, 1985; Smith, 2004) and interactive model (Rumelhart, D., 1985; Ruddell and Speaker, 1985) as the synthesis of the previous two models. Interactive model states that the level of reading comprehension depends on how well the reader variables such as motivation for reading and awareness of reading process interact with the text variables such as text type and structure (Hosenfeld, 1979).

Research has shown that excellent readers possess a greater metacognitive awareness of reading strategies and use a greater variety of strategies than poor readers (Alderson, 2000; Block & Pressley, 2008; Cohen, 1998). Also, excellent readers know how to use them appropriately, that is, they possess metacognitive control. The third characteristic of a strategic reader is metalinguistic awareness which Nagy (2007) defines as the ability to reflect on language knowledge and structure and the ability to manipulate that knowledge consciously. Foreign language reading is an even more complex process due to the interaction of at least two languages as both Interdependence Hypothesis (Cummins, 2000) and the Language Threshold Hypothesis posit (Alderson, 2000).

L2 reading research has shown that explicit teaching of reading strategies raises students metacognitive and metalinguistic awareness allowing them more control over the reading process (Oxford, 1991; Cohen, 1998) which may in turn lead to higher reading motivation which has also been shown as an important characteristic of a strategic reader (Kondo-Brown, 2006; Mori, 2002).

According to Douglas (2000), strategic competence is essential in English for Specific Purposes because it serves as a link between language and content knowledge on one side and the context of usage on the other. We believe teaching reading strategies will prove beneficial to students who possess neither content nor context knowledge and have poor L2 knowledge.

This research is motivated by the following question: can current L2 reading theories and reading strategy theories be successfully applied to an English for Legal Purposes course? We will try to address it through these hypotheses:

- Experimental group will outperform the control group on the comprehension test.
- Poor readers will show the greatest improvement in reading comprehension.
- Experimental group will show greater awareness of reading strategies than the control group.
- At the end of the treatment reading motivation will be greater in the experimental group.

First year law students will participate in this study during their first semester (30 hours). They will be given a reading comprehension test at the beginning of the first semester in order to ensure equal distribution of poor, average and excellent readers into the experimental and control group. Each group will consist of 30 students. The same reading materials will be used in both groups, but the control group will not receive any instruction in reading strategies while the experimental group will be taught using the SSBI (Styles-and Strategies Based-Instruction) method which is based on the following series of components: strategy preparation, strategy awareness-raising, strategy training, strategy practice and strategy personalization. 30 reading strategies will be taught using this method.

The following instruments will be used at the beginning and the end of the semester: ELP reading comprehension tests in order to determine the progress in reading comprehension; SORS questionnaire (Survey of Reading Strategies) to determine the students metacognitive awareness of reading strategies; and a reading motivation questionnaire developed by Mori (2002) and adapted for Croatian law students to find out the effects on participants’ reading motivation of ELP texts.

At the end of the semester a semi-structured interview will be conducted with 5 poor, 5 average and 5 excellent readers from the experimental group in order to find out their attitudes towards this method of teaching. The collected data will be analysed qualitatively and quantitatively using SPSS. T-tests will be performed to determine the statistical significance between the means on reading comprehension tests of experimental and
control group as well as means on the reading strategies and reading motivation questionnaires before and after the treatment. To test the second hypothesis, analysis of variance will be performed to compare the means on reading comprehension tests of poor, average and excellent readers in experimental and control groups.

The results of this research will provide insight into the effects that explicit teaching of reading strategies has on raising students' metacognitive awareness and metacognitive control as key components for reading comprehension in English for Legal Purposes. It will also show how greater awareness of reading strategies influences ELP reading motivation.

**Keywords:** Reading strategies, English for Legal Purposes

**References**


Acceptance and Use of a Performance Assessment Scoring System for Problem-Based Learning in Higher Education

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Abstract

Goal is the systematic evaluation and dissemination of an innovative learning assessment model for higher education. PASS (Performance Assessment Scoring System) can be used for analytic as well as holistic purposes, but its strength will especially be played out in analytical assessment. In complex learning environments, students have to show mastering of a set of concepts and methods, and acquisition of competence in applying them under semi-realistic conditions. PASS enables an assessor to specify and capture qualitative and quantitative assessment criteria of an arbitrary number of assignments of arbitrary type. It is fully adaptable, extensible, as well as compatible with more traditional assessment approaches and local assessment practices. The project will run a series of case studies, in which the potential merits of PASS for assessors will be evaluated and a feasible dissemination scheme for faculty management will be set up and rolled out.

PASS itself has been developed and tested in the author's own classes over the last four years driven by the necessity to solve several interdependent assessment problems, e.g. how to convert group assessments into individual assessments. It turned out that a clever mixture of several methods and techniques can solve all the identified practical problems, and some more. We have already shown the advantages and tested an implementation of PASS as far as possible. A study of the consequences of adopting/applying PASS by lecturers working in distinct cultural/educational environments is still missing. The research question is which factors are responsible for negative/positive attitudes to adopting/applying PASS, and - if negative - which alternative assessment policies/strategies are used, and why.

Through Evaluation-in-Action experiments and real-life show-cases we expect to be able to demonstrate that PASS is not just another well-designed fancy assessment model, but one which holds its promises with respect to practicality, adequacy, validity (as for results) and soundness (as for methodology).

There will be only one success criterion here: will PASS be adopted by lecturers and supported by faculty? Extended interviews with all stakeholders during all phases will be reported and analysed to find substantive explanations for either "Yes" or "No". Explanations may be at all levels: personal, behavioural, cognitive, educational, national, and cultural.

Our goal for PASS was to discover a model and tool that matches as well as possible the cognitive processes and working contexts of (analytically-minded) assessors taking cognitive resources and practical limitations into account. We expect that PASS will be effective, efficient and satisfying for teachers and students, without sacrificing completeness, correctness and other equally important formal criteria. The project gives us a chance to empirically demonstrate that PASS as is fulfils our – and teachers’ - expectations. Anyway it offers a generic solution for some practical problems in day-to-day assessment without requiring extended statistical expertise from the assessors or students.

Keywords: PBL, formative assessment, summative assessment, scoring, marking, grading, fuzzy logic and measurement

References

Abstract

As in all other professions there are also exceptionally talented managers to be found in the hospitality industry. The outstanding, superior performance of these managers are so unique it is often believed such professional heights can only be achieved by a chosen few, endowed with the gifts of personality traits, charisma, good leadership, and human relation skills. It is those who can wear a permanent smile and communicate well with others which make it to the top of the executive ladder. However, the question may be posed whether we really know how experienced managers approach complex problems in daily practice and whether we possess a theory of schooling, which might contribute to the development of managerial competencies.

My research attempts to identify the practice wisdom or knowledge, its acquisition, and the linkages that exist between the epistemologies adopted by competent hospitality managers. Practice wisdom, according to Fletcher (1996) is different and is the opposite of practice skills. It grants sufficient autonomy to act upon and alter the profession. It is that which makes a professional more than a technician. “Wisdom is opposite to folly”, Fletcher writes. This practice wisdom or knowledge of which I speak is probably best described by scientist and philosopher, Michael Polanyi, through the well quoted aphorism, “We know more than we can tell”(Argyris and Schön, 1974 p 108). This is an inexplicable wisdom that seems to mystify management practice and management education alike. It is the kind of knowledge I believe excellent managers should possess.

In pursuit of these goals, a web of relationships among personality (IPIP), learning style, practical intelligence or tacit knowledge, emotional intelligence (SUIET) and management performance in the form of knowledge are presented as research questions and hypotheses guiding this study. As an educator of hospitality management, I cannot pin-point explicitly what are the defining characteristics of an expert hotel manager, but I know them when I see them. I recognise these characteristics when I visit well managed hotels, read and hear interviews conducted with executives of hospitality management. To unravel what this knowledge entails is a central objective of this research.

This research aims to understand the expert performance of hospitality managers and how hospitality experts learn from their experience and education to gain useful knowledge that supports their decision making processes. The relationships among personality, learning style, practical or tacit intelligence, emotional and cognitive intelligence are considered as predictors of success. Like previous studies in cognitive psychology, Chi, Farr and Glaser (1988), Isenberg (1984, 1986) Sternberg and Horvath (1999) and Arts (1996), Arts, Gijselaers and Segers (2006); this study focuses on (a) a theory of expertise that describes skilled performance and knowledge structure which is hoped to be stimulated in novices, (b) a theory of acquisition that describes the process of knowledge and skill construction which people use in acquiring new competencies and (c) a theory of intervention that prescribes the actions to be taken by educators in order to stimulate the novices learning process and provide appropriate external information. The four studies in this research project are also concerned with the mental processes which are involved in performing various tasks and management decisions which are made in everyday running of hotels.

The objective of Study 1 is to investigate how managerial information is selected, interpreted and finally represented.. I will further explore what cognitive units i.e knowledge and information types which are important during reasoning on hospitality managerial tasks. From this exploratory research on the development and acquisition of hotel managerial expertise, I hope to find the different variables that account for expertise development, can be assessed. Thus the main research question that will be addressed in this study is:

What is the role of knowledge in the development of managerial expertise in hospitality?

Personality and emotional intelligence are considered as variables that are often used to explain success in hospitality management. Many curricula for hospitality management build on the belief that certain personality traits, talents and emotional intelligence are the key to the development of expertise in this domain. On top of that, these beliefs are confirmed in labor market studies for hospitality industries. Typically these studies collect interview or survey data from human resource executives, management practitioners, members of executive advisory boards, program directors, and graduates. A consistent research finding in these types of studies is that employers and employees indeed identify personality and talent as key factors to explain careers in hotel management. However, research in cognitive sciences has demonstrated that superior performance is
not necessarily a matter of talent and emotional intelligence. To investigate this I will address the following research question in Study 2.

**Do emotional intelligence and personality play a role in expertise knowledge development?**

Study 3 aims to consider the relationships among personality, emotional intelligence and learning style on the one hand, and the impact of these variables, on expertise development in hospitality management on the other hand. The research questions asks how traits affect expertise development, with special attention paid to tacit knowledge.

In what ways do learning style, personality, emotional intelligence and tacit knowledge affect expertise development?

Finally Study 4 looks at relationships among experience or tacit knowledge, personality, emotional intelligence and learning style and their roles in the development of expertise in hotel managers. The study seeks to answer the central research question:

**How does internship experience affect learning in hospitality management given emotional intelligence, personality, tacit knowledge and learning style?**

Below I have outlined the procedures for each study.

### Study 1:
**The Role of Knowledge in Expertise Development in Hospitality Management?**

**Instruments:** Three Hospitality Management Cases

**Subjects:** 90 subjects: 25 first, 25 fourth, 25 eighth semester students and 15 expert hotel managers who are working in the hotel industry and have acquired approximately 5-7 years experience.

**Main Research Question:** What is the Role of Knowledge in Expertise Development in Hospitality?

**Study Design:** Cross sectional

**Analysis Method:** Proposition Analysis of Reasoning and Performance

### Study 2:
**Effects of Emotional Intelligence and Personality on Expertise Development**

**Instruments:** 3 Case Studies, The Big Five Personality Test (IPIP) and Emotional Intelligence Test (SUIET) Same data set as in Study 1, excluding experts but now adding The Big Five Personality Emotional Intelligence (SUIET) to explain scores on case protocols from Study 1.

**Subjects:** 75 participants - 25 first, 25 fourth and 25 eighth semester students

**Main Research Question:** Do emotional intelligence and personality play a role in expertise knowledge development?

**Study Design:** Correlation

**Analysis Method:** Propositional Analysis seeking relationships

### Study 3
**Differential Influence of Personality, Emotional Intelligence and Learning Style on Expertise**

**Instruments:** 3 Cases, SUIET, IPIP, and Learning Style

**Subjects:** 75 participants: 25 first, 25 fourth and 25 eighth semester students.

**Main Research Question:** How traits affect expertise development with special attention paid to tacit knowledge

**Study Design:** Correlations

**Method of Analysis:** Propositional Analysis seeking relationships

### Study 4 A:
**Effects of Experience on Learning in Hospitality Management**

**Instruments:** First Observation (Measurement) cases 1, 2 and 3, SUIET, IPIP, and The Learning Style Inventory.

**Subjects:** 75 participants, 25 first, 25 fourth and 25 eighth semester students

**Main Research Question:** How does Internship experience affect Learning in Hospitality Management (Case Scores), given emotional intelligence, personality, tacit knowledge and learning style.

**Study Design:** Longitudinal study (First semester students measured against the fourth semester)

**Analysis Method:** Regression analysis and pad analysis

### Study 4 B
**Instruments:** Second Observation Measurement Cases 1, 2 and 3, SUIET, IPIP, The Learning Style Inventory adding Tacit Knowledge Instrument.

**Subjects:** 75 participants: 25 first, 25 fourth and 25 eight

**Main Research Questions:** How does Internship experience affect Learning in Hospitality Management (Case Scores), given emotional intelligence, personality, tacit knowledge and learning style.

**Study Design:** Longitudinal Study, first semester students measured against the fourth semester

**Analysis Method:** Correlations
The results of the studies so far are in-conclusive. However there is some support from earlier studies, Arts, Gijselaers and Segers (2002, 2006) and van de Weil (1997) that expertise development is a long process with several peaks and lows. From all indications expertise development in hospitality management is no different than in other domains. Hotel managers are knowledge users. Few studies have sought to relate the expertise of hotel managers to knowledge.

The empirical studies included in this research have set the stage for much needed work in exploring the nature and assessment of the behaviors of hospitality and tourism experts. Some work has been done to identify competencies needed for success in these industries. However, educators and researchers need to fully understand the cognitive knowledge that hospitality managers use when carrying out their duties. Findings from the above studies in this thesis should:

1) Encourage professionals in education and industry to reflect on their daily practice so that standards can be developed for these professions and

2) To help improve knowledge about curriculum development in the context of management education for the hospitality and tourism professions.

On a personal level this research will afford the author the experience with additional technical relevant skills needed for further occupational development. Acquisition of research based techniques for the analysis of management and information system are direct results of writing this thesis. More importantly as a practitioner researcher, the capacity to conduct research within my academic field will help me become a competent enquirer.

Keywords: Hospitality managerial expertise, managerial knowledge, information processing, cognitive skills and competencies of hotel managers.

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ELSIN XVI

GOOD

PRACTICES
Encouraging Greater Resilience and Independence in Learners

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Abstract

The purpose of this study is to investigate how teachers/educators can empower students to become more resilient and independent as learners. In order to achieve this aim the study employs quantitative and qualitative assessments in both cognitive and affective areas.

Factors such as time constraints, number of students in a class and extensive course material to be covered, indicate strongly that it is not practical or realistic for a student to constantly use the teacher as a default.

The sample for the study consists of 60 mixed ability 11 year old students in a coeducational, urban British High School. There are approximately equal numbers of male and female students.

Initial assessments of the 60 students have been carried out using measures of anxiety and self esteem (Beck Youth Inventories for Children and Adolescents, Beck, J.S.; Beck, A., Jolly,J.B, and Steer,RA, 2005), field dependence-field independence (Embedded Shapes Test (EST) Pearson, F. 2008); and working memory (Working Memory Rating Scale (WRHS) Gathercole, S. Alloway, T.P, (2008).

Raw scores and “T”scores will be examined between these fundamental areas influencing learning with the aim of identifying clusters of pupils who share similar characteristics and then grouping them together for teaching purposes. Also, correlations will be computed in an attempt to identify relationships between the cognitive (i.e. field dependence-independence and working memory) and affective measures (i.e. self-esteem and anxiety)

As part of the study a “Learning Log” is being developed with the students in which they reflect and record their feelings, impressions, wishes and level of engagement during instruction.

In order to address any discrepancy between the current attainment of students and their desired attainments/learning outcomes evidence from both the cognitive and affective areas, i.e. the information obtained from the quantitative and qualitative assessment will be continually considered.

An essential part of this study is the quality of feedback given by and to the students. (The Power of Feedback Review of Educational Research, Hattie, J, 2007). Although the students will be allocated into groups according to their level of self esteem, anxiety, field dependence-independence and working memory this information will not be shared directly with the students themselves. However, training will be given to ensure that no labelling takes place on the part of the teachers or teaching assistants involved in the study. Therefore a differentiated teaching approach will be adopted to meet the needs of each group. Combined with regular inspection of the Learning Log, this approach is likely to ensure that an ethos is developed to encourage progress during lessons.

By using this approach that takes into account affective and cognitive states a deeper and more productive relationship is likely to be established with students. It is hypothesised that skillfully encouraging students to bridge the gap between current and desired attainment will result in greater self regulation and higher confidence levels. This, in turn, is likely to foster greater effort in lessons.

In order to establish that change has taken place it is planned to reassess the students using the same quantitative assessments and by examining any changes in the Learning Log (qualitative assessments) some weeks later.

Keywords: Cognitive Affective Anxiety/Self Esteem, Field dependence-independence, working memory

References


Integrating Research and Practice: How Research Instruments Can Be Used as Incentives for Improving Student Teachers’ Professional Learning

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Abstract

One of the aims of many teacher education programs is to develop student teachers’ conceptions and skills necessary for their further professional development during their teaching career. Multiple studies have suggested that an independent and meaning-oriented way of learning is regarded as being preferable for becoming an expert teacher (Hagger, Burn, Mutton & Brindley, 2008; Oosterheert, 2001). However, this learning competence is often mentioned as the most intangible competences by student teachers as well as teacher educators. A series of studies carried out at a one-year post-graduate teacher education programme (Endedijk, 2010) have shown that less than half of the student teachers was able to develop themselves in towards an independent and meaning-oriented learner during a one-year school-based teacher education programme. Therefore, an intervention was developed to make student teachers more aware of how they learn and what good professional learning means.

In order to make student teachers more aware of how they learn and teacher educators of how their students learn, the Personal Learning Report was developed. This report consists of a description of how the student teacher learns on three different moments during the one-year teacher education programme. The report is based on the outcomes of the Inventory Learning to Teach Process (ILTP, Oosterheert, 2001) and the Structured Learning Report (Endedijk, 2010), which are completed by the student teacher. In the first year, the report was given to all participating students (N=80) at the end of the teacher education programme, to see whether the reports were meaningful for the student teachers and to serve as a baseline for follow-up studies. In the follow-up year, a personal report was already given after half a year, to see whether this would help them improving their way of learning in the second half of the year. Furthermore, the experiment was extended to another teacher education institute.

Student teachers responded positively to the Personal Learning Reports: in an evaluation questionnaire, two-thirds of the respondents spontaneously described how much they had learned from reading their personal description of their development as a learner. Furthermore, because the reports showed also alternative ways of learning, student teachers got new ideas how to vary more in how they learn. On the other hand, it turned out that the majority of the student teachers was satisfied with their results, even if they showed a survival oriented way of learning. During the presentation, also the results of the comparative analysis between the base-line and follow-up group of student teachers will be discussed.

This example of good practice shows how research instruments can be used as incentives for improving student teachers’ professional learning. Student teachers are often asked to reflect by themselves in a portfolio on how they learn. However, using research instruments to give them feedback on how they learn and showing alternatives turned out to be a more powerful start for student teachers and teacher educators to start the conversation about the quality of student teachers’ professional learning.

Keywords: Teacher education, student teachers, professional learning, meaning-oriented learning, intervention

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Guidance for Independent Learning in Teacher Education through ‘Supervision’

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Abstract

Supervision within teacher education is a method of learning guidance for small groups of students during their teaching practice (Rozemond, 2000). Experiences of practice offer a rich source of material to learn from in supervision. The concerns of the students are the starting point. Problems, uncertainties, frustrations and dilemmas can be addressed, but also positive experiences and successes.

Supervision is focused on independent learning (Siegers, 2002). The students choose the experience of practice they wish to discuss, they formulate their own learning questions and they search for answers themselves. The aim is to learn students how to deal with their learning questions on their own efforts. The group can support this process. The role of the supervisor isn’t to supply ready-made answers to the questions, but to stimulate and monitor the learning process of the individual and the group (Harrison, Lawson, & Wortley, 2005).

Teaching behavior is influenced by external factors, but also by an unconscious body of thoughts and feelings, beliefs and values, needs and experiences, roles, and habits. Supervision aims to raise awareness of the personal educational philosophy. In this way, the students build their own professional teaching style in confrontation with the requirements of the professional context.

Ideally a supervision group consists of six students and one supervisor. The group gathers approximately eight consecutive weeks at meetings of 1.5h in parallel with the teaching practice of the students. The meetings take place at the Training Institute at some distance away from the teaching practice. The starting point is always a concrete experience of teaching practice, described by one student in a work report. The other group members prepare for the meeting by reading and commenting it. Shortly after each meeting all the participants write a reflection report to process the content of the meeting. An electronic learning platform is used for file exchange and communication.

The link with the professional performance is essential. Supervision supports students to find a balance between professional socialization and personal identity. Private problems are not on the agenda.

A crucial condition for successful learning guidance is a safe learning environment. All information addressed upon at the supervision is treated confidentially. There is a strict separation between supervision and practice guidance. The supervisor doesn’t assess the teaching competence but the students’ ability to learn and reflect. The evaluation criteria are explicitly discussed with the students.

Supervising these groups is intensive and comprehensive. In addition, the organization requires a solid volume of staffing.

Learning from teaching practice requires a form of profound reflective learning. The students analyze their performance, reasoning, motivation and feelings in teaching situations, both on the instrumental level of their teaching and on the fundamental level of their educational philosophy. Acquiring this competence is crucial to lifelong learning. Students that master this type of experiential learning, are capable of independent learning throughout their teaching careers

Keywords: teacher education, supervision, independent learning

References


Adult Learners, Blended Learning and the Home Care Sector: a Winning Combination

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Abstract

In the spring of 2010 a group of 17 experienced caretakers in the Dutch homecare sector started with a course to become a ‘First Responsible Caretaker’. The blended learning course was based on a combination of an interactive website with information a discussion forum and films with role models, a workbook with flowcharts of the seven home care sub-processes, on-the-job learning tasks including the drafting or updating of a care plan, and meetings with a buddy and an assessor. The course was feasible (80 percent finished the course within the set time of three month. The quality of the materials was highly rated. Participants would recommend the course to colleagues) and effective (knowledge about care processes and competencies to draft a care plan, to monitor its implementation and to revise the care plan) were enhanced. New pilots with the course are planned. Options to strengthen the quality of the assessment instruments applied in the study and to use this form of blended learning in other sectors and with other target groups are discussed.

Keywords: Adult learners, e-learning, blended learning, home care sector

1. Introduction

At the end of January 2010, a group of seventeen caretakers came together for the first time at the start of their continuing vocational training course ‘First Responsible Caretaker in the home care sector’. Three month later, at a festive last meeting, the certificates were awarded. In itself, nothing special, if not for the fact that these meetings were the only two times all participants met each other. In the meantime they had been in contact via the internet. On a site, only open to the participants, they could find learning materials, discuss with each other, refer to other sites, etcetera. Participants came from all over the Dutch province of Friesland.

In this paper an overview is presented of the reasons why the training package for this target group was developed, its theoretical background, the way it was implemented and the results obtained. The learning package was the result of a close collaboration, within the EU Leonardo da Vinci programme, between the home care organisation De Friese Wouden, the Faculty of Education at the University of Erfurt (Germany) and the Kenniscentrum Beroepsonderwijs Arbeidsmarkt.

2. Background

2.1 Practical background- home careprovison and caretakers

In the Netherlands, home care is provided to those who need it to keep living independently. The first step in the process of getting home care is to ask for an assessment by the Centre for the Assessment of Care Needs (CIZ: Centrum voor Indicatiestelling Zorg). This process results in a list of care tasks which are to be provided to the client and which will be paid for by the AWBZ, a social security fund. The tasks can included in the indication cover the provision of personal care, such as helping to take a shower or to get dressed, and the provision of basic medical tasks, such as administering medicines, and of more complex nursing tasks, such as tending wounds and giving injections. On the basis of the list, the care receiver can invite one or more care providing organisations to bid for the delivery of the care. Together with the client and, almost always his or her family, a First Responsible (FR) Caretaker from a home care organisation draws up a care plan. In
other words, the care indication is translated into an operational plan in which it is indicated who will provide what kind of support at what time during the day or week. The FR Caretaker is, in addition to proving the care, responsible for monitoring the implementation and, when required, the updating of the care plan.

Home care is provided by caretakers and nurses. Caretakers have finished a two or three years vocational training course at approximately level 2 or 3 of the European Qualification Framework or a nursing course at EQF level 4 or 5 (http://ec.europa.eu/education/lifelong-learning-policy/doc44_en.htm).

2.2 Home care providers and continuing training

Why offer continuing training to workers in the home care sector? The first reason is to ensure that the best possible care is provided. The average age of a caretaker in the Dutch home care sector is 45. This implies that the majority of the caretakers has finished her – over 95 percent is female - initial training over 20 years ago. Over the last decades the demands made on caretakers are significantly increased. Clients are released from hospital earlier, clients stay longer in their own house, and care tasks have become more complex. So the competency level of caretakers needs to be refreshed and broadened. Refreshed to be able to provide the ‘best’ care and broadened to be able to act as an FR caretaker. As mentioned above, such a caretaker must be able both to provide care and to plan, monitor, evaluate and adjust it. To be able to carry out the latter mentioned tasks, the caretaker needs a good overview of the kinds of care her organisation and others can provide and must have the competencies to ensure that the care plan always reflects the needs of a client. Thirdly and finally, in order to ensure that a caretaker stays as long as possible on the labour market, she must be able to assess her own physical and psychological capacities properly. Being able to do so ensures that she can indicate at the right moment which care tasks should be transferred to other care providers, e.g. nurses, or when care in a nursing home is required.

2.3 Theoretical background

In order to make the training course for the target group – experienced caretakers in the home care sector, over 45 years of age, working alone - as effective as possible it was decided in the starting phase to base it on a combination of theories about how adults learn, e-learning and blended learning.

The Faculty of Education at the University of Erfurt has developed a model of how adults learn most effectively (Grimm-Voncken, Vonken, Kattein & Oschman, 2008). This approach is an adaptation of the ‘Arbeitsprozessorientiert’ (work flow embedded) model constructed by staff of the Fraunhofer Institute for vocational training in the IT sector (Rohs, year unknown; Schmidt, 2005). The model is based on the assumptions that the more (a) learning is integrated into daily activities, (b) the theory about the new activities is bridged to ‘old’ activities, so that links to the existing knowledge framework can be easily made, and (c) the interim outcomes of the learning process have a direct practical value, the more effective the learning process will be (Bolhuis & Simon, 1999). In order to structure the steps within the learning process, a representation of the tasks to be learned is presented in the form of a flow chart. The learner is taken, step by step, through the chart. For each step the competencies required are indicated and information, explanations, tests, etc. are provided.

E-learning is the container name for learning situation based on the application of information and communication technology, in particular the internet. The advantages of e-learning are evident. Learning can take place at a time – e.g. during a night shift – and a place – e.g. at home or at a learning spot in one of the Friese Wouden offices - which are convenient to the learner (Bergenhenegouwen, Mooijman & Tillema, 2002). For a pilot, in which the participants live all over the province, avoiding travelling time to joint meetings, is an extra bonus. However, it is known that the L of e-Learning often stands for Lonely. Maintaining motivation in an e-learning course is hard to do. The drop-out rate is often high (Tyler-Smith, 2006).

Blended learning, or a mix of on- and of-line learning, seemed a much promising solution for this issue. It is assumed that the combination of these two types of learning is more effective that each one individually, as different needs of the learner (e.g. individual self study and direct contacts with others or indirect via the internet) are met.
3. The training package: elements, participants and implementation

3.1 Elements of the training package

The blended learning package consists of a workbook, a website, practical tasks and personal contacts with a buddy and an assessor. Staff of De Academie, i.e. the in-house training department of De Friese Wouden, was responsible for the development of the package (Opzeeland, 2010).

The workbook, in which each of the seven subprocesses of the home care process are presented in the form of a flow chart, forms the core of the training package. As extra support to the participants each of the sections is enriched with a self assessment test (see table 3.1: “to what extent do I already possess these competencies?”) and examples taken from of work situations. A website with (references to other sites with background) information, films in which a role model reviews each of the subprocesses and a forum. The site was produced by students from the NHL, a third leven vocational education institute. Practical tasks of which the drafting of a new or the updating of an existing care plan is the most important one. Meetings with a buddy to discuss any issue related to the care and learning process. The buddy, i.e. a very experienced First Responsible Caretaker, monitors progress in the learning process, provides advice and motivates the participant. Meeting with a manager. Each participant has a manager who is responsible for the assessment at the end of the course.

Table 3.1: Competencies: a sample of the generic and sub-process specific competencies

<table>
<thead>
<tr>
<th>Generic competencies – a FR Caretaker …</th>
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<tbody>
<tr>
<td>- can communicate / has communication skills</td>
</tr>
<tr>
<td>- can cooperate with other care providers in a multi-disciplinary team</td>
</tr>
<tr>
<td>- has knowledge about, age related, health issues and illnesses</td>
</tr>
</tbody>
</table>

Some of the sub-process specific competencies – a FR Caretaker…

1) Prepare first meeting with client
   - knows where to get official care indication documents
   - reads background documents about client related health issues

2) Assess care needs
   - can assess care needs of a client
   - can describe the family / care providers network around a client

3) Compare care indication with care needs
   - can review official care indication documents
   - knows how to carry out a revision procedure

4) Transform care needs into care plan
   - can produce a clear, well structured care plan, indicating care activities
   - can clearly indicate who is responsible for which tasks

5) Provide care
   - can provide care according to quality standards
   - can maintain a professional relationship with a client

6) Evaluate care provision and adapt care plan
   - can monitor the implementation of care activities / care plan
   - can invite other care providers to join the team

7) End the provision of care
   - can forward information to e.g. a hospital or a home for the elderly
   - knows how and where to file relevant documents

3.2 Participants and implementation

Seventeen female caretakers of De Friese Wouden started with the course. Their average age was 52.5 years. They had, on average, seventeen years of experience in the care sector. With one exception, all had already taken part in at least four training courses.

The course started on 28 January 2010 and finished on 21 April 2010. On that date thirteen participants received the certificate. The main reason for dropping out was the illness of either the participant herself or of a member of her family.
4. Evaluation

4.1 Questions and data collection

As the training package was implemented for the first time, a formative evaluation approach was adopted. The main evaluation questions were: Is the training package feasible (desired target group reached, materials clear?) and: Is the package effective (goals achieved)?

Participants completed two questionnaires. One before the course, which contained questions about background of the participant, i.e. age, experience with care and continuing training, etc., and one after the course, with questions about the learning outcomes, the time invested in the course, etc. In addition, during the course interviews were held with four participants and two buddies. Questionnaires were also completed by buddies and managers. They were asked to rate the learning progress made by participants and the time they themselves had invested in the course. See Meijer, Kees, Opzeeland & Douwes (2010) for more background information.

4.2 Feasibility

All involved were also asked to rate the quality of the workbook and the website. In general participants, buddies and managers held a positive opinion about these two features of the learning package. The quality of the website got a score of 7.5 from the participants and a 7.0 from the buddies. The managers did not have access to the site. The clarity and user friendliness of the site got high scores. On all features the buddies are a bit more critical than the participants. Managers, buddies and participants awarded the workbook an 8- an even higher score than for the website. Here too the buddies were most critical. The fact that one buddy, in a group of five, was, in comparison with the others, very critical has had a negative impact on the average score.

It was planned that the course would require an investment of 1.5 to 2 hours per week per participant or 16.5 to 22 hours for the full 11 weeks course. Ten hours could be booked by the participants as working time; the other hours were regarded as a ‘private investment’ in the participant’s own professional development. Table 4.2 shows that participants invested on average 17.5 hours in the course, with an almost even split between studying the workbook, the website, taking part in meetings and drafting / updating a care plan.

Table 4.1: Assessments of the quality of the workbook and website

<table>
<thead>
<tr>
<th></th>
<th>participants</th>
<th>buddies</th>
<th>managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORKBOOK</td>
<td>Overall</td>
<td>7,7</td>
<td>7,3</td>
</tr>
<tr>
<td></td>
<td>useful</td>
<td>7,8</td>
<td>7,6</td>
</tr>
<tr>
<td></td>
<td>informative</td>
<td>7,8</td>
<td>7,2</td>
</tr>
<tr>
<td></td>
<td>clear</td>
<td>7,6</td>
<td>7,2</td>
</tr>
<tr>
<td></td>
<td>easy to use</td>
<td>7,6</td>
<td>7,2</td>
</tr>
<tr>
<td>WEBSITE</td>
<td>Overall</td>
<td>7,5</td>
<td>7,0</td>
</tr>
<tr>
<td></td>
<td>useful</td>
<td>7,5</td>
<td>6,8</td>
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<td></td>
<td>easy to use</td>
<td>7,5</td>
<td>7,2</td>
</tr>
</tbody>
</table>

Sources: 11 participants, 5 buddies and 7 managers.

Participants reported that they used the website from “occasionally” to “almost every day”. On average each participant spent about 3.5 hours on the website. Each visit lasted 12 minutes and 48 seconds. During that time 15 pages were opened. In the context of linking theory with practice, each participant had drafted one new care plan and upgraded three. Each participant reported to have had three or four meeting with her buddy. The self reported number of learning hours shows that the majority of the participants is willing to invest own time in the course.

Each buddy was responsible for two or three participants. Buddies, who were given five paid hours for their counselling task, spent about double this number on the meetings with the participants. Managers met each participant once or twice. The assessment session was regarded as a part of their normal working tasks, so they did not get any hours earmarked for it. Each was responsible for one or two participants and spent, including time for the preparation and reporting, 3.5 hours on each participant.
Table 4.2: Time investment of participants, buddies and managers; number of hours

<table>
<thead>
<tr>
<th></th>
<th>Avg overall number of hours</th>
<th>information meetings with workbook</th>
<th>website participant buddy manager drafting care plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>participant</td>
<td>17.0</td>
<td>4.0</td>
<td>3.5</td>
</tr>
<tr>
<td>buddy</td>
<td>10.0</td>
<td>2.0</td>
<td>6.0</td>
</tr>
<tr>
<td>manager</td>
<td>5.5</td>
<td>1.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Sources: 11 participants, 7 buddies and 7 managers.

4.3 Effectiveness

Managers and buddies were asked to rate the competency level of the participants at the end of the course using a 10 point scale\(^1\) (see table 4.3). The competencies covered four knowledge categories, including knowledge of illnesses and of care products of De Friese Wouden, four skills categories related to drafting, implementing and evaluating a care plan and three generic competencies, i.e. communicating, cooperating and using a computer (see table 4.4). In addition, they were asked to assess the learning gains made by a participant. On each category they could indicate whether the participant had become ‘better’ or ‘much better’. Afterwards, the score ‘better’ was, in line with Dutch tradition, interpreted as a gain of one point on the ten point scale and ‘much better’ as a gain of two points.

At the end of the course (see table 4.3) the average score for participants given by the buddies and the managers (see table 4.4) was a 7.2, with the individual scores ranging from a 6.1 to a 7.8. The average learning gain was 1.2. Between the participants the gain varied between 0.5 and 1.7 points. This overall result is very satisfactory. In the Netherlands giving high marks, i.e. an 8 or higher on an assessment scale, is not very common. Eight out of eleven scores of a 7 or higher can be regarded as a good result.

Table 4.3: Final mark and learning gain score by buddies: on average and by participant

<table>
<thead>
<tr>
<th></th>
<th>data per participant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>final mark</td>
<td>7.2</td>
</tr>
<tr>
<td>learning gain</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Note: 10 = highest, 0 = lowest

The first things which attract attention in table 4.4 (top row) is that the average score given by managers and buddies is exactly the same: a 7.2. For the three groups of categories (knowledge, working with a care plan and generic competencies) there are minimal differences in the average scores of buddies and managers. It is at the level of the eleven separate categories that differences are found. Buddies gave higher marks than managers for knowledge of rules and regulation, assessing care needs and communication skills. Managers were more positive than buddies as regards the knowledge of participants about illnesses.

As regards the average competency level of the participants at the end of the course, there are hardly any differences between the opinions of the managers and the buddies. There are, however, differences in their opinions as regards the categories in which learning gains are made. The buddies saw gains made on four core categories, namely on the competencies which are directly related to assessing care needs and drafting, implementing and evaluating a care plan. Managers saw gains made on the knowledge which a participant needs to be able to carry out her work. The impression is that buddies, who had met the participants more often than the managers, looked more at progress made in practical job competencies. Managers tended to focus more, or pay more attention to, gains in the knowledge categories.

What do the participants themselves say about what they have gained from the course? They were given a list of fifteen learning effects (see table 4.5) with the question: to what extent has this effect been realised?

In line with the assessments of the buddies and the managers, the participants themselves rate their learning progress overall as ‘good’. The participants indicate that their knowledge about care and caring has been brushed up and extended. Relevant new knowledge about illnesses and medicines has been acquired which, so say some, was already applied in their work. The new knowledge and the wider competencies have enabled the participants to draft better care plan.

\(^1\) In the Dutch education system a 10 point marking system is applied, with 10 as the highest and 1 as the lowest mark.
### Table 4.4: Scores of knowledge, skills and generic competencies

<table>
<thead>
<tr>
<th></th>
<th>buddies</th>
<th></th>
<th>managers</th>
<th></th>
<th>differences between assessments (1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mark</td>
<td>gain</td>
<td>mark</td>
<td>gain</td>
<td>mark</td>
<td>gain</td>
</tr>
<tr>
<td><strong>Overall average final mark</strong></td>
<td>7.2</td>
<td>1.0</td>
<td>7.2</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knowledge of handbook care plan</td>
<td>7.2</td>
<td>1.6</td>
<td>7.0</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>knowledge of illnesses</td>
<td>6.9</td>
<td>0.6</td>
<td>7.3</td>
<td>1.0</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>knowledge of rules and regulations</td>
<td>7.0</td>
<td>0.5</td>
<td>6.5</td>
<td>-</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>knowledge of care products</td>
<td>6.9</td>
<td>0.6</td>
<td>7.0</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>average mark <strong>knowledge</strong></td>
<td>7.0</td>
<td>0.8</td>
<td>7.0</td>
<td>1.1</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>can assess care needs</td>
<td>7.5</td>
<td>1.4</td>
<td>7.2</td>
<td>0.5</td>
<td>0.3</td>
<td>0.9</td>
</tr>
<tr>
<td>can draft a care plan</td>
<td>7.2</td>
<td>1.4</td>
<td>7.3</td>
<td>0.8</td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>can provide care</td>
<td>7.5</td>
<td>0.9</td>
<td>7.6</td>
<td>0.3</td>
<td></td>
<td>0.6</td>
</tr>
<tr>
<td>can evaluate care</td>
<td>7.1</td>
<td>1.3</td>
<td>7.3</td>
<td>0.5</td>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td>average mark <strong>occupational skills</strong></td>
<td>7.3</td>
<td>1.3</td>
<td>7.4</td>
<td>0.4</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>can communicate</td>
<td>7.6</td>
<td>0.9</td>
<td>7.3</td>
<td>1.0</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>can cooperate</td>
<td>7.4</td>
<td>1.0</td>
<td>7.5</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>can use computer</td>
<td>7.0</td>
<td>1.0</td>
<td>7.1</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>average mark <strong>generic competencies</strong></td>
<td>7.3</td>
<td>1.0</td>
<td>7.3</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: - = no / insufficient data available  (1) only differences of 0.3 or larger are indicated.

### Table 4.5: Self assessment by participants: in %

<table>
<thead>
<tr>
<th></th>
<th>totally agree</th>
<th>tend to agree</th>
<th>tend to disagree</th>
<th>totally disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have updated my knowledge and skills</td>
<td>70</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have already applied my new knowledge</td>
<td>50</td>
<td>40</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>I can produce a care plan better</td>
<td>20</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have acquired new knowledge and skills</td>
<td>20</td>
<td>70</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>I have acquired new information</td>
<td>20</td>
<td>60</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>I can provide better care</td>
<td>10</td>
<td>50</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>I carry out my job with more pleasure</td>
<td>10</td>
<td>20</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>I have gained self confidence</td>
<td>20</td>
<td>50</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>I have set learning goals for the future</td>
<td>80</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know how to set learning goals</td>
<td>70</td>
<td>20</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>I am (more) motivated to learn</td>
<td>60</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have gained self discipline</td>
<td>50</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I got acquainted with new ways of learning</td>
<td>40</td>
<td>40</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>I can use the internet better</td>
<td>10</td>
<td>60</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>I can use the computer better</td>
<td>20</td>
<td>35</td>
<td>35</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: 11 participants

Seventy percent of the participants disagrees with the statement that they enjoy doing their work more after than before the course. Many of the participants say that already before the course they were happy doing their work. In other words: not much learning gain could be made in this respect.

Ninety percent of the participants say that the job related aims of the course have been achieved. Participants say that they are better able to prepare and evaluate a care plan. They are less sure whether they can implement it better.
In the context of life long learning, it is relevant to note that over three quarter of the participants say that they have become more self confident and that they now know better what they would like to learn in the future. Half of the group says that they are (re-)motivated to learn again, but the same number doubts whether they have enough self discipline to do so.

Eight out of ten participants have become acquainted with a new way of learning. They have learned to search effectively for information on the internet. About half of the group indicated that their computer skills were improved.

On the open question: ‘What else have you gained from taking part in the course?’ five participants answered that they had learned to use the care plan better: “I now find it easier to convince colleagues to work in a proper way with a care plan. I can explain and demonstrate that an up-to-date care plan is useful for both the client and the caretakers”.

A second group of, again five, participants mentioned that, due to the course, their professional role has been reinforced. “Now, I can look at myself and the type of care I am providing in a more critical way” remarks a participant. Another one adds that she: “has become much more aware that the care plan is an important tool. Not simply a book in which notes are made and which is signed to prove that the client has been visited. It plays an important role in monitoring the health situation of the client”. During the final meeting one of the participants remarks that the course has enabled her: “to have an open discussion with a doctor and a nurse. As a FR Caretaker I dare to speak out now, if I think it is in the best interest of the client”.

5. Conclusion and discussion

The main conclusions of the pilot with the blended learning training package ‘First Responsible Caretaker’ are:

*The training package is effective.* According to buddies and managers, the participants have made clear learning gains, can draft better care plans, can reflect better on their work and have become more confident and better able to use the computer and the internet as learning tools. The participants agree with this assessment.

*The training package is feasible.* The intended target group – experienced workers over 45 – is reached. Three quarter (13 of the 17) of the participants finishes the course within the time set for it. Participants rate the quality of the workbook and the website with a score of 7.5 out of 10. Nine out of ten participants are interested in taking part in a similarly designed course and will recommend their colleagues to do likewise.

These conclusions are, at least in the eyes of the authors, much promising. However, this does not imply that no critical comments can be made.

Only a small group of participants took part in the pilot. More trials and/or larger groups are needed to be able to draw firmer conclusions about the validity and reliability of the conclusions. At the time of writing this article – April 2011 – already a second pilot with 9 participants has started and for later this year a third one is planned. This means that additional evaluative data will come available about the package.

There was no control group, therefore the value of the achieved outcomes are hard to interpret. Possibly, with another learning mode the same or even better results could have been achieved. As there was no control group, this argument is hard to refute. However, as in the past a classroom based variant of the course has been implemented, the staff of the Academie was asked to compare the results of the two models. In their opinion, the outcomes of the blended learning model were certainly as good as, if not better, than those of the classroom model. As regards the time investment required in the two variants, there were clear differences. The classroom based approach cost participants an investment of six days of eight hours plus home work. A total of 48 hours plus. This implies that the blended learning model leads to a significant reduction in time investment for a participant and the organisation.

The instruments used to assess the learning outcomes and gains should and can be made stronger. Their validity and reliability should be increased. In the pilot, the assessment methods used by De Academie (see section 3.1) were used. De Academie is already discussing with regional Vocational training Colleges, opportunities to strengthen the assessment procedures. This could be achieved through for instance offering training to managers and/or buddies so that they can become officially recognised assessors. In this way the training package could also be linked to the formal Dutch qualification structure. This would mean that participants can gain part-qualifications which have a recognised value on the labour market.
Can the blended learning model be used for other target groups and in other sectors? In our opinion: yes. In the first place, because the model is based on features for which it was already shown that they are effective in other sectors. The work flow embedded approach (see section 2.2.) worked well in the IT sector and as a training model in SMEs (Grimm-Voncken et al. 2008). So why not in other sectors too? In our opinion, as long as it is possible to represent the main working tasks in a sector in a structured flow chart, the model is applicable. In the pilot, e-learning was added to the equation. Computers and the internet created no problems for our target group of 45+. There is no reason to expect that e.g. with a younger age group, there will be any problems in this respect. Opportunities of talking (in) directly to an expert were another addition to the model. This form of mentoring worked well, in particular as regards the interpersonal aspects of drafting and implementing a care plan. This approach seems applicable too in other sectors and for other target groups.

All outcomes taken into account, it seems more than worthwhile to invest further in the development of this type of blended learning packages and in evaluating the combination of theoretical models on which it is based.

6. References


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Learning Trajectory Coaching in a Teacher Training Program

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Gert VANTHOURNOUT (University of Antwerp, Belgium)

Abstract

Today’s higher education faces the challenge of not only having to teach students a range of domain-specific frameworks and disciplinary insights, but also having to foster skills that will enable them to become ‘knowledge workers’ and ‘lifelong learners’ (Dumont & Istance, 2010). It is said that to reach these goals, education should stimulate students to acquire deep and self-regulatory learning skills (Simons, Van der Linden, & Duffy, 2000). This is certainly also true for the context of teacher education. Learning-trajectory coaching is seen as a means for helping students cope with the heightened and changing demands of higher education and a way for preparing students for lifelong and professional learning (Hagger, Burn, Mutton, & Brindley, 2008).

This presentation describes the design, implementation and evaluation of a learning-trajectory coaching trajectory in a Flemish teacher training program. Learning-trajectory coaching is seen in this program as a range of initiatives aimed at helping students reflect on their role as a professional, learner and as a person. Learning-trajectory coaching starts from the assumption that these ‘professional learning processes’ can be optimized by making students aware of who they are (as a teacher, learner and professional) and by reflecting in group on how to cope with new and changing situations (exams in higher education, first internships, first contact with students in the classroom, …).

The learning trajectory coaching trajectory is comprised of group activities, called learning groups, and individual progress interviews between students and their learning trajectory coach.

A learning group is a group of about ten students who together reflect on their roles as a starting professional, learner and person under supervision of a learning trajectory coach. Most learning group sessions are linked to a critical experience for students in the first year of higher education, e.g. their first observations in a school, their first exams, their first internship, ... Through a range of assignments and discussions, using various methods, students are stimulated to reflect on these experiences and to explore how these experiences affect them as a professional, learner and person. Participation in the coaching trajectory is mandatory. During the First year of the course students participate in six to ten learning group-sessions of about two hours. All faculty in the course act as a learning trajectory-coach.

During the academic year students also have three individual progress interviews with their coach. These interviews allow students of coaches to discuss progress, individual problems and personal topics, without the rest of the group being present.

Learning-trajectory coaching predominantly succeeds in providing students with much needed socio-emotional support. Students very much appreciate their coach being involved in their learning processes. However, exploratory research on the current program shows that that strong and highly motivated students have a higher appreciation of the format. Students who lack regulatory skills experience the LTC as having a higher workload. Therefore, for these students the individual progress interviews might prove crucial.

Also sometimes a conflict can be observed on devoting time and energy on each of the three roles incorporated in learning trajectory-coaching. Some faculty advocate that preparing students in their role as starting professional should be the main goal, while other prefer taking a wider angle and devoting more time to the roles of students as learners or persons.

Finally a real challenge for learning trajectory coaching is taking students’ individual differences and preferences into account, for instance by looking for a balance between methods of reflection that capitalize on written reflection and more oral activities.

Preparing students for lifelong and professional learning and the rapidly changing society remains a challenge for (higher) education. Various methods of supporting students in their learning process towards lifelong and
professional learners have been proposed (theoretically at least). However expertise and experiences on how to implement trajectories is still lacking. Both theory and practice can learn from good practices on this topic.

**Key words:** Learning patterns, teacher education, learning trajectory coaching

**References**


Lemo on Goleweb: An Educational Instrument to Enhance Students’ Learning Competences

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Peter DAVID
Nick JANSEN

Abstract

Our aim is to enhance students’ learning abilities by raising more awareness about their own learning competences through the provision of feedback and specific learning skill training activities. We want to stimulate teachers to be more attentive to the learning processes of pupils and students. We want to stimulate teachers, tutors and study counsellors to set up activities to strengthen students’ competences for effective learning. And finally, by means of all these activities, we want pupils and students to be more successful in their studies.

We implemented Goleweb, a web based educational tool on motivation characteristics and learning competences that can be used by secondary schools and H.E. institutions. Students who fill in the Lemo questionnaire (Donche, 2010) get immediate feedback together with a short explanation and tips. The focus lies on making students aware of their learning strengths and weaknesses. The tool provides also reports for counselors and lecturers to make them aware of student characteristics when constructing learning environments or coaching the learning process of the student.

Based on many sources like for example the Dublin Descriptors (Joint Quality Initiative informal group, 2004), the results of research (Donche & Van Petegem, 2007) and based on the experience of teachers from secondary and higher education, from the Netherlands and Belgium, we defined 6 crucial learning competences that are crucial in order to make a successful transition from secondary school to University College and in order to succeed in the first year of higher education.

1. Self-Knowledge: Knowledge about own learning style, about the way one studies
2. Self-Regulation: Taking study and the organisation of the study process in one’s own hands: orientation, planning, evaluating and adjusting
3. Working Together (cooperative learning): Learning with each other & from each other
4. Analysing-structuring-relating: Seeing the different parts of the content, seeing the connections and still keeping an overview
5. Critical processing: Not just accepting theory, comparing arguments, giving alternatives, having a personal opinion
6. Application-oriented: Giving examples - Applying the theory in everyday life/on the job

A student who masters these competences has a great chance in making a successful transition from secondary to higher education, and to pass in the first year in higher education.

Together with practitioners in the field of education, specific materials for learning, coaching, and feedback were developed and tested.

Through the use of the web based system with the Lemo questionnaire and the immediate, appreciative feedback, we experience a lot of enthusiasm with teachers and especially study counsellors. They assert that the instrument together with the tools and tips we offer on the accompanying website, gives them means to coach students’ learning more effectively. We also have indications that the positive way we give feedback to pupils and students raises their awareness about their own learning competences. To evaluate the impact on study success we have to set up research of the outcomes.
The feedback that pupils and students receive after filling in the Lemo questionnaire makes them aware of their own learning strengths and weaknesses. We have indications that all these activities result in more effective learning and probably also in more effective teaching.

The database behind the web based educational tool delivers a valuable resource for further research. For instance: which learning styles occur and which learning competences and motivation characteristics correlate with study success.

**Keywords:** Learning styles, learning competences, web based feedback system, group reports on learning competences and motivation characteristics

**References**


Recognising Informal and Non-Formal Learning – A New Higher Education requiring New Pedagogic Skills?

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Abstract

In 2009 Cedefop issued European guidelines for the validation of non-formal and informal learning. Such learning ‘takes place in the spaces surrounding activities and events with a more overt formal purpose, and takes place in a much wider variety of settings than formal education or training’ (Eraut, 2004). Research by Eraut (2004) indicates that, although many people equate learning with formal education, most workplace learning takes place in the workplace. Such learning takes place when ‘knowledge is created through the transformation of experience’ (Hensman, 2001). Critical reflection on practice is an integral element of the transformation of experience into higher level learning; it is a complex process which students do not find easy, and facilitating students’ reflection requires a sophisticated pedagogy. The process of reflection requires the student to develop meta-cognitive skill – the ability to observe their own practice and learning, and the pedagogic skills required for the facilitation of students’ reflection are quite different to those required to disseminate theoretical knowledge within the academic disciplines. Biggs points out that most of higher education is organised on the basis of a ‘transmission model’ whereby tutors are experts who disseminate theoretical knowledge to their ‘novice’ students. This model may be appropriate for young, inexperienced students, but cannot respond effectively to lifelong learners who have considerable informal and non-formal learning. Mature, experienced, professional learners require a different approach from higher education. Jarvis argues that, rather than being involved with pedagogy, such learners required that academic staff are involved in adragogy, which Knowles defines as ‘the art and science of helping adults learn’ (cited in Jarvis, 2004). When facilitating reflective practice, the relationship between the tutor and the learner is much more egalitarian than that of ‘expert’ to ‘novice’. Ramsay argues that there should be a ‘new metaphor of tutor-student relations, that of Paraclete – from the Greek verb meaning to draw alongside’ (2002). This would require academics who are supporting experiential learning, whether in the workplace or elsewhere, to move ‘from seeing themselves as persons who induct students into a disciplinary culture to one in which they accept a role as learning consultants, actively engaged in mediating work, context and academic expectation’ (Boud and Tennant, 2006). These are the characteristics which would support a learner-centred response to experience-based learning, while at the same time ensuring appropriate academic standards. The academic skills involved are, for example, the ability to evaluate general characteristics of learning across different contexts, and to design assessment which does not draw on specific disciplinary content but which does require a high level of performance. This facility to support students in the ‘translation’ from one discourse to another, academic discourse allows for a wider recognition of learning, but ensures that appropriate academic standards are maintained.

During this study we consider the pedagogic skills required to recognise informal and non-formal learning by exploring current debates relating to learning in context, and drawing on the author’s own practice of using informal and non-formal learning in programme design. Effective pedagogies to support and assess experience-based learning will be fundamental to the development of full recognition of informal and non-formal learning, but these are quite different to those required for teaching and assessing theoretical knowledge inside the university.

Keywords: Informal learning, non-formal learning, experiential learning, work-based learning, critical reflection

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