




University of Tartu
Tartu Ülikool



9th CONFERENCE OF EARLI'S JURE

**Models and Learning:
Theory, Design and Application**

30th June – 4th July 2006 Tartu, Estonia

 **EARLI** JURE
9th Conference



University of Tartu
Tartu Ülikool

9th CONFERENCE OF EARLI'S JURE

**Models and Learning:
Theory, Design and Application**

30th June – 4th July 2006 Tartu, Estonia

 **EARLI JURE**
9th Conference

Foreword

9th EARLI's JURE 2006 conference is hosted by University of Tartu, Science Didactics Department. The theme of the conference is "Models and Learning: Theory, Design and Application". This theme includes, but is by no means limited to, following topics: models in theory building, models in research methods, models in data-analysis, instructional design models ICT-based models in learning, learning models, student assessment models and evaluation models. The conference includes five keynote addresses by internationally recognised scholars. In addition, the academic events of the conference consist of seven workshops and twenty one concurrent paper and poster sessions. In addition to a wide variety of stimulating presentations, the conference will end with the Business Meeting of JURE where organizing committee and host country of JURE 2008 will be elected.

During JURE 2004, when we took the responsibility of organising this event, we set ourselves a goal of making a conference which will enable young researchers to discuss their research with academic peers, internationally recognised scholars and senior researchers. We hope that the programme and planned activities will enable you to share your research concerns, gain an insight on the current trends in the research and receive a feedback on your presentation and research design.

In this booklet you will be able to find the abstracts of all presentations in alphabetical order by author's last name, a detailed conference programme, a list of keynote addresses, description of workshops as well as the list of invited speakers and participants.

We wish you good times in Tartu and Estonia and a memorable conference.

JURE 2006 Conference Organising Committee

Margus Pedaste (chair)

margus.pedaste@ut.ee

Kai Pata

kai.pata@ut.ee

Anna Wernberg

anna.wernberg@bet.hkr.se

Marina Michael

marinam91@yahoo.com

Boris Jokic

boris@idi.hr

Goknur Kaplan Akilli

k111@psu.edu

ISBN-13: 978-9949-11-394-1

ISBN-10: 9949-11-394-6

Keynote speakers

- Filip Dochy filip.dochy@ped.kuleuven.be
University of Leuven, Belgium, University
of Maastricht, The Netherlands
Managing director of EARLI — European
Association for Research on Learning and
Instruction
- Wolfgang Schnotz schnotz@uni-landau.de
University of Koblenz-Landau, Germany
Editor of EARLI journal Learning and
Instruction
- Shaaron Ainsworth Shaaron.Ainsworth@nottingham.ac.uk
School of Psychology, University
of Nottingham, United Kingdom
Coordinator of EARLI SIG Comprehension
of text and graphics
- Wouter van Joolingen w.r.vanjoelingen@utwente.nl
University of Twente, The Netherlands
Member of the coordinating team of EARLI
SIG Computer supported inquiry learning
- Roger Säljö Roger.Saljo@ped.gu.se
Göteborg University, Sweden
President of the Executive Committee
of EARLI

Workshop sessions

Approaches to analysing external representations

Shaaron Ainsworth

School of Psychology, University of Nottingham, United Kingdom

Shaaron.Ainsworth@nottingham.ac.uk

The aim of a workshop is to discuss approaches to analysing representations with a practical focus. e.g. information, semantic, cognitive affective, strategic levels of analysis. Participants are invited to bring along some representations they would like to analyse.

Combining qualitative and quantitative approaches

Katrin Niglas

University of Tallinn, Estonia

katrin.niglas@tlu.ee

The workshop will tackle an issue of research methods in a context where both qualitative and quantitative approaches are not only seen as valid and useful ways of studying educational phenomena, but it is assumed that, in some cases, combined design may be the best choice for a particular research project. Current practice by which research courses are often either qualitative or quantitative, and even if taught in a single course, then in a sequential manner and with no attempt to draw parallels between the two arguably polar approaches, will be challenged — instead of the classification of research into two or three clearly separate methodological paradigms, we will look at methodology as a qualitative-quantitative continuum.

How to get actively involved in EARLI, the SIG meetings and the EARLI journals and publications

Goele Nickmans & Filip Dochy

EARLI office, University of Leuven, Belgium

goele.nickmans@ped.kuleuven.be

filip.dochy@ped.kuleuven.be

This could be very interesting topic for all young PhDs. It deals with how young researchers can be better involved in EARLI SIGs, what kind of conferences the SIGs held, what kind of conference publications they

have, also what is the aim of different EARLI journals. Recently one new journal Educational Research Review has appeared that invites young researchers to apply the publications that are based on their doctoral studies to be submitted.

Video-analysis

Pekka Salonen

University of Turku, Finland

peksal@utu.fi

Recent advances in digital video technology and software development for behaviour analysis have resulted to integrated hardware-software systems raising the versatility and flexibility of video-analysis to an unequalled level. It is now possible to observe, record, capture, and transfer different aspects of participants' behaviour to the computer, and then code and analyze multimodal behaviour streams 'on-line', directly on the computer. Moreover, sophisticated software and methods of analysis (e.g., T-pattern analysis, state-space grids, Karnaugh maps) have been developed to detect time-related macro patterns or hierarchical behavioural structures hidden among enormous amounts of 'non-transparent' interaction data.

The present workshop will discuss new integrated computer-assisted systems for the real-time recording, coding and analyzing of complex person-situation interactions in learning and instructional settings. First, we will shortly introduce and discuss some major methodological principles for real-time analysis of multimodal interpersonal behaviour. Second, we will discuss examples of video-based, computer-assisted recording, coding, and analysis of multimodal behaviour comprising, e.g., cognitive, affective, motivational and social control elements and time-related relationships or patterns (e.g., coordination) across participants' behavioural streams. Finally, the workshop will discuss the applicability of real-time behavioural analysis to different learning and instructional settings, such as individual text-processing, dyadic scaffolding transactions, and small-group collaborative learning.

From reject to accept. How to present and write scientific paper

Ulla Runesson

Goteborg Univesity, Sweden

Ulla.Runesson@ped.gu.se

The workshop deals with issues like: characteristics of a research paper, how to communicate one's ideas and learning from referees.

How to understand the inner life of data

Leo Vöhandu

Tallinn University of Technology, Estonia

leov@staff.ttu.ee

He is the grand old man of Game theory and talks in a very challenging way of different new ways how to look at your data, how to find regularities from data, what kind of new visual methods there are to see these regularities. Issues: how to estimate the hidden complexity and dimensionality of datasets; how to peel data; how to create order in data (if it is possible!).

The responsibility of research (and researchers) in educational innovation

Silvia Caravita

Institute of Cognitive Sciences and Technologies, Rome, Italy

caravita@ip.rm.cnr.it

Educational researchers often complain the limited effects that their findings produce on the school system. The workshop will take into account a range of research projects selected from the literature, particularly in the field of science education. We will analyze and discuss the factors that may positively or negatively influence an effective interaction between research and school, the constraints that originate at different levels of organization of the school and of research systems. The participation of young researchers from different countries will contribute to make comparative analyses more insightful.

Dear colleagues,

The University of Tartu is welcoming you in the small, yet historical and heart-warming city of Tartu to the 9th conference for Junior Researchers of the European Association for Research on Learning and Instruction. We hope that you will enjoy your stay in Estonia.

This international conference on theme “Models and Learning: Theory, Design and Application” aims to give you the opportunity to:

- discuss your research with internationally recognised scholars and/or senior researchers;
- share your research concerns with researchers from all over Europe and beyond;
- receive feedback on your presentations and your project designs.

We hope that this conference will be a great opportunity to learn from the experiences of peers and senior researchers. The focus of the keynote speeches and practical workshops will be the problems that arise from conducting research.

The proposals have been reviewed by an international committee of EARLI SIG members. We are grateful to all anonymous reviewers for their contributions.

Programme

8	Friday June 30		
	10.00–11.00 Conference registration in a lobby		
	11.00–12.00 Main auditorium. Opening of JURE 2006.		
	12.00–13.00 Keynote speech: Investigating new modes and models of assessment: past and present research F. Dochy		
	13.00–14.00 Lunch for the conference participants in a lobby		
	14.00–15.30 Room 107 Session 1: Learning and instruction with computers 1. Giacosa Norah S., Giorgi Silvia M. Concar Sonia B. Models involved in physics simulations and the use of simulations for teacher training 2. Pata Kai The influence of virtual inquiry with “Young Scientist” on primary students’ conceptual development about seasonal changes 3. Pearson Mary A case study to evaluate the effectiveness of learning and instruction with computers	14.00–15.30 Room 108 Session 2: Learning and instruction 1. Eklund Ann-Charlotte, Mäkitalo Åsa, Säljö Roger Developing collective knowing in 'high tech' work settings: The case studio as an arranged activity for learning 2. Dehler Jessica, Buder Juergen, Bodemer Daniel Knowledge Mirroring Tool (KMT) for computer-mediated knowledge communication: impact on communication efficiency and effectiveness 3. Wernberg Anna Learning from ones practise	14.00–15.30 Room 137 Session 3: Instructional design 1. Kicken Wendy, Brand-Gruwel Saskia, van Merriënboer Jeroen Effects of advice on task selection on students’ choices in learner controlled instruction 2. Cierniak Gabriele Cognitive Load Theory: investigating the interplay of experimentally manipulated load types 3. Deimann Markus Towards the development of a volitional design model
	15.30–16.00 Coffee break in lobby		
	16.00–17.30 Room 107 Workshop 1: Approaches to analysing external representations S. Ainsworth	16.00–17.30 Room 108 Workshop 2: Combining qualitative and quantitative approaches K. Niglas	16.00–17.30 Room 137 Workshop 3: How to get actively involved in EARLI, the SIG meetings and the EARLI journals and publications F. Dochy & G. Nickmans
18.30. Welcome Banquet in Botanical Gardens			

3

6

Saturday July 1	9.00–10.00 Main auditorium Keynote speech: The impact of cognitive load theory on our understanding of teaching and learning W. Schnotz		
	10.00–10.30 Coffee break in lobby		
	10.30–13.00 Room 107 Session 4: Learning science 1. Ibarra Canedo Sabrina Scientific precursor models construction: A science learning and teaching approach in preschool education 2. Teppo Moonika Bridging the cap between research and practice - science teachers views on an international research report 3. Laius Anne Reasoning strategies for selected socio-scientific issues	10.30–13.00 Room 108 Session 5: Metacognition 1. Pasternak Deborah Pino, Whitebread David Analysing parent-child interactions during study-related activities and their impact on children's self-regulated learning 2. Dignath Charlotte, Büttner Gerhard & Langfeldt Hans-Peter The efficacy of self-regulated learning interventions at primary and secondary school level — a meta-analysis 3. Begum Marjahan, Elliman Dave and Higgins Colin Cognitive and meta-cognitive strategies of novice programmers 4. Helle Laura, Tynjälä Päivi, Olkinura Erkki, Lonka Kristi Ain't nothin' but the real thing. Motivation and cognitive processing on a project-based course in information systems design 5. Siegle Thilo Social background, parents' competencies and students' achievement: Structural models by Rasch measurement	10.30–13.00 Room 137 Session 6: Moral and democratic education 1. Schults Astra, Tulviste Tiia Estonian children's reasoning about social rules transgressing and teachers' evaluation of children's everyday behavior: A developmental perspective 2. Tapola Anna Evaluating critical discourse analysis: A demand for alternative assessment criteria? 3. Ubani Martin What kind of learning takes place in RE? 4. van Ewijk Reyn The effect of ethnicity and SES in the class on achievement: a meta-analysis 5. Moolenaar Nienke A social capital model of school effectiveness: students' citizenship competences as an outcome measure
	13.00–14.00 Lunch for conference participants in lobby		

Saturday July 1 (continued)	14.00–15.30 Room 107 Session 7: Learning and instruction with computers 1. Hyvönen Pirkko Playing at school — Teachers view of playing and the roles of teacher and children in the playful learning environment 2. Näykki Piia, Järvelä Sanna Using a mobile concept map tool to support collaborative knowledge construction 3. Pedaste Margus Which are the factors influencing web-based problem solving of learners' groups?		14.00–15.30 Room 108 Session 8: Assessment and evaluation 1. Hertel Silke, Bernhard Schmitz Determine competence development by applying a mixed-method design 2. Rexwinkel G.B. Trudy Assessing the Level of Degree Courses 3. Mehdinezhad Vali, Peltonen Juhani The needful knowledge, skills and abilities for educators: Assessment	
	15.30–16.00 Coffee break in lobby			
	16.00–17.30 Room 107 Workshop 4: Video-analysis P. Salonen	16.00–17.30 Room 108 Workshop 5: How to understand the inner life of data L.Vöhandu	16.00–17.30 Room 137 Workshop 6: From reject to accept. How to present and write scientific paper U. Runesson	
	Organised guided sightseeing of Dome-Hill and downtown 18.15–19.15 and 19.15–20.15.			

Sunday July 2	9.00–10.00 Main auditorium Keynote speech: The roles of multiple representations in learning complex topics S. Ainsworth		
	10.00–10.30 Coffee break in lobby		
	10.30–13.00 Room 107 Session 9: Conceptual change 1. Chiras Andreas, Valanides Nicos Primary school children's understanding of the day/night alternation 2. Sepp Evald, Pata Kai The role of virtual inquiry simulation "Young Scientist" in developing student's conceptual coherence about food chains in water ecosystems 3. Hyvönen Pirkko, Kangas Marjaana Playfulness — a conceptual tool for evaluating playful learning environment (PLE) and activities 4. Wang Li Exploring learning about greenhouse effect in green schools in China 5. Villalón Ruth, Mateos Mar Students' conceptions about academic writing: Knowledge telling vs. knowledge transforming	10.30–13.00 Room 108 Session 10: Learning and professional development 1. Bazanov Boriss, Võhandu Priit, Haljand Rein Trends and rules in offensive teamwork in basketball 2. Arellano Alfredo Bautista Piano teachers' conceptions about teaching and learning: the role of the educational experience. 3. Aprea Carmela Coaching as a model for instructing pre-service teachers how to plan effective learning environments in the domain of economic and business education 4. Yinon Hayuta Re-examination of Kagan's model of teachers' professional development: interns' concerns and reasoning as reflected through their self-reported cases 5. Rienties Bart, Rehm Martin, Dijkstra Joost An online remedial teaching model used in practice	10.30–13.00 Room 137 Session 11: Teachers and teacher education 1. Kocher Miraim, Wyss Corinne Teaching competency of teacher training students. A video-analysis 2. Darnon Celine Achievement goals and conflict regulation in classroom 3. Leuhin Illar, Bhattacharya Madhumita Estonian teachers' attitudes towards hands-on activities in elementary school science lessons 4. Mägi Katrin, Kikas Eve Patterns of achievement motivation and relations to mathematical achievement: a person oriented approach
	13.00–14.00 Lunch for conference participants in lobby		

Sunday July 2 (continued)	<p>14.00–15.30 Room 107</p> <p>Session 12: Motivation and emotion</p> <p>1. Filisetti Laurence, Wentzel Kathryn Psychological, social and motivational processes as predictors of student's social and academic achievement</p> <p>2. Lichtenfeld Stephanie Development and validation of the emotions questionnaire in higher elementary grades (EQEG)</p> <p>3. Lindström Paulina Are there emotional responses when understanding visual pictures? A pilot study with eye tracking</p>	<p>14.00–15.30 Room 108</p> <p>Session 13: Social interaction</p> <p>1. Norman Phillip Challenging Talk: Experiments in English language simulations to develop social capital in UK secondary students' speaking and listening.</p> <p>2. Ward Sophie Claire, Meyer J.H.F., Shanahan M. P. Awareness of self as learner and its contribution to learning outcomes in first-year economics.</p> <p>3. Romero Margarida Analysis of computer mediated project activities through an ICT-based model</p>
	<p>15.30–16.00 Coffee break in lobby</p>	
	<p>16.00–17.30 Room 107</p> <p>Session 14: Demo session</p> <p>1. Pedaste Margus Inquiry learning environment "Young Scientist"</p> <p>2. Persson Petter Bivall, Tibell Lena, Cooper Matthew Force Feedback Virtual Reality Technology</p> <p>3. Olga Fragou An ancient Greek literacy learning environment</p>	<p>16.00–17.30 Room 108</p> <p>Workshop 7: The responsibility of research (and researchers) in educational innovation</p> <p>S. Caravita</p>
	<p>19.00–23.00 Conference dinner in Shakespeare Restaurant</p>	

Monday July 3	9.00–10.00 Main auditorium. Keynote speech: Models and modelling as a means for learning W. van Joolingen		
	10.00–10.30 Coffee break in lobby		
	<p>10.30–13.00 Room 107</p> <p>Session 15: Learning and instruction with computers</p> <p>1. Madsen Lene Møller How do we understand learning strategies in relation to computer based programmes? — An example from geography using geographical information systems.</p> <p>2. Kangas Marjaana, Kultima Annakaisa Co-creative learning processes in school settings — a case of the game concept of a “Different World”</p> <p>3. Molkenthin René Real-time assessment of problem-solving behaviour in business simulations</p> <p>4. Luik Piret Preferences of educational software and learning style</p> <p>5. Stamouli Ioanna Learning object oriented programming from the students’ perspective</p>	<p>10.30–13.00 Room 108</p> <p>Session 16: Educational effectiveness</p> <p>1. Rasinen Tuija Horizons to the content and language integrated learning. Individual school development changed the school’s reality</p> <p>2. Nishimuko Mikako Primary education in Sierra Leone and partnership with Britain</p> <p>3. Uibu Krista Roles of the primary school teacher in the computer-based instructional settings</p> <p>4. Inal Sevim What are Turkish senior students’ attitudes and anxiety towards research skills</p> <p>5. Kurland Hanna, Hertz-Lazarowitz Rachel Does organizational learning contribution to teachers' extra effort, job satisfaction, and students' academic achievements?</p>	<p>10.30–13.00 Room 137</p> <p>Session 17: Learning science</p> <p>1. Wildschut Hilde, Schee Joop van der Shee Improving the quality of geography research papers in secondary education</p> <p>2. Sturm Heike How do birds fly? An educational approach of 6th graders</p> <p>3. González Manuel Rodríguez Understanding of sustainable development: Ideas and reasoning of children and adolescents</p> <p>4. Valanides Nicos, Papageorgiou Maria Primary school children’s experimentation strategies and related cognitive abilities</p> <p>5. Adojaan Kristjan, Villako Heli-Anneli Improving students understanding in scientific processes by conceptual web-based models</p>

Monday July 3 (continued)	13.00–14.00 Lunch for conference participants in lobby	
	14.00–15.30 Room 107 Session 18: Learning and instruction with computers 1. Fragou Olga The language learning process and ancient Greek literacy in an environment based on the implementation of New Technologies 2. Kübar Külli Students' reading strategies for different types of texts 3. Jakavonyte Daiva Lithuanian fourth formers' communication competence in reading NON-fiction TEXT: factors that influence it	14.00–15.30 Room 108 Session 19: Higher Education 1. Charlesworth Zarina M. The influence of higher education on conceptions of Learning 2. Kärner Anita PhD students' expectations and concerns towards supervision 3. Rähä Pekka, Nikkola Tiina. Towards a critical teacher education — why is it so difficult to change the structure of teacher education?
	15.30–16.00 Coffee break in lobby	

Monday July 3 (continued)	<p>16.00–17.30 Lobby Session 20: Poster session</p> <ol style="list-style-type: none"> 1. Adam-Schwebe Stefanie, Trenk-Hinterberger Isabel & Souvignier Elmar. Predictive value of strategy-knowledge and reading motivation on reading comprehension: A longitudinal study 2. Amaral Rosa Maria, Lencastre Leonor. Figurative language processing: what skilled readers do 3. Antonietti Maja. Preschool and primary school teachers for children with especial needs evaluate their professional competences: a research in progress 4. Endedijk Maaïke, Vermunt Jan, Brekelmans Mieke, and den Brok Perry. Self-regulation of learning processes of student teachers in new training arrangements 5. Glueck Daniela, Souvignier Elmar. Implementing cooperative learning in elementary schools: Preconditions of effective learning when using the jigsaw method 6. Gonzales Fernanda. How was America Discovered? “Reading” historical images in children, adolescents and adults 7. Herweg Constanze, Seidel Tina, Prenzel Manfred. Clear and structured teaching — Developing a theoretical framework 8. Hohensee Fanny. Family background and educational achievement in PISA 9. Hyvonen Pirkko, Kangas Marjaana. Tutoring, playing and learning in a playful learning environment 10. Issaeva Elisabeth. Implicit theories and self-efficacy of the teacher: their impact on his evaluation and the motivation of pupils 11. Kask Klaara. Cognitive learning through student experimental problem solving derived from a social issue 12. Kawanabe Takashi. The nature of naive conception of sound: A comparison between novices and experts 13. Kobarg Mareike, Seidel Tina. Process-oriented teaching in physics classrooms — Creating opportunities for learning? 14. Nieder Tanja. Questionnaire-based assessment of learning conceptions and analyses of the variability of learning conceptions. 15. Persson Petter Bivall, Tibell Lena, Cooper Matthew. Using force feedback virtual reality technology as a tactile gateway to understanding of biomolecular interactions 16. Schwindt, K., Seidel, T., Rimmel, R., Prenzel, M. Teaching behaviour as a mediating factor between teachers’ pedagogical content beliefs and student learning 17. van Ewijk Reyn. The effect of ethnicity and SES in the class on achievement: a meta-analysis 18. Vuopala Essi. Technology enhanced collaborative learning — when scaffolding is needed? 19. Zander Steffi. Motivational effects on cognitive load in learning with multimedia
	Organised boat trip with food by the River Emajõgi (extra cost)

Tuesday July 4	9.00–10.00 Main auditorium Keynote speech: Learning and cultural tools: Modelling and the evolution of a collective memory R. Säljö	
	10.00–10.30 Coffee break in lobby	
	10.30–12.00 Room 107 Session 21: Learning and instruction with computers 1. Walraven Amber, Brand-Gruwel Saskia & Boshuizen Henny P.A. Judging of sources and information during information-problem solving on the WWW 2. Dörner Helga, Török Erika International school partnerships — what works, what doesn't? Integrating the European eTwinning project in teaching and learning processes. A Hungarian perspective 3. Grenon Vincent The integration of IT in teacher education programmes: Measuring the effect of the practicum on pre-service teachers	10.30–12.00 Room 108 JURE business meeting Summary of JURE 2006 organisation Call for planning next JURE conference All interested people are welcome
	12.00–13.00 Main auditorium. JURE 2006 closing	
	13.00–14.00 Farewell banquet and lunch in lobby	
	Travelling agency offers for sightseeing in Estonia	

Predictive Value of Strategy-Knowledge and Reading Motivation on Reading Comprehension: A Longitudinal Study

Adam-Schwebe Stefanie, Trenk-Hinterberger Isabel & Souvignier Elmar
University Johann Wolfgang Goethe, Frankfurt am Main, Germany

The importance of reading competence for academic achievement has led to a number of studies that investigated the role of various aspects of reading. Cross-sectional designs showed that beyond intellectual abilities and prior knowledge, strategy-knowledge and reading motivation are related to text comprehension. Over a 20 months period the present longitudinal study investigated the effects of knowledge of reading strategies, self-efficacy and interest in reading on reading comprehension. A total of 77 students were examined. Initial data containing measures of reading strategies and reading motivation were collected at the beginning of grade 5. At the end of grade 6 reading comprehension was assessed using a newly developed reading test employing an expository and a narrative text. Results of multiple regression with reading motivation (self-efficacy and interest in reading) and strategy-knowledge as dependent variables show that both predictors — cognitive as well as motivational — proved to contribute significantly to reading comprehension. With respect to the kind of text-format the predictive value of cognitive and motivational variables changed. While motivational aspects seem to be most important for the understanding of narrative texts, strategy-knowledge turned out to be a crucial factor for dealing with expository texts. Since predictive validity of these variables proved to be stable over time, fostering reading comprehension should take these aspects into consideration.

Improving students understanding in scientific processes by conceptual web-based models

Adojaan Kristjan & Villako Heli-Anneli
Science Didactics Department, University of Tartu, Estonia

One of the main objectives of teaching science is providing learners with scientific understanding on natural processes surrounding them in everyday life. The use of computer based model through visualization is one possibility for learner to acquire knowledge and skills about these processes. The main goal of the present study was to investigate the effectiveness of a teaching method based on the application of conceptual web based models with supplementary printed worksheets. The outcome of this method was related to the better understanding on certain biological processes in everyday context. The study was based on three computerized models, created for exploratory learning of basic school biology - Photosynthesis, Photosynthesis and Respiration, and Plant's Transport System. All three models enabled students to change some environmental conditions and to explore their influence on a particular process. 76 students (grade 7) from three schools of Tartu participated in the study. First, the description of an everyday situation was presented to students on a worksheet where they had to solve a problem. Next, they had to find some information from the model, experiment with different conditions, make observations, and record the data to find patterns related to the process. Finally, students found a solution to the similar everyday problem. The pre- and post-questionnaires were used to establish students' progress as a result of the lessons. They also filled in an evaluation questionnaire about the usage of particular model and worksheet. Students' activities were observed by a researcher. The results of this study demonstrated a significant improvement in students' understanding on particular biological processes. Students' skills have been developed towards active using scientific terms and decreasing misconceptions in solving everyday problems. Their performance also depended on the complexity of worksheets. Certain differences revealed in the students' performance related to the presentation of information on graphs, figures, and diagrams on the models.

Figurative Language Processing: What Skilled Readers Do

Amaral Rosa Maria & Leonor Lencastre

Faculty of Psychology and Education, University of Oporto, Portugal

Figurative language instructional model adopted by most Portuguese teachers has to be reconceptualized since the results of the national assessment, taking place at the end of ninth grade, show that there is a low level of success in metaphor comprehension and interpretation when compared to other literary competences. Various authors have challenged the traditional methods based on reading products assuming that reading is a mental activity and the think-aloud protocols an on-line method leading to the analysis of the meaning construction, monitoring and evaluation processes. Adopting this perspective, the present study aims to investigate how skilled readers behave during the figurative language comprehension-interpretation process and answers to the research questions: do ninth graders interpret metaphors? which model is favoured? do monitoring activities regulate consciously the comprehension-interpretation process? do readers engage in an evaluative activity when reading figurative language? A qualitative analysis was made to 26 ninth graders verbal reports during a reading activity of poetic texts where nominal metaphors, predicative metaphors and metaphorical comparisons occur. Considering meaning construction the results revealed that: the interactive property attribution model of metaphor comprehension seems to be favoured in relation to the conceptual metaphor and to the pragmatic models; monitoring activities are based on problem-solving situations, through re-readings, self-questioning and textual search movements for meaning; the evaluative processes are related to style appraisal, content agreement/disagreement, and affective judgements.

Preschool and Primary School Teachers for Children with Special Needs Evaluate Their Professional Competences: A Research in Progress

Antonietti Maja

Department of Social, Cognitive, Quantitative Sciences; Università di Modena e Reggio Emilia, Italy

The activation at the University of Modena and Reggio Emilia of courses for teacher training and teacher training in special education for preschool and primary school teachers still working in school as flexible workers, provided an opportunity to investigate the knowledge possessed by those teachers as well as a research opportunity to investigate their ideas about their professional profile. The scope of the research was two-fold: to explore the formative needs of the teachers attending university courses and to evaluate the perceptions about the real and ideal profile of professional competences of teachers for children with special needs. In accordance with the aim of the research and with the literature (Perrenoud 1999, Barcellona Conference 2002, Coggi 2004, Pellerey 1996, Vitteritti 2004), a questionnaire was drawn up articulated in four parts: the first part concerning personal data, the second one centred on methodology and content of university courses, the third part about the problems of teaching. The fourth part, through an appropriate scale, assess the opinion of the teachers presenting a list of competences that could be considered relevant for teaching and teaching to children with special needs. The research involved 283 teachers in the provinces of Piacenza, Parma, Reggio Emilia and Modena in Italy. The first analysis of the data is related, in particular, to the relevance of each competence in the teacher's evaluation according to the different professional identities and working experience. The research is still in progress and the aim, starting with this first exploration, is to improve the research instrument through theoretical studies and other research methods.

Coaching as a Model for Instructing Student Teachers How To Plan Effective Learning Environments in the Domain of Economic and Business Education

Aprea Carmela

University of Mannheim, Germany

While there are numerous models which provide information about the principles and components of effective learning environments, only a few models describe the process of planning such learning environments and even less is known about how to teach these planning procedures to pre-service teachers. The presented research study tries to contribute to fill this gap by developing an instructional model for teaching planning skills. The research draws on the assumptions that instructional planning may be seen as a kind of design process and design skills are most effectively promoted by coaching interventions. The model construction activities are based on a developmental approach and include the design, implementation and evaluation of a master's level university course on planning skills. The course incorporates authentic planning tasks, the modelling of planning expertise, feedback on students' responses to the planning tasks, texts, mini-lectures and reflective activities. Course delivery evolved over 4 iterations and included 64 students enrolled in a university teacher education program for teachers in economic and business schools at the University of Mannheim (Germany). In order to sustain model construction, each course delivery is analyzed and evaluated in terms of underlying design decisions, experiences during course implementation and impact of the course on students' (objective and subjective) learning success. As a whole, the research is intended to be a starting point for further inquiry into the development of planning skills. Moreover, it is considered as a first attempt to give teacher educators a conceptual as well as a practical technology from which to teach how to plan effective learning environments.

Piano Teachers' Conceptions About Teaching and Learning: The Role of the Educational Experience. An Application of the Lexicometrical Method to the Study of Implicit Theories about Learning and Instruction

Arellano Alfredo Bautista

Facultad de Psicología , Universidad Autónoma de Madrid, Spain

In this research we analysed some features of 33 Spanish piano teacher's conceptions about teaching and learning. Analyzing their written answers to an individually questionnaire exploring didactic ideas, by means of the lexicometric program SPAD-T (version 1.5), we could see lexical differences among groups of teachers, divided considering their professional experience. Factorial correspondence analysis was applied to the aggregate lexical table. The modal response procedure was also employed. Results revealed three groups of teachers with different conceptions, rely on one of the following representations concerning learning and instruction: direct, interpretative and constructive (according to the taxonomy by Pozo and Scheuer, 1999). The less experienced group (less than 5 years) showed a constructive conception, focused on the development of abilities. The medium experienced group (among 5 and 15 years) showed an interpretative conception and the most experienced group (more than 15 years) showed a direct conception. They both focused on content acquisition, but with different orientations. The conclusions were: first, the results found with the statistical analysis of textual data fit with researches using other methodologies; second, it is necessary to develop teaching updating programs for Spanish teachers to acquire more appropriate conceptions; finally, we think about the psychological useful of the statistical analysis of textual data to infer mental representations or conceptions; we consider that this use of lexicometric analysis is innovative, since it has only rarely been used to study teacher oral texts or to infer subjects' mental conceptions.

Trends and Rules in Offensive Teamwork in Basketball

Bazanov Boris, Võhandu Priit, Haljand Rein

Laboratory of Kinesiology, Faculty of Physical Education, Tallinn University, Estonia

The purpose of this paper is to analyze the structure of the models of offence and to determine their efficiency. We were able to determine the teamwork structure and intensity by using a system of analysis of the offensive process. The analysis of the team activity as an integrated whole becomes very important. For this research we observed the Tallinn University basketball team, which plays in Division One of the Estonian league. The data was gathered from 600 ball possessions in 8 recorded games of the regular season. The data we collected was analyzed by the means of data mining. This research has helped to work out the basics of the analytical system of the teamwork aspect. The analyzing system of the competitive activity of the game, enables us to find out interesting technical and tactical models from the data. The results show that the team scoring (points/possession) as the main indicator of analyzed offences was equal to 1,13 on average with a frequency of 48%. The 1–2 sec duration period of ball possession in offensive zone proves to be most effective (scoring 68%). The most effective transition period is under 1,82 sec (62%). The scoring of set offence is 44% in the mean. The analyzing system worked out through that, helps coaches to develop performance and promote learning.

Cognitive and Meta-cognitive Strategies of Novice Programmers

Begum Marjahan, Dave Elliman & Colin Higgins
University of Nottingham, United Kingdom

Programming is a complex cognitive activity within the framework of problem solving. It involves understanding the problem specification, decomposing the problem into series of sub-problems, designing, coding, debugging and testing. Cognitive and meta-cognitive strategies and behaviour play an important role in the completion of a programming problem. The specific aims of this study are 1) to investigate cognitive and meta-cognitive strategies used by novice programmer within the cognitive framework of programming 2) to identify the relationship between these strategies and the performance in programming. To accomplish the aim, a self-reporting questionnaire based research tool was developed. The research tool was informed from three main sources: 1) empirical research on novice programmers and 2) previous research on the role of cognitive and meta-cognitive strategies in mathematics problem solving 3) Students open-ended retrospective reports on strategies and difficulties encountered during previous programming problem solving. The students completed the self-reporting questionnaire for three different programming problems which requires to students to use the key programming concepts in a given problem domain. Along with completing the questionnaire students were also asked to complete an open-ended questionnaire on their strategies at different stages of the programming process. The results of the two retrospective reports were than analysed in the light of their completed code to inform the research question outlined above. It is intended that this analysis will inform understanding of students' behaviour during programming and inform the teaching method of introductory programming teaching.

The Influence of Higher Education on Conceptions of Learning

Charlesworth Zarina M.

The University of Geneva, Switzerland

This paper presents one aspect of a longitudinal multi-stage study which is examining both the conceptions of learning as well as the learning style preferences of international students studying Hospitality Management at an Institute of Higher Education in Switzerland. The conceptions of learning, as defined by Marton, Dall'alba & Beatty (1993) held by students prior to their higher education experience as compared to their conceptions in their third year of higher education have been examined. The results show statistically significant differences for three of the conceptions investigated: memorisation, changing as a person, and seeing things differently. Memorisation goes from a solid first position to an unequivocal last position and this, for the large majority of students regardless of their cultural background. Using factor analysis four components have been identified at Time 1 to account for 86.20% of the variance and three at Time 2 to account for 76.23% of the variance. Quite a different pattern of loadings on the components at Time 1 and Time 2 were found. The data all lend support to the idea of the educational environment inducing change. Implications are the call for further confirmatory research as well as potentially in the area of programme development and delivery.

Primary School Children's Understanding of the Day/night Alternation

Chiras Andreas & Nicos Valanides
Department of Education, University of Cyprus

The study investigated the mental models of primary school children related to the day/night cycle. Semi-structure interviews were conducted with 40 fourth-grade and 40 sixth-grade children. The sixth-grade children were taught the day/night cycle approximately six months prior to the conduction of the research. Qualitative and quantitative analysis of the data indicated that the majority of the children were classified as having geocentric models. The results also indicated that a large number of children did not appropriately conceptualize the essential prerequisites for understanding the day/ night alternation and that primary school children's observational skills were limited. It was also concluded that children's age (class) and their mathematical achievement were good predictors for the quality of their mental models. Based on the total results, several suggestions were put forward concerning science curriculum and the instructional approaches that should be adopted for teaching the day/night cycle. Some concepts that are considered prerequisite for the understanding the day/night alternation should be targeted by instruction prior to teaching the day/night cycle, and additional research efforts must be designed to identify the hierarchical relations among these concepts, and appropriately construct both their teaching sequence and the corresponding age for effectively teaching each concept.

Cognitive Load Theory: Investigating the Interplay of Experimentally Manipulated Load Types

Cierniak Gabriele

Eberhard Karls University, Tuebingen, Germany

The phenomenon that instructional methods that are highly effective with inexperienced learners can lose their effectiveness and even have negative consequences when used with more experienced learners is termed expertise reversal effect (ERE). The ERE is explained by researchers favouring cognitive load theory due to unnecessary redundancy that causes high extraneous cognitive load for higher prior knowledge learners. High extraneous load forces learners to invest high mental effort during learning but not to benefit from it (Kalyuga, Chandler & Sweller, 1998). The ERE is an example of an aptitude treatment interaction (ATI) and a closer look into ATI literature reveals two further possible explanations of the ERE that consider mental effort as the underlying mechanism. The two alternatives to the proposed extraneous load mechanism are (1) the substitution hypothesis that instructions good for low prior knowledge learners supplant relevant cognitive processes, and hence, prevent high prior knowledge learners to invest their own learning relevant mental effort (Clark, 1982; McNamara et al., 1996; Snow, 1977) and (2) the appraisal hypothesis that low and high prior knowledge learners differ in their self-efficacy and perceptions of instructions that seduce high prior knowledge learners not to invest enough mental effort (Salomon, 1983). The objectives of the dissertation project are (1) to ascertain whether mental effort measured with subjective ratings, pupil dilatation and secondary task performance is the mechanism of the ERE by conducting moderated mediation analyses and (2) if so which of the three proposed mental effort mechanisms is most appropriate.

Achievement Goals and Conflict Regulation in Classroom

Darnon Céline

Pierre Mendès France University, Grenoble (France)

The present research examines whether mastery and performance goals predict different ways of reacting to a conflict with another person over material to be learned. Results from two studies show that mastery goals predict epistemic regulation (a conflict regulation strategy focused on the attempt to integrate both points of view) whereas performance goals predict relational conflict regulation (a conflict regulation strategy focused on the evaluation and affirmation of self-competence). Study 1 showed these links on a sample of 51 French introductory psychology students, led to imagine they interacted with a disagreeing partner. In this first Study, conflict regulation was assessed via self-report. In Study 2, the sample was composed of 63 10th grade French students. This study showed the same links using the amount of competence reported for the self and for the other as measures of conflict regulation and in a standardized conflict situation. It also indicated that mastery goals favoured interest in the learning material, whereas performance goals favour the search for the “normative evaluative information”, the grade.

Knowledge Mirroring Tool (KMT) for Computer-mediated Knowledge Communication: Impact on Communication Efficiency and Effectiveness

Dehler Jessica, Juergen Buder & Daniel Bodemer
University of Tuebingen, Germany

Collaborative learning methods are ubiquitous in educational settings such as higher education courses. The present study aims at increasing efficiency of computer-mediated communication (CMC) in learning scenarios and its effectiveness regarding learning outcomes. Knowledge communication is fostered by accurate estimation of the learning partner's knowledge. Thereby, learners mutually build models of partner's knowledge on which they adapt their utterances. Adaptation can be found in two aspects of communication: audience design, e.g. comprehensible explanations that elicit few queries; and information seeking, e.g. concrete questions on content the partner is knowledgeable about. Default models of other's knowledge have shown to be biased towards the model of one's own knowledge. Additionally, the special affordance of CMC restrict the ordinary process of estimation of other's knowledge in face to face communication particularly by the reduction of feedback. A Knowledge Mirroring Tool (KMT) based on self-assessed levels of understanding is introduced within a peer-discussion scenario. KMT supports the development of a model of the learning partner's knowledge. The study investigates the impact of KMT on communicative efficiency and its effectiveness for knowledge acquisition. KMT is expected to increase both aspects of communicative adaptation, audience design and information-seeking. Communicative adaptation is hypothesized to facilitate knowledge acquisition within the peer-discussion and should therefore be reflected in higher knowledge test scores in the KMT-condition as opposed to the control condition.

Towards the Development of a Volitional Design Model

Deimann Markus

Erfurt University, Germany

Current theories and models on self-regulated learning (SRL) emphasize the importance of sustained motivation in the face of distractions or obstacles for successful goal-oriented learning to take place. However, there is a significant lack of theories and models with regard to dealing with issues such as decreased motivation. As two decades of research on modern conceptions of volition have convincingly shown, volitional strategies that are targeted on supporting the learner in the face of distractions can make a significant difference. Although there are some validated models regarding the systematic design of motivational sound learning environments available, none of them are focussing on volitional aspects. Hence, this paper introduces the development and empirical examination of a volitional design model.

The Efficacy of Self-Regulated Learning Interventions at Primary and Secondary School Level — A Meta-Analysis

Dignath Charlotte, Gerhard Büttner & Hans-Peter Langfeldt
University Johann Wolfgang Goethe, Frankfurt am Main, Germany

The efficacy of self-regulated learning has been investigated mainly in older students. Recently research has increasingly focused on fostering self-regulated learning at the primary school level. We will present the results of a differentiated meta-analysis of studies on self-regulated learning at both primary and secondary school level. Based on literature search in PsycInfo, ERIC and the German data base Psyndex, publications were included if the study (1) employed a pre-post control group design and (2) descriptive data (required to calculate effect sizes) was provided. Based on recent models of self-regulated learning, which consider motivational as well as cognitive and metacognitive aspects (see Boekaerts, 1999), effects of self-regulated learning on academic achievement, cognitive competencies and motivation were analyzed. In a first step the integration was limited to studies conducted at primary schools. As the results show, self-regulated learning training proved to be effective already at a primary school level. A significant difference between study characteristics at the different school levels was found concerning motivational aspects as part of the interventions: While training programmes conducted with elementary school students demonstrated highest effects in the motivational area, only few studies at the secondary school level assessed motivation or included motivational aspects in the intervention. Altogether the effects of the interventions turned out to be heterogeneous. This heterogeneity indicates the existence of further moderator variables.

International School Partnerships — What Works, What Doesn't? Integrating the European eTwinning Project in Teaching and Learning Processes. A Hungarian Perspective

Dorner Helga & Erika Török
University of Szeged, Hungary

Information and communication technologies (ICT) became a useful tool in daily classroom praxis. They can make educational processes more efficient than ever, however, their application is not only a question of technological innovation (Csapó, 2003). Intercultural training and the development of intercultural competence (Byram, 1997) are inevitable in the teaching and learning processes. Preparing teachers and students for the difficulties in both professional and private encounters when using ICT is the duty of educators on all level. The eTwinning project wishes to integrate ICT in teaching and learning processes. Its main goal is to encourage teachers and students of European schools to establish school partnerships, organise projects through which they will be able to obtain intercultural experiences. Our research aims at investigating the factors that play an important role in establishing and maintaining international school partnerships. It also focuses on finding out whether taking part in such a project can contribute to developing students' intercultural competences that are crucial to international encounters and successful co-operations between participants of different nationalities and whether projects alike could be integrated in the classroom praxis and be basis of local pedagogical innovation. During the data collection we intend to use both quantitative and qualitative instruments. Questionnaires for collecting data about the technical background, methodological concepts of the schools, structured interviews with the responsible colleagues at the different stages of the project work, e-mail questionnaires for the partner schools, analysis of the students' e-mail interaction in case of one concrete project.

Developing Collective Knowing in 'High Tech' Work Settings: The Case Studio as an Arranged Activity for Learning

Eklund Ann-Charlotte, Åsa Mäkitalo & Roger Säljö
Department of Education, Göteborg University, Sweden

In this study, learning and the development of collective knowing in using complex technologies is studied from a sociocultural perspective. From such a perspective transformation of collective practices in terms of new cultural tools and ways of organising activities constitutes premises and challenges for learning. Traditionally, work and collective knowing in 'high tech' settings have been coordinated according to a logic of dividing, among staff, responsibilities for specific knowledge domains and tasks. Today, several organisations try to find ways of organising work that instead enables a logic of sharing both expertise and responsibilities among colleagues. There are many reasons for this, but one challenge is to deal with an increasing complexity in terms of the specialisation and continuous development of technological tools. To meet challenges of this kind of work, many settings need to be organised differently. One element of this, highly relevant to educational research, are the specifically arranged activities for learning and collective development currently being institutionalised at many work sites. Our empirical case is an IT support unit at a multinational company where work is organised so as to provide customers with assistance around the clock. In this kind of establishment it is critical to maintain a high level of knowing and coordination in pursuing activities. In this paper, we will empirically explore an authentic, locally arranged, recurring activity for learning: 'the case studio'. According to the participants the aim of the activity is to discuss and share problems, experiences and solutions of real 'cases', and to develop professional expertise collectively. Our empirical data consist of video-recordings of 'case studios', recorded over a period of two years.

Self-Regulation of Learning Processes of Student Teachers in New Training Arrangements

Endedijk Maaïke, Jan Vermunt, Mieke Brekelmans & Perry den Brok
Utrecht University, the Netherlands
Leiden University, the Netherlands

In the last decade a lot of new training arrangements for student teachers have been started. One of the major changes with regard to former curricula is the more self-regulative way of learning that is expected from student teachers. The question rises if student teachers are well prepared to be responsible for planning, monitoring and assessment of their own learning. We therefore designed a research project to answer the following question: What is a good didactic way to systematically optimize the quality of self-regulation of the learning process of student teachers during their in-service education? The research project includes three studies. In this paper the first study is presented. In this study an instrument is tested to measure the actual self-regulation of the learning process of 20 student teachers of a post-graduate teacher education programme for secondary education in the Netherlands. To develop the measurement instrument we searched the literature and performed two pilot studies. The study presented in this paper will result in insight in the actual self-regulation of the learning process of student teachers and in the usefulness of the week report as an instrument to measure self-regulation on a larger scale.

Psychological, Social and Motivational Processes as Predictors of Student's Social and Academic Achievement?

Filisetti Laurence & Kathryn Wentzel
University Pierre Mendes France, Grenoble, France
University of Maryland, College Park, USA

Within social psychology, as well as educational sciences frameworks, the notion of social competence has been extensively studied. Mainly examined through behaviours as sharing, cooperating, helping others and respecting rules, these studies underline how fundamental this competence is in educational settings, since it influences students well being, their motivation and their academic performance (e.g., Wentzel, 1998). The aim of the presented work is to investigate a new perspective by examining processes that may explain student's social competence and academic achievement. In this perspective, self-processes and social perceptions were examined as predictors of social behaviour by way of motivational dimensions. Based on information from 215 French students (from 6th to 9th graders) self-processes (perceived competence, autonomy and importance of social domain) as well as social perceptions (in terms of perceived social support from teachers and perceived expectations from peers) were significant positive predictors of social behaviour by way of social and academic goals or GPA.

The Language Learning Process and Ancient Greek Literacy in an Environment Based on the Implementation of New Technologies

Fragou Olga

Educational Technology Laboratory (ETL), School of Philosophy, National and Kapodistrian University of Athens (NKUA), Greece

The whole corpus of Greek literature extending from 8BC to 16th century AD should be expected to have an output of up to 60.000.000 prototype words. Thesaurus Linguae Graecae (TLG), a collection and digitization of most literary texts written in Greek (Homer to the fall of Byzantium in AD 1453), comprises 3.700 authors and 12.000 works, approximately 91 million words. This monstrous in variety vocabulary is further complicated by the multiplicity of structure schemata and the plethora of conjugation types of ancient Greek language. Focus of this research proposal is New Technologies' use and exploratory software implementation in a Greek, University students' undergraduate course, under a critical analysis scope of trends in modern language learning methodologies. Strategies of language acquisition/ competence, metacognitive strategies, motivational factors, as well as aspects of the so called "traditional method" of ancient Greek teaching shall be further examined to promote an elevated sense of personal control, sharpen cognitive engagement, examine parameters of skill linking instructional strategies, motivational processes and learning outcomes. Learners' active engagement in decoding "text" is intended to become a basic factor for setting the design principles of a rich in stimuli, open source learning environment in an effort to understand the underlying process of ancient Greek learning. The issue of classics' modernisation by enriching it with a "modern persona" for youngsters and preservation of specific subject's aura comes forward as current trends in learning theory evoke changes in forming education.

Models Involved in Physics Simulations and the Use of Simulations for Teacher Training

Giacosa¹, Norah S., Silvia M. Giorgi² & Sonia B. Concarì²

¹ Departamento de Física, Facultad de Ciencias Exactas, Químicas y Naturales, Universidad Nacional de Misiones, Posadas — Misiones, Argentina.

² GIDEAF — Departamento de Física, Facultad de Ingeniería Química, Universidad Nacional del Litoral, Santa Fe, Argentina.

Technologies of information and communication (TICs) are being frequently used as didactic resources in Physics classes. They are mainly used in computer simulation mode (software as well as physlet) and –to a lesser extent– in the acquisition of experimental data through the computer. Problem solving and laboratory experiences together with the use of simulations allow for analysis of the implicit mathematical model and of the physic model taught and also for establishing relationships between both of them. The potential of these materials in a teaching situation makes it necessary for the teacher to know not only how to use them but also the limitations of the mathematical models implied in their design. The simulations are resources that can be integrated to the learning activities, with all the advantages that can be obtained from managing a group of variables at will. Those variables are not always accessible in the real experiment, so they now facilitate the enlargement of the extent of the experiment. Simulations do not replace the real laboratory experience, because this experience is necessary in order to learn this science. In this paper we present a proposal of activities implemented in teacher training using simulations. The proposal was based on results obtained from the critical analysis of simulators that can be used in several physics subjects. These activities consisted of seminars and workshops destined for Physics teachers at the pre-university level. The workshops were developed during different events that took place in Argentina and Uruguay. The contents included topics about electromagnetism, optics and contemporary Physics.

Implementing Cooperative Learning in Elementary Schools: Preconditions of Effective Learning when Using the Jigsaw Method

Glueck Daniela & Elmar Souvignier

Institut für Pädagogische Psychologie — J.W. Goethe Universität
Frankfurt, Germany

A total of 225 fourth graders (11 classes) in four elementary schools worked on three six-hour geometry units. Specific geometry tests, assessing factual knowledge and comprehension, were given before and after each unit. Verbal and mathematical competences were measured prior to the project. Seven classes acquired the geometry units using the jigsaw-method. Observers in the jigsaw-classes quantified teachers' interventions. After having instructed the geometry units, teachers were asked to give an opinion of the jigsaw method. Pre-test/post-test differences revealed that students in the cooperative classes learned less than or as much as traditionally taught learners. Pre-test follow-up achievements were equal or significantly higher in the cooperative condition. In the cooperative condition, the majority of teachers confirmed that students improved in cooperating (71%) but had difficulties teaching their expert knowledge to their group members (57%). Nearly all jigsaw-teachers gave instructions and advice regarding the geometric contents if their students asked for help and are of the opinion that this was necessary (86%). Students' development of cooperative competence and tutoring competence — evaluated by their teachers — are connected with their knowledge gain ($r = .70^*/.82^*$). Besides this, there is a negative correlation between intervention intensity — reported by the teachers themselves— and the knowledge increase in the jigsaw classes ($r = -.68^*$). Though jigsaw-students had to read many instructional sheets, reading competence did not prove to be a specific precondition for cooperative learning achievement.

How was America Discovered? “Reading” Historical Images in Children, Adolescents and Adults

Gonzales Maria Fernanda

Universidad Nacional de Educación a Distancia, Madrid, Spain

Historical images are cultural artefacts that require an interpreter should update their meanings into image “reading act”. Historical images can create imaginaries and representations of the past. We studied the readings of Theodore de Bry’s engraving on the Discovery of Latin America. Our objectives were to analyse the cognitive aspects implied in those readings and to compare the interpretation of such readings among different groups of ages (12, 14, 16 years old and adults) from Argentina, Chile and Spain. We considered the hypotheses that individuals generated ideas about different contexts of image production. For example, their thoughts on who the author of the image was, where the author comes from, the historical moment when the image was painted, and what the author knew about what had actually happened. We classified and grouped the individuals’ responses into four reading categories: realistic-naïve, realistic, interpretative, and contextualized. The results show that image reading did not change in the groups from different countries but showed meaningful differences between the groups of ages. Twelve year-old individuals tend to interpret the image as a “window open to the past”. Sixteen-years-old adolescents infer the author’s provenance and his intentions. Based on these inferences, they can further interpret the image. Most adults read the images in an interpretative way. However, few of them are capable of understanding the image as a form of constructing the past. These results evidence the cognitive difficulties to understand historical images as representations of the past rather than direct windows to the past.

Understanding of Sustainable Development: Ideas and Reasoning of Children and Adolescents

González Manuel Rodríguez
Universidad Autónoma de Madrid (UAM), Spain

Sustainable Development is up to the next generation. Environmental education is necessary to improve their responsible participation. In order to promote children's meaningful learning, instruction must be based on their representations. But, what does a 9-year-old child think about Sustainable Development? How does he represent the water shortage? We studied children's and adolescents' representations of Sustainable Development; mainly their explanations about the economic character of Sustainable Development. We interviewed 40 participants between 9 to 16 years old. They were interviewed about: waste management, energy, water shortage, pollution and population growth. The interviews were recorded and literally transcribed. We analyzed qualitatively all the answers from each participant with the aim of establishing "General Levels of Understanding". This global analysis allowed us to reconstruct three levels of understanding of Sustainable Development. In the First Level, children represent a plenty world where the shortage is only and exception. In this level the human action can not damage the nature. In the Second Level, the shortage is something normal in all societies and human action has a great ecological impact. Finally, in the Third Level children represent a world of shortage administrated by the economy. Is in this Level where the economic explanations about the Sustainable Development appear. Knowing how children understand the Sustainable Development can allow us to adapt our instruction to their skills. A better instruction is necessary to improve the responsible participation of our next generation.

The Integration of IT in Teacher Education Programmes: Measuring the Effect of the Practicum on Preservice Teachers

Grenon Vincent

University of Sherbrooke, Canada

This paper examines the effect of the practicum on the integration of IT by 160 pre-service students in their third year of the teacher education programme at the University of Sherbrooke, Canada. To effectively prepare future teachers to integrate IT into their practice, Rogers (2000) suggests that they be exposed to the integrating practices of experienced in-service teachers. Interaction between pre-service and in-service teachers creates a favourable context that affects the probability of transfer by pre-service teachers of integrative uses of IT. The importance of observation practices by students and the interaction between novices and experienced professionals is recognized in the scientific literature pertaining to teacher education programmes (Larose, Grenon, Morin & Lenoir, 2005). Based on the social learning theory of Bandura (1997), we shall briefly present three factors that characterize the marginal and limited nature of IT integration: the computer literacy level of pre-service teachers, their attitudes towards the integration of IT and self-efficacy in conducting activities that integrate IT. An inquiry questionnaire covered items concomitant with those identified in the conceptual framework pertaining to computer literacy, computer attitudes and self-efficacy. A pre-test and a post-test were administered to measure the impact of the practicum on the three aforementioned factors. A comparison between these two results will allow us to determine the effect of the practicum in relation to the dimensions studied. The study should help teacher education faculties gain a better understanding of IT integration by pre-service teachers.

Ain't Nothin' But the Real Thing. Motivation and Cognitive Processing on a Project-Based Course in Information Systems Design

Helle Laura, Tynjälä Päivi, Olkinuora Erkki & Lonka Kirsti

University of Turku, Finland

University of Jyväskylä, Finland

University of Helsinki, Finland

Advocates of the project method tend to assume that most students find project-based studies motivating. However, there is little empirical evidence to support these claims. In addition, there is indication that some students find project-based studies frustrating. It is possible that some of the problems encountered in project-based learning reported in the literature stem from “friction”, an incompatibility of student self-regulation and teacher regulation of the study process resulting from the teacher handing over too much responsibility to the student. The purpose of the study is to evaluate a particular model of work-based project-based learning in terms of intrinsic study motivation and cognitive processing on students differing in levels of self-regulation of learning. The mainly third-year participants (N=58) were the students of a work-based project course in information systems design from a Finnish university. The comparison group (N=51) consisted of computer science students in the same phase of their studies, but from two different universities. Data were collected by two sets of questionnaires pertaining to self-reports of motivation and processing before and during the project based course. A between-groups repeated-measures ANOVA was carried out on self-report measures of intrinsic study motivation and cognitive processing. Results indicate that the project group reported significant gains in intrinsic study motivation, whereas motivation appeared to remain stable in the comparison group. Contrary to expectations, students who initially scored lowest in self-regulation of learning reported the largest gains.

Determine Competence Development by Applying a Mixed-Method Design

Hertel Silke & Schmitz Bernhard
TU Darmstadt, Germany

The development of competences is a main issue in educational psychology research (Creswell, 2002). To determine the development of competences a valid measurement is necessary (Bortz, 1999;). In our study we accomplished a triangulation mixed method design (Creswell, 2002), which refer to the multitrait-multimethod approach (Campbell & Friske, 1959). The overall data interpretation bases on both kinds of data. Additionally, results from both datasets can be compared to determine if they yield similar results. We extended this design by the trait and state level. Thus we implicated questionnaires (quantitative) and working-samples (qualitative) concerning counselling-competences at trait and state level. The instruments base on an explorative factor analyses concerning counselling-competence. The qualitative data was processed using a categorisation pattern (frequency scores). The study is based on a two (training: yes/no) by two (self-reflection support: yes/no) by two (feedback: yes/no) design. 98 teachers from 10 German secondary-schools volunteered. The assignment to the training conditions was randomized or paralyzed when possible. Four conditions were examined: no treatment; training; training and self-reflection-support; training, self-reflection-support and feedback. The data analyses are in progress. We process three-factorial analyses of variance with repeated measures and correlation analyses. We expect significant competence increase across training conditions and measures. Regarding the correlation analyses we expect a significant correlation between trait-questionnaire competence score and quality competence score in the trait-work-sample, a significant correlation for the state-questionnaire competence score (self-assessment) and quality competence score in the state-work-sample (observer-assessment) and significant correlations between the trait measures and the state measures.

Clear and Structured Teaching — Developing a Theoretical Framework

Herweg Constanze, Tina Seidel & Manfred Prenzel

Leibniz-Institute for Science Education (IPN) at the University of Kiel, Germany

The research on teaching factors that influence student learning has been long, manifold and dependent of the current trend in education. One of the most stable teaching factors investigated, however, is clear and structured teaching. Numerous empirical studies and meta-analyses have shown the positive effect of clear and structured teaching on cognitive learning outcomes (Fraser et al., 1987; Scheerens & Bosker, 1997; Sheerens et al., 2005). In addition, clear, structured and application-oriented instruction supports the integration of new learning contents into existing knowledge structures (Bransford et al., 2000). Despite this consistency in investigating clear and structured teaching, the operationalisation of this factor is manifold. Within survey research the development of a theoretical framework on clear and structured teaching is provided to a very limited degree. Thus, the review presented aims to compile theoretical aspects of clear and structured teaching from learning and instruction research in the last 25 years (1980–2005). This work is embedded within the IPN Video Study. (Prenzel et al., 2002) which analyses teaching patterns and their effects on the development of students' competencies, attitudes and interest. This review aims to outline a differentiated framework of clear and structured teaching to analyse our classroom video data. The framework is designed in a way that studies about teaching and learning can be reasonably classified according to the framework. I will be further investigated which components of clear and structured teaching are analyzed by the reviewed studies, which direction of effects are found, and what components lack empirical investigation.

Family Background and Educational Achievement in PISA

Hohensee Fanny

Leibniz-Institute for Science Education (IPN), Kiel, Germany

It is well known that students from less advantaged home backgrounds tend to do less well on average at school than their more advantaged peers. This was also an important result of the Programme for International Student Assessment (PISA), conducted by the Organisation for Economic Co-operation and Development (OECD, 2001, OECD, 2004). PISA measures a number of different aspects of students' background. However, the extent to which the performance of students with advantaged backgrounds differs from students with poorer backgrounds reaches wide diversity among the participating countries. Especially for Germany, a high correlation of family background and school achievement was found. Next to factors related to the school, the economic, cultural and social capital of a student's family is an important issue for the educational future. Based on the PISA 2003 study in Germany, the present analysis investigates the influence of parental support on achievement, in addition to the socio-economic status. In order to be able to answer this question in the PISA 2003 cycle, an additional student and parent questionnaire was implemented in Germany. In detail, we hypothesize that a special constellation of background factors, in addition to socio-economic variables, is connected to the achievement of the students, and that this can be represented by groups of parents. This is analyzed with the method of Latent Class Analysis (WINMIRA, von Davier, 1999). It is expected that the results will show that the family background can be characterized by more than the socio-economic variables.

Playfulness — A Conceptual Tool for Evaluating Playful Learning Environment (PLE) and Activities

Hyvönen Pirkko & Marjaana Kangas
University of Lapland, Rovaniemi, Finland

The aim of this paper is to discuss about the concept of playfulness with seven features that describe the quality of playful learning environments (PLE) and the activities that are implemented in PLE's. A playful learning environment is a construction similar to an outdoor playground that is designed for learning activities that take place through playing and games. Our definition of playfulness is based on the grounds of current theoretical views of playing, Liebermann's (1977) definition of playfulness, different views on socio-emotional and socio-cultural learning, and on our two datasets: image-crafting and interviewing. We have listened to both children and teachers to reach an understanding about learning that is facilitated by play and games. Our research strategy is mostly qualitative and the research design is based on grounded theory. Playfulness is critical to combining the goals of curricula with learning activities in a meaningful way and is defined by these seven features: action, embodiment, emotion, narration, creation, insight and collaboration.

Tutoring, Playing and Learning in a Playful Learning Environment

Hyvönen Pirkko & Marjaana Kangas
University of Lapland, Rovaniemi, Finland

The aim of this paper is to introduce the pedagogical model of Tutoring, Playing and Learning (TPL) that is designed for playful learning environments (PLE). PLE is an outdoor playground environment that affords playing, games and other physical activities. Playful learning environments will increase the amount of play in children's daily practices. For teachers, the TPL model provides a pedagogical model to clarify the theoretical basis for daily activities aimed at carrying out playful learning processes. The perspective on learning and playing lies in a socio-cultural view, enhanced with emotionality and the features of mature play. The TPL-pedagogical model is based on the theory of McClintock (1971), Uljens (1997) and Kansanen (1999) who separated teaching, studying and learning as concepts. In the TPL model, Tutoring replaces teaching, and Playing replaces studying, while playing may convey Learning. Interaction that intertwines teaching and studying is central to this process. Tutoring refers not just to what teachers do, but is evaluated from three points of view: teachers' intentional tutoring, the impact of one's peers on collaborative activities and playful learning environments that afford tutoring once children interact physically with it. Playing is the way that children learn according to the curricula by being active learners who examine, inspect, wonder, spy, seek, observe, create, pretend, discuss, tell, take care, have adventures, express emotions, create roles and plots, construct plans and visions, etc. The role of children is to get involved in playing, not to think about learning.

Scientific Precursor Models Construction: A Science Learning and Teaching Approach in Preschool Education

Ibarra Sabrina Canedo

Didactics of Experimental Ciencias and Mathematics Department, University of Barcelona, Spain

In this paper some results are presented about young children scientific precursor models construction using scientific procedural and communication skills. This exploratory research used a qualitative data collection and analysis to describe how young children aged 5–6 years, construct their explanations concerning different natural phenomena in a dialogical context. The study was conducted in three phases: pre-interview, instructional process and post-interview. Children worked on “Flotation” and “Living Things” precursor models, and in this paper we present results about Flotation precursor model construction based on the objects’ material nature as an indicator of an intuitive approach to density. At individuals interviews we asked the children to predict the possible flotation or immersion of cubes made of different materials and of different sizes. After they had carried out their experiments we asked them to compare the experimental results with their initial predictions and give their explanations. On analyzing children’s answers we realized that several children were lead to both the construction of a precursor model and a general qualitative upgrade of reasoning.

Do the Turkish Senior Students' Attitudes Toward Research, Anxiety and Competency of Research and the Importance that Students Assign to Research Differ According to their Gender and the State of Taking the Research Skills Course?

Inal Sevim

Çanakkale Onsekiz Mart University, Turkey

Considering the political, economical and technological changes and the complexity of knowledge that took place both in the world and in Turkish society during the last decade of the 21st century, characterized the landscape and the quality of current direction of education. This change has moved from traditional passive receiver to active researcher student in education. So, today research and learning are two terms that go hand in hand in education and especially in higher education. A crucially important aspect of higher education is to have students gain critical thinking and problem solving skills and the ability to conduct and develop research competence. As Goetsch (2004) states "success comes from good research". Keeping this in mind, it is important to help students develop good feelings and beliefs toward research and low anxiety for research and identify their competency of research. Researchers have also attempted to relate low anxiety and positive attitude to success and it is reported that the students' general attitude was the best predictor of success. In this sense, the integration of affective characteristics such as attitude and anxiety toward research is important. But in reviewing literature it has been observed that little theoretical or empirical research has examined university students' attitude, anxiety and their competency for research, and the importance they assign to research. This article tries to investigate what Turkish senior students' attitudes toward research and research anxiety are and to investigate their research competence and determine their opinions they assign to research in respect to gender and the state of taking/not taking the research skills course. To perform the objective of the study four scales were administered to the participants: the anxiety scale for research (ASFR); the attitude scale toward research (ASTR); the research competence scale (RCS); the scale related to the importance of research (SRIR). In data analysis, t-test was used to identify the differences between students' attitudes, anxiety, competency and students' opinions that they assign to research according to gender and the state of taking the research skills course. The sampling group consists of 139 senior students studying in English, French, German and Turkish

departments. Some of the participants had already taken the research skills course while others hadn't. The findings indicated that there are no significant differences between trainees' research anxiety, their attitudes toward research, research competency in respect to their gender. But there is a significant difference between the importance that trainees assign to research and their gender. Females' scores are higher ($\bar{X}=25.98$) than those of males ($\bar{X}=23.79$). The mean of trainees taking/not taking the research skills course in respect to their research anxiety, research attitude, research competency and the importance that students assign to research varied.

Teachers' Implicit "Theories" of Intelligence and Their Self-Efficacy: Which Impact on Assessment of Students and their Motivation

Issaeva Elisabeth

FAPSE, University of Geneva, Switzerland

This research has two objectives. The first objective is to determine the impact of the implicit theory of intelligence and of the efficacy belief of the teacher on its evaluation and on the implicit theory of the intelligence of the pupil and on his academic self-efficacy. In agreement with this objective we advance the following hypothesis: 1) The teacher who believes in the fixed nature of the intelligence will have a negative teacher efficacy belief, who will affect his evaluation and the theory of the intelligence the pupil and his cognitive self-efficacy. This effect will be marked more with the pupils having weak success; 2) The teacher adhering to a belief in the malleability of the intelligence will have a positive teacher efficacy belief, which will influence its evaluation and the beliefs of the pupil. The other objective is to determine the predictive capacity of the implicit theories of the intelligence. In agreement with this objective, we propose and test two models: 1) According to the first model, the implicit theory of the intelligence predicts the teacher efficacy belief and thus indirectly affects the evaluation and the beliefs of the pupils; 2) According to the second model, the theories of the intelligence and the teachers efficacy beliefs are two correlated factors, which directly influence their evaluation and indirectly the beliefs of the pupils. The first analyses reveal the predictive capacity of the implicit theory of the intelligence of the teacher and the considerable effects which the beliefs of the teachers exert on their prognostic judgement, like on the beliefs of the pupils.

Lithuanian Fourth Formers' Communication Competence in Reading Non-Fiction Text: Factors that Influence It

Jakavonyte Daiva

Klaipeda University, Lithuania

Communication competence in reading non-fiction text is revealed through the analysis of pupils' reproduction and production abilities. Pupils showed their reproduction abilities at: answering text comprehension questions and accomplishing tasks, where information must be found; recognizing the kind and theme of the text being read. Pupils showed their production abilities at: drawing uncomplicated and generalizing the text conclusions; making interpretations according the whole of the text and personal experience: evaluating the content of the text. The article restricts to communicative competence in reading non-fiction texts. Reading of non-fiction text has influence on communication competence. While reading, pupils develop accurate information apprehension and transfer skills, which are some of the most important skills. These abilities are fundamental for the primary school pupil, as they help in learning other subjects, especially mathematics, world recognition. Pupils' communicative competence in reading non-fiction text. The research was aimed at finding out pupils' abilities to apprehend a non-fiction text, that is, what are communicative pupils' abilities. Pupils were asked to answer 4 questions, which disclosed intelligence and apprehension and 8 questions, which disclosed problem solving, interpretation and evaluation. Be seen that after having read non-fiction text pupils demonstrated better answers to questions, which required disclosing reproduction abilities, that is, 63% of possible amount of points was scored. Nevertheless, more that 30% of the researched have not developed reproduction abilities yet. Slightly more than a half of the researched answered questions, which required production abilities (54%), that is, they made generalizing conclusions, interpreted and evaluated. That means that more than 30% of the researched have not developed communicative (production and reproduction) abilities in reading non-fiction text. That means that these pupils were not able to find directly stated information; draw uncomplicated and generalizing the whole of the text conclusions; interpret and evaluate the text.

Co-Creative Learning Processes in School Settings — A Case of the Game Concept of a “Different World”

Kangas Marjaana & Annakaisa Kultima

University Of Lapland, Faculty Of Education, Centre For Media Pedagogy, Rovaniemi, Finland

The aim of our study is to define the theoretical model of co-creative learning processes (CCLP) and present a game concept based on the model designed for the outdoor playground. Innovative learning environments, in Rovaniemi, consist of new kind of playground equipments and utilise identification and sensory technology in activities. The “Different World” (DW) game concept has been developed and designed for playground activities within the school context. The DW is adaptable for children of different ages and is based on children's creativity and capacity for narration. According to several authorities, fostering creativity should be an essential part of education and should be a guiding principle for teaching. We assume that it is reasonable to pay attention, create and study such learning processes in a school context for which e.g. activity and creativity are essential. For our theoretical background we intertwine the views of game studies, socio-cultural perspectives of learning, concept of creativity and philosophical aspects of possible worlds and thought experiments. First we will introduce theoretical aspects for co-creative learning process with an emphasis on children's creative and collaborative activities. Secondly, we will present a case of co-creative learning process in which children create a narrative framework and game surroundings for “Different World”. The results will be utilized in the design further of learning environments consisting of playgrounds with identification and sensory technologies.

PhD Students' Expectations and Concerns Towards Supervision

Kärner Anita

University of Tartu, Estonia

Traditionally an experienced scientist supervises research done by a young researcher for obtaining the degree of doctor. In German region universities the system is based on principles expressed by Humboldt. Professor who is leading and advising young researchers in the system is called Doktorvater. In Anglo-American system advisor or supervisor is more "soft" expression characterizing relationship between degree seekers and his/her scientific "guide". Without doubt, supervisor has a strong role in success of doctoral student. Some aspects of supervision are discussed in current presentation on the basis of interviews with 15 fresh PhD holders from the University of Tartu. In spring term of 2004 also the investigation was carried out in six Estonian universities to get an overview of the content and management of doctoral studies. The main focus in the survey was doctoral students' attitude towards supervision. The following problems are discussed in the paper on the basis of the results of the investigation: What are PhD students expecting from their supervisors? How does the process of supervision look from young researcher's viewpoint? Which problems occur and what impact do they have on the results of doctoral study?

The Impact of Communication on Cognitive Learning in Science Lessons During Experimental Problem Solving

Kask Klaara

University of Tartu, Estonia

Development of communication skills is an important goal for science education, yet not very much acknowledged in Post Soviet countries. However, scientific literacy has been seen as major target of science teaching, expressed in many science curricula, the meaning and operationalisation is often poorly discussed within social domain. Research has shown that teachers do not use resources for developing the communication skills among the students. Current study is an attempt to find out how communication skills are developing in inquiry-based environment through socially derived laboratory experiment in chemistry classes. The goal of the study was to determine if the quality of learning associated with student undertaking experimentation depends on the type of experimentation, which the students were involved in. The communication index, the HO thinking and the relevancy define the quality of learning. As a part of the instruments, six instructions of socially derived experimental problem solving tasks were used, each instruction involving 3–5 worksheets. The results of the study show that experimentation, involving some or all of the steps of experimental problem solving, increases the student-to-student and student-to-teacher HO oral communication that was reflected in the quality of written communication in the experimental report. During this study, the compendium of socially derived experimental problem solving laboratory instructions was worked out for 9th grade chemistry lessons. Regular use of this enables students to move from current cognitive categories to a higher one and initiates the meaningful multidimensional communication between students.

The Nature of Naive Conception of Sound: a Comparison Between Novices and Experts

Kawanabe Takashi & Yoshida Hajime

Department of psychology, University of Ritsumeikan, Japan

The present study was aimed to explore the nature of naive conception of sound, and identify how it changes. The participants were 70 5th graders aged 10–11 year olds and 53 undergrads (25 majoring in humanities and 28 in physics). Whether they give sound the properties of objects or they consider it as a kind of process, and if they understand its vibratility were examined. The participants were required to answer the 9 questions about physical phenomena of sound in everyday contexts or experimental, hypothetical contexts. It was hypothesized that the tendency to consider sound as a kind of matter would be observed the most frequently in the children and the least in the physics students. The results mainly supported the hypothesis. Additionally, the participants' responses suggest that naive knowledge is partly consistent and structured, and that it can be called a theory. A comparison of the descriptions among the children, the humanities students, and the physics students showed that the conceptual change is not a rapid or sudden process, but a very gradual one. Finally, the methodology for the research for the naive conception was discussed by analyzing the participants' descriptions.

Students' Perceptions of the Effectiveness of A Development Portfolio on Their Self-Directedness in On-Demand Vocational Education and Training

Kicken Wendy, Saskia Brand-Gruwel & Jeroen van Merriënboer
Open University of the Netherlands, Educational Technology Expertise
Centre, Heerlen, The Netherlands

On-demand education is increasingly introduced in Vocational Education and Training (VET) to address the uniqueness of students' learning needs and prepare students for life long learning. This educational approach puts demands on the flexibility and transparency of the learning environment and on students' self-directed learning skills, like the ability to adequately assess their performance, formulate learning needs and select tasks. Empirical evidence shows that many students are often not able to effectively self-direct their learning, except when being regularly informed on their performance gaps, progress, and task features. In this study we investigate whether self-directed learning skills of hair-dressing students (n=10) and beautician students (n=14) in VET can be supported and enhanced by means of a development portfolio in combination with giving them feedback on self-assessment and advice on task selection. Data are gathered on students' perceptions of the effectiveness of portfolio use and advisement and loggings of portfolio use and supervision meetings are kept. In addition, student characteristics and environmental factors influencing portfolio use are examined. Preliminary results indicate that students perceive the portfolio to be effective in helping them to conduct self-assessments and make task selections. However, when students are not intrinsically motivated to use the portfolio they are more inclined to be discouraged by environmental factors to use the portfolio.

Process-Oriented Teaching in Physics Classrooms — Creating Opportunities for Learning?

Kobarg Mareike & Tina Seidel

Leibniz-Institute for science education (IPN) at the University of Kiel,
Germany

International comparative studies such as PISA indicate significant deficits in the scientific literacy of students in some of the participating countries (OECD, 2004). In order to explain these deficits factors on school level and aspects of the social background are taken into consideration, but the role of classroom conditions remains unsettled. Studies focusing on events within German science classrooms show a chalk-loaded demonstrative instruction (Baumert & Köller, 2000) and a narrowly focused conduction of class work (Seidel, Rimmele, & Prenzel, 2003). These classroom activities do not create opportunities for students to engage in higher order learning processes (Bransford, Brown, & Cocking, 2000). This paper aims to identify teacher-student-interactions in the classroom that can create those opportunities for student learning; namely aspects of “process-oriented teaching”. In this context it is not only of interest if process-oriented teaching is implemented, but also if the students actually perceive the learning opportunities offered. This study focuses on the students’ perception of autonomy, competence and social relatedness as indicators for their perception of learning opportunities. The implementation of process-oriented teaching is measured using video-analysis procedures. To investigate whether the students perceive supportive learning conditions, the results from the video analysis are combined with student questionnaire data. The results of this study reveal, that process-oriented teaching is hardly ever implemented in common physics instruction. However, the HLM-Analyses show that students’ in classes with a high level of process-oriented teaching are more likely to report about feeling autonomy and competence, as well as being socially related.

Teaching Competency of Teacher Training Students. A Video-Analysis

Kocher Mirjam & Corinne Wyss

School's of Teachers education of Rorschach, Switzerland, Weingarten, Germany and Zürich, Switzerland

The conventional School's of Teacher Education in Switzerland as well as in the surrounding countries are in a changing phase. Teacher Education is part of a critical-controversial discussion and new ways and criteria for it are searched. With the definition of standards the quality of Teacher Education and the teaching competencies of the students should be secured. Indeed, according to Frey (2004) the question, what competencies student (should) develop, is not clarified. The research project tries to approach and analyse the question which teaching competencies students acquire during their education. A longitudinal study reveals how the teaching competencies are changing with progressive Teacher Education. The coeval cross study identifies differences between the students (novices) and the teaching training mentors (experts). The analysis is proceeding on the base of videotaped lessons, which are taken during the initial teacher training.

Students' Reading Strategies for Different Types of Texts

Kübar Külli

Science Didactics Department, University of Tartu, Estonia

The discourse processing model of van Dijk and Kintsch (1983) assumes that during comprehension, a reader gradually constructs a representation of the text in episodic memory. This textual representation features surface, semantic, and pragmatic information, as well as schematic superstructures. The aim of the present study was to find how different types of texts influence students' text comprehension. Additionally, the processes were studied under the conditions of increased cognitive load, as the texts were read to the experimental and control group by synthetic speech and human voice, respectively. The Estonian speech synthesis is currently not able to distinguish phrases from each other and, therefore, it does not follow the melody contour of different types of sentences, add accents or pauses in the middle of the sentence, characterizing natural speech (Mihkla & Meister, 2002a, b). 32 students (aged 14–18), and 16 adults participated in the study. Two types of audio materials were prepared for two descriptive biology texts, one of these was read by a computer and the other by a human person. After listening to both texts, the participants were asked to write an essay on the same topic. Although the length of texts was similar (72 and 78 clauses, respectively), the content of text 2 was more difficult. As a main result of this experiment, it was established that the number of recalled clauses and the structure of essays depended on the difficulty of text and on the age group, but did not depend on the listening mode.

Does Organizational Learning Contribution to Teachers' Extra Effort, Job Satisfaction, and Students' Academic Achievements?

Kurland Hanna & Rachel Hertz-Lazarowitz

Faculty of Education and Teaching Oranim — The Academic College of Education the Kibbutz Movement Tivon, Israel

Faculty of Education, The University of Haifa, Israel

Schools are currently under pressure to adapt to rapid changes in society, and to improve educational outcomes. Researchers claim that processes of organizational learning (OL) have the potential to improve school's effectiveness. This study examined the effect of OL on teachers' outcome variables: extra effort; job satisfaction and pupils' academic achievements. One hundred and four (104), Jewish elementary schools in Israel were studied; 104 principals and 1,474 teachers participated in the study by answering 46 items Likert type questionnaires. The school was the unit of analysis. Four organizational learning mechanisms (OLM) were identified by using factor analysis: Evaluation, staff involvement, information management, and in-school professional development (Alpha .92). Teachers' extra effort and teachers' job satisfaction were measured by 6 and 8 items Likert type questionnaires. Data on students' achievements were obtained from the Ministry of Education for half of the schools. Results showed significant positive correlations between organizational learning and teachers' extra effort and between organizational learning and teachers' job satisfaction and a tendency to contribute their pupils' academic achievements. It is evident from the results that the processes of organizational learning in school, and that certain mechanisms of organizational learning, contributes to teachers' extra effort, job satisfaction, and show a lower but significant tendency to contribute to pupils' academic achievements.

Reasoning Strategies for Selected Socioscientific Issues

Laius Anne

University of Tartu, Estonia

This paper reports on a methodological approach to the analysis reasoning and argumentation strategies in Estonian basic school science classes developed as part of the project “The development of students’ creative and critical thinking through real-life situations in science classes”. The sample was formed from 165 ten grade students in 5 different schools and their 10 science teachers. Three different real-life situations were used to investigate the reasoning strategies of students and their teachers, based on the type of selected socio-scientific issues and Toulmin’s argument pattern. According to the results, the students’ and teachers’ reasoning skills depended on the theme of real-life situation. The mean level of argumentation did not exceed the third category on Toulmin’s scale of five.

Estonian Teachers' Attitudes Towards Hands-On Activities in Elementary School Science Lessons

Leuhin Illar & Madhumita Bhattacharya

Department of General Education, Faculty of Education, University of Tartu, Estonia

Department of General Education, Center of Research and Development, University of Tartu, Estonia

In order to find out Estonian elementary school science teachers' attitudes and experiences about the use of practical activities in the classroom, a web-based survey (n=153) was conducted. Several questions in Likert scale were asked on, including actual classroom practices: understanding of the importance of practical and hands-on activities; obstacles and limitations on using these activities. The results indicate that most of the teachers have a positive attitude towards practical activities. They enjoy using hands-on methods and also consider them effective both in learning a subject and raising pupils' interest towards science. Lack of instructions in the textbooks and unsatisfactory salary were seen as the main factors hindering the use of practical activities. Due to low response rate (30%), an additional survey with more participants is necessary in order to clarify and explain the pattern of attitudes.

Development and Validation of the Emotions Questionnaire in Higher Elementary Grades (EQEG)

Lichtenfeld Stephanie

Department of Psychology, University of Munich, Germany

Many studies on academic emotions have been done in adolescence, but hardly any studies were conducted in elementary schools. In this study, we tried to construct a valid and reliable questionnaire for emotions in mathematics in elementary grades based on Pekrun's Control-Value Theory. In a study with a representative sample of 687 Bavarian 3rd Graders we examined reliability, validity and factor structure of self-report scales assessing class-related, learning-related and test-related joy, anxiety and boredom in mathematics. Reliability analysis (Cronbach alpha) indicates that the scales of the EQEG are reliable. Moreover, an explorative factor analysis could show that the questionnaire was valid in terms of representing different emotions in diverse academic situations. Confirmatory Factor Analysis (CFA) showed that the 2nd Order Model, which differentiated between the diverse academic situations for each emotion (class-related, learning-related and test-related emotions) fitted better than the 1st Order Model. This implies that the various academic situations evoke different emotional reactions.

Are There Emotional Responses When Understanding Visual Pictures? A Pilot Study With Eye Tracking

Lindström Paulina

Lund University Cognitive Science, Kungshuset, Lundagård, Sweden

This study investigates the possible emotional correlates accompanying aha-experiences. If the hypotheses are supported by the experiment, the aim is to use this knowledge to improve learning and understanding by paying attention to emotional responses in learning situations and to use this knowledge to support students. I suggest that emotion functions like a beacon by guiding attention to a difficulty (Lindström, to appear) and to areas of a stimulus considered to be more relevant for identifying it. It is hypothesized that understanding, characterized by the aha-experience, is preceded and accompanied by emotional responses such as changes in eye movement behaviour and physiological measures such as skin conductance. Data was collected by eye tracking equipment and skin conductance measures. My research is grounded in cognitive theories. Learning and understanding is investigated by examining similarities and differences between novices and experts and how the social context affects learning and understanding.

Preferences of Educational Software and Learning Style

Luik Piret

University of Tartu, Estonia

Every person has his/her own learning style. Knowing students learning style, a teacher can create classroom management system to meet students' individual needs. Nowadays the educational software is extensively used in many schools all over the Estonia for several learning activities. Computer literacy is one of the required competences. The study was carried out to find does usage of educational software responds every student preferences and learning style in Estonia. Only one of the three components of learning style was investigated by the Learning Style Inventory in this study — a sensory orientation. Participants of this study were 336 students age of 13–18. The data were gathered by the electronic questionnaire. The questionnaire consisted sensory oriented learning style inventory, questions on 5-point Likert scale about the attitudes towards computers and computer-based education; and questions on 5-point Likert scale about preferences of Web-based learning and learning activities conducting with the educational software. Due to the fact that the data were on ordinary scale, Spearman rank correlation was used for the analyses. The results of this study indicated that there were not any statistically significant relationships between the sensory orientation of learning style and preferences of learning with the educational software or attitudes towards computers.

How Do We Understand Learning Strategies in Relation to Computer Based Programmes? — An Example from Geography Using Geographical Information Systems

Madsen Lene Møller

Centre for Science Education, University of Copenhagen, Denmark

The present study discuss the development of learning strategies among first-year university students in relation to a computer based programme — in this case Geographical Information System (GIS). Traditional, GIS has been seen as a technical support to existing geographical subjects as e.g. urban studies, land use studies and so on. However, GIS is increasingly being viewed as a geographical instrument educating the students in geographical thinking e.g. spatial thinking throughout the curriculum. This setting creates a new learning situation for the students. It is this changed learning situation and theories of instrumental genesis that are the conceptual focus of the study. Empirical the study is based on a 'coaching' project of existing teaching practice at an introduction course to GIS at the Institute of Geography, University of Copenhagen. Focus was on the students' perspective and included interviews, questionnaires and observations of the students' perception of GIS and their GIS-learning strategies. Data have been collected in fall 2005 and different GIS-learning strategies among the students were found. The paper discusses how these learning strategies are constantly created and re-created in relation to the computer programme and the teaching practice of the course. Focus is on the individual student's construction of understanding and her/his use of the computer programme. Further, issues of gender are touched upon. The paper concludes by addressing the wider educational perspectives of the results.

Patterns of Achievement Motivation and Relations to Mathematical Achievement: a Person Oriented Approach

Mägi Katrin & Eve Kikas

University of Jyväskylä, Department of Teacher Education, Jyväskylä, Finland

University of Tartu, Pedagogical Seminar, Tartu, Estonia

Research has confirmed that cognitive abilities explain a large part of the observed variance in student's achievement; however, in order to reach a more complete understanding of children's school achievement cognitive predictors such as general and specific abilities should be complemented by motivational predictors. Because mathematics is often perceived to be more difficult than many other school subjects and pupils may be relatively early confronted with the possibility of failure, keeping positive motivational orientation may be especially important for good achievement. Achievement goals have been shown to play an important role in achievement in middle- and high-school, however, only few studies have investigated the development and influence of these motivational constructs in elementary grades. One reason could be related to young children's limited self-evaluating abilities. Because elementary grades are considered to be a critical period in the development of motivational orientation, this study aimed to investigate the patterns of children's self-reported and teacher evaluated motivational orientations in elementary grades and the relations between these different patterns and children's academic achievement. The sample consisted of 247 pupils who were in 2nd, 3rd and 4th grade at first measurement and in 3rd, 4th, and 5th grade at second measurement. The results are discussed from the perspective of person oriented approach.

The needful knowledge, skills and abilities for educators: Assessment

Mehdinezhad Vali & Juhani Peltonen

Department of Teacher Education Rauma, Faculty of Education, University of Turku, Finland

It's important that to answer to these questions "why assessment is important? What is authentic assessment? What is purpose of assessment? And..." Assessment of student academic achievement is the process of evaluating whether students are learning what we say they are learning. More specifically, assessment is the systematic collection, review, and use of information to increase students' learning and development. Through a variety of measures, students are assessed to determine whether or not they are achieving the learning outcomes that faculty have determined for their courses and programs. Authentic assessments are essentially those that embed assessment in real world contexts. Wiggins (1993) describes authentic assessment as tasks and procedures in which students are engaged in applying skills and knowledge to solve "real world" problems, giving the tasks a sense of authenticity. Educators use the results of tests and other assessments to monitor the progress of students, diagnose their needs, and make instructional plans. When students complete courses or sequences of courses, programs use assessments to certify that students have achieved a required level of mastery or have met industry standards. Finally, aggregated information about student progress (acquired knowledge and skills, success in courses, etc.) is used to judge the quality of programs. This paper tries to provide information about: Importance use of assessment for educators, purpose of assessment, criteria and principles of assessment, type of assessment, assessment tools, and so on.

Real-Time Assessment of Problem-Solving Behaviour in Business Simulations

Molkenthin René & Klaus Breuer

Johannes Gutenberg University of Mainz, Germany

Business simulations are based on a computational model which represents the complexity and dynamics of business structures and concepts. Within a business simulation the participants can make decisions to direct the modelled enterprise. Thereby the participants can experience the dynamical interdependencies between the different activities within an enterprise. From an economical perspective the success within a business simulation can be measured by the development of core business variables. From an educational perspective the structure of the cognitive system which is responsible for the economical success is relevant. A related aspect refers to the elaboration of the mental model during the activities within a business simulation. Furthermore in the context of web-based learning environments there is the issue how to foster self-regulated learning processes. A prerequisite for an effective feedback which supports self-regulated learning is a continuous diagnosis of the problem solving process, in particular the diagnosis of the information-retrieval and decision-making processes. This contribution describes the basic concept of the diagnostics within a prototype of a web-based business simulation labelled solar SYDUS. First explorative results based on a group of 13 apprentices who have participated in a 2-day simulation session are presented.

A Social Capital Model of School Effectiveness: Students' Citizenship Competences as an Outcome Measure

Moolenaar Nienke

Faculty of Social and Behavioural Sciences, Department of Education,
University of Amsterdam, The Netherlands

The principal aim of school effectiveness research is to obtain knowledge about relationships between 'explanatory' and 'outcome' factors using appropriate models (Goldstein, 1997). Until now, to identify these explanatory factors, scholars have predominantly focused on the formal side of the school organization. While organizational literature shows a growing interest in the nature of organizations as social communities (Kogut & Zander, 1996), educational research on explanatory factors of school effectiveness provided by the school as an informal community is missing. Therefore, this study examines social capital of the school organization and teachers' citizenship behaviours as informal explanatory factors of school effectiveness. Moreover, with respect to 'outcome' factors, school effectiveness research has almost without exception concentrated on academic (cognitive) achievement. In addition to these standard measures, this study investigates students' citizenship competences as an outcome measure of school effectiveness. In this paper, a theoretical model of our informal approach to school effectiveness will be presented, and an empirical test of the model on 51 schools in The Netherlands will be discussed.

Questionnaire-Based Assessment of Learning Conceptions and Analyses Of The Variability of Learning Conceptions

Nieder Tanja

Institute of Educational Psychology, Wolfgang Goethe-University,
Frankfurt, Germany

Qualitative data based on phenomenographic research indicates that students think about learning in qualitatively different ways. Six categories of thinking about learning can be identified repeatedly. Usually they are characterized as (1) increasing one's knowledge, (2) memorizing and reproducing, (3) applying, (4) understanding, (5) seeing something in a different way and (6) changing as a person. The first three of these categories have been described as constituting a surface conception of learning, whereas the latter three represent a deep understanding of learning. Taking phenomenographic research as a starting point a questionnaire was developed to assess learning conceptions of university and high school students. This quantitative data shows that learning conceptions of university and high school students can be assessed in a standardized and reliable way. However, factor analyses provided little support for the surface vs. deep distinction of learning conceptions. Instead, a plausible solution with three factors emerged, which were labelled "surface orientation" (in a stricter sense), "subject-based orientation", and "self orientation". Learning conceptions of university students, high school students as well as students in vocational training were compared on the basis of these three superordinate orientations. In accordance with phenomenographic research, results show that university students think about learning in a more sophisticated way than high school students do, while students in vocational training take an intermediate position.

Primary Education in Sierra Leone and Partnership with Britain

Nishimuko Mikako

Institute of Education, University of London, United Kingdom

Sierra Leone is one of the world's poorest countries and one which until recently experienced a long armed conflict which killed thousands of people, and devastated the economy and infrastructure. In education, the net primary school attendance is 41 per cent, with female attendance at 39 per cent. The government capacity to rebuild the nation is still weak. Her former colonial master, Britain is the largest aid provider to Sierra Leone. The government introduced a policy of free education since 1998 in order to meet the international goals of the Education for All and MDGs. However, considering the above statistic, the prospect of meeting the goal seems remote. Field work data based on questionnaires from 452 parents and 125 teachers in 27 schools in 5 towns, show that the majority of parents have financial difficulties in sending their children to school as primary education is not really free for them. The government lacks the ability to adequate teaching and materials to schools. Therefore, many schools have charged 'school fees' on an individual basis. This research on the one hand investigates the impact of the free education policy in primary education in Sierra Leone and on the other hand, the British contribution and 'partnership' and 'ownership' in the development of education. More specifically, it aims to investigate parents' perception of the difficulties underlying regular access to primary education, and the relationship between donors and recipients.

Challenging Talk: Experiments In English Language Simulations To Develop Social Capital In UK Secondary Students' Speaking And Listening

Norman Phillip

University of Plymouth, Faculty of Education, United Kingdom

This paper reports from on-going research in UK secondary English teaching practice on the theme of 'Social Interaction in Learning and Instruction'. It reports investigation into the use of language simulations in English teaching to develop 11–14 year-old children's linguistic skills and social capital. The UK Secondary National Strategy's focus on the practices of teaching reading and writing has promoted a functional-skills approach in first language English learning, and has isolated these skills from the very contexts that provide them with value and meaning. Similarly speaking and listening, or oracy, in the UK English curriculum is bounded within frameworks of 'formal' speaking and uses of 'Standard' English. Neither are precisely defined in national documents for teaching. Such documents tend to isolate and de-contextualize oracy. This research is an evaluation of a project to re-contextualize oracy within simulated activities. These simulated activities are derived from adult work situations that demand skilful listening and talk. Simulations employed here are scenarios with distinct discourses that involve students in situated group role-play. The scenarios provide space for individual and group creativity, yet are constrained by social and linguistic demands of situation and audience. These simulations are designed to activate children's tacit knowledge of linguistic conventions and create space where such knowledge is distributed through communities of practice in the classroom. The report considers the potential of learning simulations for motivation in speaking and listening. It also considers their implications for students' agency, involvement and language learning in UK secondary English teaching, especially at a time when UK schools are under pressure for vocationally-oriented first language skills teaching.

Using a Mobile Concept Map Tool to Support Collaborative Knowledge Construction

Näykki Piia & Sanna Järvelä

Research Unit for Educational Technology, Department of Educational Sciences and Teacher Education, University of Oulu, Finland

This study explores collaborative knowledge construction facilitated by cognitive tools, such as, concept mapping with paper and pen and concept mapping with the mobile concept map tool. Particular aim is to explore how students externalise their task-specific knowledge in different phases of the collaborative learning and when using different cognitive tools. The reported study was a part of higher education students' (N=13) studies of educational technology. The video data was used for analysing the content of the discussions and the process during the collaborative learning situation. The data driven qualitative content analysis revealed five different ways for externalising knowledge and five categories were inductively formulated to describe externalisation of knowledge.

Analysing Parent-Child Interactions during Study-Related Activities and their Impact on Children's Self-Regulated Learning

Pasternak Deborah Pino & David Whitebread
Faculty of Education, University of Cambridge, United Kingdom

This conference paper will present interim findings from a microdevelopmental study (Granott and Parziale, 2002) of parent-child interactive dynamics during an intervention programme designed to foster a self-regulated approach towards academic tasks on the part of primary school children presenting difficulties in learning at school. Following a sociocultural approach (Wertsch, 1991 and Rogoff, 1998) the paper will examine changes in the adult's interactive and mediational styles observed throughout the sessions and will analyse the impact of these changes on children's self-regulation. The findings presented in this paper are part of a multiple case study conducted in Santiago, Chile with 17 families. Children (aged 7 to 10) showing poor academic achievement and low ability to self-regulate their performance during academic tasks, and parents reporting consistent difficulties when supporting their children's learning at home were selected for the study. During 7 sessions parents and their children were encouraged to work together on academic tasks in the areas of reading and mathematics that were specially designed to foster metacognitive dialogues and strategy use (King, 1991). The results presented in this paper suggest the overall presence of a controlling and an autonomy-supportive pattern of parent-child interaction (Grolnick, 2003) associated to different outcomes in terms children's self-regulated performance. Parents who adopted a more controlling style were more likely to instruct their children providing fewer opportunities for children's planning and strategy use. Conversely, parents who were more autonomy-supportive provided consistent opportunities for the children to organise the task, articulate and implement strategies and evaluate their effectiveness.

The Influence of Virtual Inquiry with “Young Scientist” on Primary Students’ Conceptual Development About Seasonal Changes

Pata Kai

Science Didactics Department, University of Tartu, Estonia

In this article the application of inquiry environment “Young Scientist” was investigated as the tool for promoting students’ conceptual change and conceptual coherence about astronomy conceptions at primary school level. This learning environment supports guided authentic inquiry with models enabling students to actively deal with different correct and alternative conceptions about the reasons for seasonal phenomena. The experiment was conducted with 176 Estonian primary school students from 4th Form who solved different inquiry learning tasks about seasonal changes. It was studied how learning with ‘Horizon’ and ‘Astronomical’ models that provided distinct standpoints for understanding the phenomenon influenced students’ conceptual development during and after the inquiry. Students’ explanations about the reasons for seasonal phenomena were collected with open-ended pre- and post-essays before and after the inquiry with only one or with two models. Changes in students’ conceptions at different stages of the inquiry process were recorded in “Young Scientist” environment with close-ended questions. Students’ explanations in essays and during the inquiry were categorized according to the conceptions: geo- or heliocentric orbit, distance theory, temperature and light differences, weather phenomena and Sun’s position above the horizon. It was found with K-means clustering of pre- essays and post-essays that students have conceptual coherence before and after the inquiry. Different conceptual development was found with selected models. 2-dimensional dissimilarity matrixes of students’ conceptions during the inquiry were constructed with ALSCAL multidimensional scaling for illustrating students’ conceptual coherence patterns when working with different models. It was concluded that although students have conceptual coherence in pre-inquiry situation, their conceptual behaviour during the inquiry depends on whether their conceptual framework was correct or alternative. The latter students did not have conceptual coherence during the different steps of the inquiry.

A Case Study to Evaluate the Effectiveness of Learning and Instruction with Computers

Pearson Mary

University of Sherbrooke, Canada

This case study focuses on the manner in which a teacher in a low socio-economic school neighbourhood exercised his professional autonomy by transforming his practice so that his pupils in grades 4, 5 and 6 could succeed in situ and be prepared for the transition to high school. He set up a "virtual classroom" using personalized computers as instructional and learning tools to develop methodological and cross-curricular competencies. His professional thinking corresponded to that of researchers for whom the use of technology improves school results, increases technological competencies and reduces inequalities between groups (Corbett & Willms, 2002). What is most significant for educational research is that few studies have been conducted to explore the effectiveness of IT as an instructional and learning device. Founded on a socio-constructivist framework, the research design contained qualitative and quantitative elements that involved prolonged contact with the teacher targeted. Three samples were used to measure the specificity of teacher planning, classroom management and teacher-pupil interactions. Results of lexicometrical analysis of discourse and video observations of interactions during pedagogical projects revealed that the teacher targeted stood apart from his peers with regard to authentic contextualized learning and flexibility of approach. The study could impact further research because of the mixed methods used and the dynamic collaboration between researchers and practitioners. The superior results obtained by the 23 pupils on summative tests at the end of grade 6 indicate the positive effects of the instructional model to meet pupils' needs.

Which are the factors influencing web-based problem solving of learners' groups?

Pedaste Margus

Science Didactics Department, University of Tartu, Estonia

A situational simulation 'Hiking Across Estonia' was developed for investigating the factors influencing the performance of solving story problems in a web-based simulation environment. Two samples of voluntary groups from 3 to 5 students solved 25 ecological and environmental story problems and filled in a pre- and post-test that evaluated problem-solving skills. A typology of learners' groups was made with hierarchical cluster analysis according to their characteristics and performance. Five significantly different clusters were distinguished: 'Slow-learners', 'Quick-learners', 'Success-learners', 'Smart-learners', and 'Ineffective-learners'. Different support systems were composed on the basis of the difficulties in particular clusters. These consisted of different types of supportive notes and the rearrangement of the sequence of problems according to students' initial results in the first four problem solving tasks of the learning environment. Applying our support system demonstrated statistically significant improvements in the outcome of solving story problems in small groups. The main factors influencing the effectiveness of problem solving were: i) time spent on learning, ii) initial skills of problem-solving, iii) presence of support for enhancing situation awareness, iv) graduated problem-tasks sequenced on the basis of complexity and difficulty, and v) ratio of genders in a learning group. The importance of these factors depended on the cluster and, therefore, it can be concluded that the design of the instruction of problem solving has to be adaptive.

Using Force Feedback Virtual Reality Technology as a Tactile Gateway to Understanding of Biomolecular Interactions

Persson Petter Bivall, Lena Tibell & Matthew Cooper

Department of Science and Technology

Department of Biomedicine and Surgery

Swedish National Graduate School in Science and Technology Education

Research, Linköping University, Sweden

The area of molecular life science is rich in its use of illustrations and different kinds of computer generated visual representations. These representations are used by students and researchers to convey abstract knowledge and as the models are taken in by the communities the new technology influences the ways to think and work. New visualization software does not necessarily aid the non-professional to any insight about the molecules displayed, as inclusion of new technology into the classroom all too often is done without a proper process of thoughtful development and evaluation. Many chemical events within the human body involve large molecules interacting with smaller molecules in docking processes. Processes that are hard for students to understand, involving complex forces between the molecules. With the Chemical Force Feedback (CFF) system, developed at Norrköping Visualization and Interaction Studio, a student or researcher can examine the forces between a protein and a substrate, all in an integrated environment giving both visual and haptic (tactile/kinetic) feedback. The system also includes a real-time model to show the dynamic properties of the ligand's torsional bonds, a feature not available in any previous haptic system. We recently performed tests at Linköping University, mainly with fourth year undergraduate students in the Chemical Biology program. Data has been collected from computer labs using the CFF haptic environment. Using a formative assessment approach, combining quantitative and qualitative assessment of in an in situ learning situation, we aim at isolating the effects of the inclusion of haptics.

Horizons to the Content and Language Integrated Learning. Individual School Development Changed the School's Reality

Rasinen Tuija

University of Jyväskylä, Department of Teacher Education, Finland

A number of studies have introduced the success of Canadian language immersion practises but the number of CLIL (Content and language integrated learning) studies in Europe is still relatively small. According to the previous researches the advantages of having foreign language as a medium in teaching contents of school subjects are obvious. However the teachers', pupils' and parents' — the users' — voices are barely heard in them. The CLIL-users' voices were captured in the present study. This study describes one model of using CLIL method at the primary school level. The exceptional way of studying is evaluated and described by those who have experienced the approach. The analysed qualitative data by the informants in this case study will offer ideas, notices and observations regarding learning through a foreign language. The learning process, the elements of high quality teaching, the meaning of foreign language competence, challenging way of studying and developing an individual school were the topics that constructed the horizon of meanings in the data analysis. One of the crucial educational issues in contemporary Europe has been the question of increasing the efficiency of language learning and teaching. According to the findings of this study teacher education and in-service education should offer teachers a wide range of tools for working with a foreign language so that teaching would be demonstrative and flexible. Teachers' willingness for co-operation would lead into the integration of contents and that would be an important part in the holistic way of considering the learner.

Assessing the Level of Degree Courses

Rexwinkel G.B. Trudy

Netherlands Quality Agency, The Netherlands

A consequence of the European Higher education Area is that degree courses need to be comparable with each other internationally regarding credits as well as level. Comparison of the level should be rendered as concretely as possible, preferably in the form of quantitative data. How can the level of degree courses be determined? In other words: How can the level of Higher Education Degrees be assessed so that it can be compared internationally? Besides the knowledge economy makes demands to graduates. What are these demands and how can they be integrated in the level concept? In this investigation two questions are leading:

- How can the level of degree courses be formulated?
- How can the level of degree courses be measured in an objective way?

Based on principles from theories and the execution of four pilot studies we developed a method that now takes place at 77 HBO Bachelor degree courses in eight countries. We determined nine indicators by which the level concept can be operationalised and additionally we developed a method to measure the level that can meet in an accountable way the criteria of validity, reliability and acceptance. The method renders results the degree courses need for their management and for the accreditation procedure: the results are quantitative in nature and demonstrate the competences that are developed satisfactory and unsatisfactory by students and graduates of the degree courses. The results correspond with international standards and are underpinned with explanations and arguments coming from six sources: students, graduates, managers of graduates, internal and external supervisors of students and members of the board of branch organizations.

Longitudinal Study of Online Remedial Teaching Effects: A Case-Study of Bachelor Study Economics

Rienties Bart, Dirk Tempelaar, Joost Dijkstra, & Martin Rehm
Maastricht University, Faculty of Economics and
Business Administration, The Netherlands

Due to increased heterogeneity of enrolments of students, problems arise for both institution and student to make the correct choice. Remedial teaching programmes might mitigate these problems. However, the rates of success of traditional remedial teaching programmes in terms of students completing the programme are unclear. The experiences at Maastricht University show that it should be possible to create innovative online summer courses with existing ICT-facilities based on an in-house developed online remedial teaching model. Afterwards, the results of the follow-up study show increase in study success in relevant bachelor courses. Finally, although the courses used two different didactical scenarios, there seems to be some empirical support that the structure fitted the context.

Analysis of Computer Mediatized Project Activities through an ICT-Based model

Romero Margarida

Laboratoire Travail et Cognition, Toulouse, France &
Universitat Autònoma de Barcelona, Barcelona, Spain

The heterogeneity of models used on collaborative activity analysis is a major difficulty on CSCL research capitalization and peer review. Our research had considered preliminary project activities models and proposes a new one based on genericity and interoperability with main CLE requirements. After that, we use the Computer Mediated Project Activities (CMPA) theoretical model to identify the difficulties on mediated project activities through a descriptive statistical analysis. The second section of this paper presents the results of an experiment that aims to verify the assumption that student activity has a correlation with the activity success or failure. The research population were Virtual Campus (VC) students, represented by 39 students engaged on University of Limoges VC. We've considered CLE students' activity as a sum of (1) forum posted messages, (2) number of synchronous activities and (3) total number of CLE user queries during the activity. Then, we've transposed these three numerical variables on an activity index; doing this revealed an important linear correlation between CLE activity and academic success. This research result consolidates partially our first CMPA theoretical model, which is improved on an iterative process, and allows us exploring, in a more detailed way, the reasons of this correlation. All of that, maintaining the main objective of our research, which is the identification of variables intervening on CMPA difficulties in order to design and implement a system helping students face their CMPA difficulties.

Towards a Critical Teacher Education — Why is It so Difficult to Change the Structure of Teacher Education

Räihä Pekka & Tiina Nikkola

University of Jyväskylä, Department of Teacher Education, Finland

In this paper, we aim to discuss some problematic issues in the Finnish teacher education. At the moment, it might seem somewhat daring, and even strange, to criticise the existing teacher education system in Finland, because international researches, such as the PISA research, have shown that Finnish pupils do extremely well at school. One of the offered explanations to this phenomenon has been the supposedly high quality of our teacher education. On the other hand, some researches (STAKES/WHO) in the 21st century show us that Finnish pupils — and teachers to some extent — do not enjoy themselves at school (Suutarinen 2006). In this paper, we will concentrate on discussing the problems belonging to the ontological side of the Finnish school system, to which we refer with the concept of lifeworld. It seems to us that there are two main problems which are closely connected with each other, and which might explain the negative results of these researches. One of the problems is the ineffectiveness of teacher education, and the other is the student selection, which seems to lack the appropriate theoretical framework. In brief, we claim that the didactic side is well taken care of in Finnish schools, as the PISA study shows, but the ontological side, lifeworld, is neglected. In our opinion, the solution to this problem is to alter and improve our teacher education towards a better understanding of lifeworld instead of improving didactic skills.

Estonian Children's Reasoning about Social Rules Transgressing and Teachers' Evaluation of Children's Every- day Behavior: A Developmental Perspective

Schults Astra & Tiia Tulviste

Department of Psychology, University of Tartu, Estonia

First, this study examined children's evaluations of descriptions of hypothetical transgressions of different social rules. Children (N=84) between the ages 5 to 14 were divided into 4 groups according to age (5, 7, 11 and 14 years). Children gave evaluations of the nine descriptions of transgressions of social rules. There were descriptions of transgressing moral norms on purpose and by accident, as well as descriptions of transgressions of conventions. Second, teachers (N=6) of the children rated the frequency of children's actual transgressions in everyday school life. The evaluations of severity of transgressions given by the children depended on social domain of the rule (e.g., transgressing moral norms was evaluated to be more severe than transgressing conventions, as well as on particular content of a description (e.g., purposeful transgressions were evaluated more severely than accidental transgressions). The five-year-olds gave the most severe evaluations of the accidental transgressions of morals as compared to the evaluations given by the children from the other age groups. According to the teachers' reports the children transgressed the social rules quite seldom in everyday life. The boys were considered to transgress moral norms more often than the girls. The five-year-olds were considered to transgress social conventions more often than the older children.

Teaching Behaviour as a Mediating Factor Between Teachers' Pedagogical Content Beliefs and Student Learning

Schwindt Katharina, Seidel, T., Rimmele, R. & Prenzel, M.
Leibniz-Institute for Science Education (IPN), University of Kiel,
Germany

In current instructional approaches researchers assume an influence of teachers' beliefs on their students' competencies mediated by their teaching behaviour. Current studies refer mostly to correlations between teachers' beliefs and students' competencies disregarding the teaching behaviour (e.g. Staub & Stern, 2002). Methods of video analysis now offer the opportunity to take mediating processes into account. Our aim is to investigate if the assumed impact of teachers' beliefs on students' competencies (Stern & Staub, 2002) can be replicated on a video sample of 9th grade physics instruction and furthermore, to study mediating factors of teaching behaviour for the explanation of the assumed relationship. As a theoretical background we draw on the definition of teachers' pedagogical content beliefs according to Shulman (1987) and Bromme (1992), as well as the analysis of teaching behaviours with regard to the choice of methods and the quality of scaffolding student learning (Seidel, Prenzel, & Kobarg, 2005). The sample includes 50 German physics classes. The data collection was realized at three measuring points during the course of one school year, including teacher and student questionnaires as well as video recordings of classroom lessons. The video material is analysed along coding schemes, developed in the context of the IPN-Video-Study (Seidel et al., 2005). The results of two-level HLM-analyses show that the effect of teacher beliefs on student learning could not be replicated for a sample of 9th grade physics instruction. Furthermore, no systematic relationship between teacher beliefs and teaching behaviour could be found.

The Role of Virtual Inquiry Simulation “Young Scientist” in Developing Students’ Conceptual Coherence

Sepp Evald & Kai Pata

Science Didactics Department, University of Tartu, Estonia

This research focused on developing conceptual coherence as an important aspect of conceptual knowledge construction. The study resided on the complex understanding of the nature of general conceptual coherence suggesting that conceptual, contextual and representational aspects should be considered. Participants of the study were 120 primary school students’ (Form 6th) from different schools in Estonia. We investigated how virtual inquiry learning supported by “Young Scientist” environment influenced the development of students’ conceptual coherence about food chains in water ecosystems. We assumed that complex learning environment for inquiry learning “Young Scientist” could broaden students’ knowledge about the various contextual and representational aspects of concepts. Conceptual coherence could be developed through the application of concepts in lower and higher order cognitive tasks during the steps of the inquiry. First it was studied, what characterized students’ different types of conceptual coherence on food chains in water ecosystems, and how the effectiveness of in inquiry steps depended on students’ initial conceptual coherence level. Secondly, we investigated how “Young Scientist” environment developed students’ conceptual coherence. The open-ended questionnaire was developed to measure students’ conceptual coherence before and after the activity in contextual (everyday and scientific) and representational (textual and visual) dimensions through lower and higher order cognitive tasks. Data about students’ knowledge construction, when operating with different representations during inquiry phases, were collected from the “Young Scientist” environment. 3 levels of students’ conceptual coherence were distinguished with k-means clustering that differed from each other in the dimensions of correctness and connectedness of conceptions about food chains within and between everyday and scientific context in textual and visual representation formats. Chi square analysis indicated that students with lower level of initial conceptual coherence were less effective in performing inquiry tasks than students with higher level of conceptual coherence. The application of “Young Scientist” environment had less influence on developing students who were initially at lower level of conceptual coherence.

Social Background, Parents' Competencies and Students' Achievement: Structural Models by Rasch Measurement

Siegle Thilo

Leibniz-Institute for Science Education (IPN), Germany

Equal opportunities in education are central to education policy. Thus, the effects of students' social background on students' competencies are relevant but connected by mediating factors in a complex way. The Programme for International Student Assessment (PISA) assesses students' competencies and context areas. These context areas are, amongst others, social background and parental factors which influence school achievement and students' attitudes and motivational factors in relation to competencies. Incorporating these areas, and based on the German PISA 2003 sample of complete ninth grade classes ($N = 8559$), a structural equation model (SEM) of the effects of social background on students' competencies will be presented. In PISA, scaling procedures rely on the Item Response Theory (IRT) in the Rasch model. Therefore, the study at hand attempts to combine the IRT and SEM approaches. Structural equation models consist of a measurement model and a structural model. In this study, the Rasch scaling procedure will be incorporated into the measurement model of the constructs mentioned, while a structural model will map the social and parental background on student motivation and competencies. An additional study, funded by the German Research Foundation (DFG), assesses the mathematical competencies of the parents of PISA 2003 test takers ($N = 245$). Parental mathematical competency is included in a second, extended structural equation model. These models may reveal mediated connections of parental background and student achievement by combining the methodological approaches IRT and SEM and by incorporating the mainly unaccounted factor of parental competencies.

Learning Object Oriented Programming from the Students' Perspective

Stamouli Ioanna & Meriel Huggard

Dept. of Computer Science, Trinity College, University of Dublin,
Ireland

Programming concepts and languages are fundamental for the study of computer science and it is essential that first year undergraduate students master skills in these areas as quickly as possible. Moreover, students who encounter difficulties when learning to program find that this has a negative impact on their performance throughout their undergraduate career. Thus, an understanding of how students comprehend topics within the subject area; the conditions for learning and how learning takes place, are powerful tools that enable educators to improve their teaching. Most universities include object oriented languages, such as Java and C++, in their first year undergraduate curriculum. This study follows a group of computer science undergraduate students at the University of Dublin through their first year Java programming class. It focuses on how novice programmers perceive both object oriented programming concepts and programming as a whole. Since the focal point of this research is on the students' perspectives and understanding, the methodology that was used is phenomenography.

How Do Birds Fly? An Educational Approach of 6th Graders

Sturm Heike

University of Bayreuth, Institute of Biology Didactics, Germany

This study compares three different educational approaches within the subject of bird flight. Two instructions are based on a working at learning stations, with variations in the instructional material. The third instruction is a conventional approach where the same content is taught in a more teacher-centred approach. 363 secondary school students (highest stratification level) participated in the quasi-experimental design. The cognitive learning effects have been measured by comparing pre-tests, post-tests and retention-tests of the different instructions. Additionally, motivational influences were assessed by Deci and Ryan's "intrinsic motivation inventory". According to the theory of self-determination the learning outcome and the motivation of the students is assumed to be higher in the instructions with the learning stations. However, working at learning stations is not per se better than conventional approaches.

Evaluating Critical Discourse Analysis: A Demand for Alternative Assessment Criteria?

Tapola Anna

University of Kalmar, Department of Biology and Environmental
Studies, Sweden

The aim of my contribution to the conference is to discuss a strategy for analysing the structures and impacts of power, dominance, hegemonic structures and elite hierarchies on certain phenomena. The strategy is commonly called Critical Discourse Analysis (CDA), and in this paper I focus on Fairclough's three-dimensional model for CDA. In order to discuss CDA as an analytical tool, I will present a pilot study. The aim of the investigation was to analyse teacher students' views on the relationship between science education and ideology, especially regarding genetic techniques, genetics and its societal implications. The students' positions were analysed in relation to educational directives. The results show two major, distinct and dissimilar discourses, i.e. the dominant Enigma Discourse and the less pronounced Discourse of Reflection. In conclusion, this means a majority of the students did not challenge the prevailing power elites nor did they question the predominant hegemony. Instead, by repeating the same rhetoric mantras — and avoiding profound critical thinking — the students seemed to support and maintain the dominant hegemonic structures. In order to assess the quality of a study we usually consider validity and reliability as important concepts — all suitable for quantitative research. In the pilot study I have chosen a qualitative approach, which might indicate the need of alternative parameters to carry out a relevant quality assessment. In this paper I discuss whether trustworthiness, in terms of credibility, transferability, dependability and confirmability, can be more appropriate.

Bridging the Gap between Research and Practice — Science Teachers Views on an International Research Report

Teppo Moonika

University of Tartu, Estonia

In a previous study, 675 grade nine Estonian students were tested to find out their interest and attitudes towards science. Findings showed differences in interest in school science between boys and girls and also in the importance of the contexts in which science is taught. The current study is an attempt to find out how Estonian science teachers understand and appreciate the need for dissemination of research outcomes. It tries to find out how two different groups of science teachers — single subject teachers (7) and primary school teachers (13) — interpret research data and see its use in their teaching, by determining what kind of information/data are interesting for teachers, what can they usefully gain from published materials, how they interpret the data, make conclusions, and determine their readiness to change their teaching strategies and gain ownership where they perceive a need to change. Results showed that 1) without in-service, teachers need special training to interpret research data, 2) it is possible to identify three categories describing teacher's readiness and interest to use research outcomes and 3) disseminating research data to teachers is recognized by teachers as important.

What Kind of Learning Takes Place in Religion Education?

Ubani Martin

University of Helsinki, Finland

This paper will explore the question of what kind of learning takes place in Religion Education (RE). This paper presents the background of a study of which data collecting will be completed during winter 2005–2006. The participants are 12–13 year old pupils. The interviews will be conducted after one specific lesson and focus on the learning and thought-processes that are going on during the RE lesson. In literature, there has been different ways to describe learning in RE. This paper adopts a view derived from the relevance structure of learning (Olkinuora 1983). Personal relevance includes the cognitive and affective domain. This paper adds a third dimension called existential significance to the two forms of personal relevance. They will form the theoretical background for the forth-coming study of learning and thought-processes going on during RE lessons. The paper finishes with some implications to the empirical study.

Roles of the Primary School Teacher in the Computer-based Instructional Settings

Uibu Krista

Faculty of Education, University of Tartu, Estonia

The introduction of information and communication technology (ICT) in education has influenced educational process, teachers' perceptions of their tasks and possibilities, their attitudes towards instruction. In 2005 a qualitative study was conducted with aims to find out the vision of primary school teachers who systematically used ICT, of their role and how ICT helped to perform the teachers' roles. The teachers were selected on the basis of the pilot study that was carried out in 11 schools of Estonia in 2002/2003. The teachers were interviewed. Results of the pilot study showed that the primary school teachers could be grouped into four types. The primary school teachers who on the basis of the pilot study were grouped into the fourth type (regularly use ICT tools in instructional settings) made up a sample for the basic study. According to the results ICT has not changed the essence of the primary school teacher's role in traditional and computer-based class, but proportions between the teacher's roles/tasks have changed. The teacher's main roles include guiding and advising students and individualising teaching, using of modern teaching methods. The teacher's activity in computer-based instruction is to complete extra tasks — to choose different materials and to control authenticity of information. Main new roles of the primary school teacher include being an expert of study materials, a planner, a collaborator and a (co)-learner. These teachers' positive example could motivate changes in the attitudes and principles of the teachers who lack positive experience in the ICT-based instruction.

Primary School Children's Experimentation Strategies and Related Cognitive Abilities

Valanides Nicos & Maria Papageorgiou

Department of Education, University of Cyprus, Cyprus

The study investigated fourth- and sixth-grade students' cognitive abilities and problem-solving strategies. Eighty students were individually interviewed as they were experimenting with an improvised device. The device consisted of a wooden box with eight small electric bulbs in a line and five switches, in another line below the bulbs, which could move up and down. Each interviewee was asked to "think aloud," prior and after any experiment with the device. The bulbs and the switches were connected in a "hidden" circuit inside the box, in a way that only one or none of the bulbs could light on. The interviewees were also instructed to proceed in a step-by-step fashion and keep a record of their observations that could be used as a "system of external memory." The transcribed interviews were audiotaped and later transcribed and analysed. The results showed that children were inclined to mainly collect evidence from the experimental space and mainly from positive experiments, that is, experiments where a bulb was lit on, while they considered that otherwise they could not get any information. Students also failed to employ the control-of-variables strategy, but they were, to a certain extent, able to employ a not fully developed combinatorial reasoning. In addition, they had difficulties to effectively organise their results and did not take full advantage of their recorded data. They did not exhibit ability to coordinate their hypotheses with the collected evidence. The results of the study can guide further research for identifying patterns of children's cognitive development and design teaching scenarios conducive to accelerating their cognitive growth.

The Effect of Ethnicity and SES in the Class on Achievement: a Meta-Analysis

van Ewijk Reyn

University of Amsterdam, SCO-Kohnstamm Institute, The Netherlands

There has been a long-going debate about whether school composition (i.e. the average SES and the percentage of ethnic minority pupils in a class / school) has an impact on individual children's study results. In a meta-analysis, we combined the findings from previous studies to come to definitive answers on this matter. There are large differences between studies in the results they find, firstly, because of real differences in the student population in their sample (e.g. composition effects are stronger / weaker in the USA than in Europe) and in the test used (language vs. mathematics) and secondly, because of differences in the statistical models used (viz. the variables controlled for in a multiple regression and the technique used). Because studies into compositional effects generally use multiple regression techniques, the more usual meta-analytic techniques could not be applied. Instead, meta-regression is used. In this, a "b" or "beta" regression parameter is "predicted" / explained from the characteristics of a study and from the control variables and technique it used. The hypotheses were that being in a class with a lower average SES has an adverse impact on an individual's achievement, as does having a higher percentage of classmates who come from an ethnic minority. The effect on pupils who are immigrants themselves is expected to be larger than the effect on ethnic majority pupils. Preliminary results support these hypotheses. Furthermore, the effect of composition according to ethnicity is stronger for mathematics than for language.

Knowledge Telling vs. Knowledge Transforming

Villalón Ruth & Mar Mateos

Autonoma University of Madrid, Basic Psychology Department, Spain

Students' representations are essential to understand why they face writing tasks in a reproductive or transformative manner (Flower et al., 1990). The aim of this study is to explore a variable which can influence this representation, conceptions about writing itself. Different approaches have established two ways of conceiving, more or less implicit, which could represent the extremes of a continuum from a reproductive position ("Knowledge Telling", "Transmissional" models) to a more epistemic one ("Knowledge Transforming", "Transactional" models). Recent studies have shown that student's beliefs are related to the quality of the texts written and they seem to influence written composition (White & Bruning, 2005). In this work, secondary and university student's conceptions about several writing aspects (uses and functions, processes, learning and command and text quality assessment criteria) were examined through a likert questionnaire. This instrument contains two scales, in which a reproductive and an epistemic writing view can be identified. Results point out that, although university students show more elaborated writing view than secondary students, neither group would reach the most epistemic view. Furthermore, differences among the ways of conceiving the different aspects examined can be found, especially in the undergraduate students group.

Technology Enhanced Collaborative Learning — When Scaffolding Is Needed?

Vuopala Essi
University of Oulu, Finland

The diversity of empirical studies has provided deeper knowledge of computer supported collaborative learning (CSCL). However it is still hard to predict when collaboration provmotes learners effective learning processes, and when they might need specific support in order to continue their studying beneficially. The aim of this study is to explore when learners need support during collaborative learning process and what kind of support is needed. Particular aims are to find out 1) what are the factors that predict both success and failures of collaborative learning processes in the context of CSCL 2) and what kind of scaffolding (given by either a teacher or a peer-tutor) is needed in order to prevent or fix the failures. The data has been collected from two different web-based courses. The first data (N=18) consists of in-service training students' interviews, tutor's interview and written notes in web-based learning environment. The second data (N=45) will consist of higher-education students' interviews, tutor's interview, written notes in web-based learning environment and on-line web questionnaires. The data has been analyzed with qualitative content analysis, but in some cases (e.g. questionnaires) also quantitative methods will be used. Preliminary results show that factors causing failure of collaborative learning can be both motivational (e.g. lack of students' motivation), meta-cognitive (e.g. lack of study skills) and cognitive (e.g. too difficult assignment). Failures can also be caused by group achievements (e.g. a group doesn't share a joint orientation).

Judging of Sources and Information During Information-Problem Solving on the WWW

Walraven Amber, Saskia Brand-Gruwel & Henny P.A. Boshuizen
Open University of the Netherlands

Information-problem solving (IPS) is a complex cognitive skill that students of all ages are supposed to have. However, research has shown that many students have problems with this skill. Judging and selecting information is especially problematic for children as well as adults (Britt & Aglinskias, 2002). This study focuses on the way students and teachers of third year pre-university classes search, judge and select information on the WWW. Special attention is given to the criteria students and teachers use to judge and select information. 23 students and 12 teachers received two tasks from different domains (physics, geography or language). After reading the task, participants wrote down their prior knowledge. They had 30 minutes per task to find information to solve it. Useful information found on the WWW could be copied into a Word-file. Tasks were made individually and participants were instructed to think aloud. A day later, participants gathered in groups for a discussion. In this discussion the criteria they used for selecting information were elaborated on. Momentarily, the protocols and discussions are being analysed. Preliminary results show that students are able to name criteria for selecting and judging information. But they also admit that they do not use these criteria while searching the WWW. Teachers are more aware of the origin and author of a site, but this is only true with a task in their own subject area. When they lack prior knowledge, judging information becomes more difficult.

Exploring Learning about Greenhouse Effect in Green Schools in China

Wang Li

Pedagogiska Institutionen, Stockholm University, Sweden

China's prioritization of economic development over ecological and social considerations may have environmental repercussions. But the problem of greenhouse effect caused by particularly coal combustion together with increasing number of cars appears as not only a Chinese regional problem, but one with global consequences. Based on pupils' discussions regarding the responsibility to reverse environmental deterioration, which is elicited from discussions about greenhouse effect, the study aims at describing and exploring how they interpret the relationships among nature, society and individuals. The investigation is from the angle of seeing them as dynamic inter-relationships woven among the three aspects. The design of the study is composed of five assignments aiming at investigating how 14 year olds studying at Chinese Green Schools in the Beijing area interpret the concept of greenhouse effect in the practical situations by referring to pictures showing changes of life, and also by referring to pictures showing changes of landscapes. The paper describes students' conceptions of the roles of individuals, nature and society towards sustainable development and their inter-relationships. The preliminary findings show that the pupils' interpretations of the relationships vary depending on where their own standpoints are.

Awareness of Self as Learner and Its Contribution to Learning Outcomes in First-Year Economics

Ward Sophie Claire, Meyer J. H. F. & Shanahan M. P.
University of Durham, School of Education, United Kingdom

This study investigates the awareness of self as learner and its contribution to academic performance within the context of first-year economics. Students enrolled on the 'Introduction to Economics' course at the University of South Australia in May 2005 completed an online economics specific 'Reflections on learning inventory' (RoLI) and were then instructed to write a short reflective essay about their learning. This exercise was repeated 12 weeks later at the end of the course, shortly before the examination. The examination results and the first and second essays of these students were studied to compare the responses of those students who passed and those who failed, and to observe any changes to individuals' responses over the 12-week interval between essays. A pilot study found that although the first essays of all of the students were very similar, subtle differences in the students' relationship to learning engagement could be observed, with successful students seeking the rationale of economics and demonstrating the desire to relate economic principles to their own experiences. The differences between the successful and failing students became more marked in the second essays, with the awareness of self as learner appearing to play a significant role in their engagement with economics. The present study (to be undertaken in May 2006) will test these initial findings. The study will be based on a random sample of approximately 150 students, half of whom were studying at the mainland campus in Australia and half were Hong Kong students studying at a distance learning centre in Hong Kong.

Learning from Ones Practice — Teacher's Growth During in Service Training in the Classroom

Wernberg Anna

Kristianstad College University, Sweden

In service training is in many ways important for teachers' development in their profession. In many cases one or two teachers are sent to a continuation course and at the very best they return with some idée of how to improve the practise. The problem then occurs in how to implement these new ideas to the other teachers who did not attend the course, as well as the problem of putting the learned theories into practise. In this paper I will show how teachers develop through in service training in the classroom. The teacher participated in a research project, "The pedagogy of learning", which among other things aims to develop teachers' learning. The method used is Learning Study. Learning Study is an iterative process where teachers in collaboration with researchers plan and conduct research lessons, with an intention to improve educational settings by revision based upon the analyses of the data (video recording from the research lesson and post-test) which indicates the students' development. In this particular study we saw a change in the way the teacher acted towards the students. In lesson one the teacher was more concerned about getting the students' to find the right answer than listen to what they said and try to discern how they thought instead of try to get them to understand how she thought. In the third lesson the teacher puts more emphasise on how students came up with the answers, by asking the students how they thought when they came up with the answer.

Improving the Quality of Geography Research Papers in Secondary Education

Wildschut Hilde and van der Schee Joop

Vrije Universiteit Amsterdam, Centre for Educational Training, Assessment and Research, Amsterdam, The Netherlands

This contribution focuses on problems that students may have with structuring information in a geographical way when writing research papers and how teachers may help students to write quality research papers. The study fits in the discussion on domain-specific skills and transfer (Alexander & Murphy, 1999) and on thinking skills (Beyer 2001). Using a questionnaire, 73 Dutch geography teachers were asked how they teach secondary school students to conduct geographical research. Teachers state to make use of different teaching strategies and they stress the importance of structuring information in a geographical way. However, one-third believes that didactical strategies are not sufficient. Further, an analysis of 46 geographical papers from final examination secondary school students showed that the geographical structure in these papers is often missing. This suggests that students probably do not know exactly what a geographical paper should entail. Finally, in collaboration with a group of secondary school teachers an instrument was developed to teach students how to write papers in a more geographical way. Although there seems to be a need for teaching students how to structure and analyse information in a geographical way, it does not seem easy for teachers to accomplish that. It seems to be necessary to design and test a didactical model that teachers can use to help their students structuring their geographical research projects. The instrument developed together with the group of teachers may be a first step in this process.

Re-Examination of Kagan's Model of Teachers' Professional Development: Interns' Concerns and Reasoning as Reflected Through Their Self-Reported Cases

Yinon Hayuta

Faculty of Education, University of Haifa, Israel

Integrating Fuller & Bown and Berliner's models, Kagan developed a new model of teachers' professional development, which translates teachers' concerns into terms of knowledge acquisition, and emphasizes the reconstruction of novice teachers' image of self as teachers. Kagan's model and its linkage between the emotional component (teachers' concerns) and the cognitive component (teachers' reasoning) of the process of becoming a teacher haven't been re-examined directly. This qualitative study aims at filling this gap by exploring what interns' self-reported cases reveal about their concerns and reasoning. Moreover, the uniqueness of the study results from its focus on self-reported cases and on teachers in their first years as formal teachers. This study is rooted in the context of a teacher education program institution, focusing on three internship workshops, instructed by the author at the University of Haifa throughout 2004–5. 49 interns' case descriptions are now being analyzed in stages by the author and by another fellow researcher using grounded theory procedures. I expect to find that interns' concerns and reasoning are more complex than the ones described in the literature, namely, that interns' concerns combine all the concerns identified by Fuller & Bown, while their reasoning reflects novice as well as expert characteristics described by Berliner. If this expectation becomes realized, it will challenge the stage-oriented and linear claim of teacher professional development models, and emphasize the contribution of pre-service and induction teacher education programs in promoting beginning teachers' cognitive skills and reasoning.

Motivational Effects on Cognitive Load in Learning with Multimedia

Zander Steffi & Roland Brünken

University of Göttingen, Georg-Elias Müller-Institute for Psychology,
Department for Educational and Developmental Psychology, Germany

Cognitive Load Theory is one of the central theories to describe effects of diverse instructional design methods on knowledge acquisition in learning with multimedia. A range of studies on the effects of cognitive learner prerequisites on cognitive load and knowledge acquisition in this context exist. In contrast there is no systematical research on the influence of motivational learner prerequisites on knowledge acquisition and cognitive load in multimedia learning. Regarding cognitive load we assume that highly motivated learners invest more mental resources than low motivated learners. So that at the one hand motivation frees up more cognitive capacity for information processing. On the other hand it would be possible that highly motivated learners invest more effort in comprehension processes i.e. the germane cognitive load would be increased. Furthermore we assume that high motivation supports knowledge acquisition. To test the hypotheses we conducted an Aptitude-Treatment Interaction study. Motivational variables constituted the aptitude variable, the presentation mode (modality of the text of a computer-based learning program) constitutes the treatment variable. Cognitive load and knowledge acquisition were the dependent variables. The study was conducted with German students of 11th and 12th grade of grammar school. Two versions, an audiovisual and a visual-only, of a computer-based learning program on a biology subject were developed. Motivation and cognitive load were measured by questionnaire in the beginning and during the learning process. First results will be presented at the JURE Conference.

List of participants and contact E-mails

1. Adam-Schwebe Stefanie	adam-schwebe@paed.psych.uni-frankfurt.de	19
2. Adojaan Kristjan	kristjan@5dvision.ee	20
3. Amaral Rosa Maria	amaralrm@gmail.com	23
4. Antonietti Maja	antonietti.maja@unimore.it	22
5. Aprea Carmela	caprea@bwl.uni-mannheim.de	23
6. Arellano Alfredo Bautista	a.bautista@uam.es	24
7. Bazanov Boris	boris.baz@mail.ee	25
8. Begum Marjahan	mzb@cs.nott.ac.uk	26
9. Charlesworth Zarina M.	charlesworth@glion.ch	27
10. Chiras Andreas	andchir@cytanet.com.cy	28
11. Cierniak Gabriele	g.cierniak@iwm-kmrc.de	29
12. Darnon Celine	celine.darnon@upmf-grenoble.fr	30
13. Degerman Mari Stadig	marde@itn.liu.se	
14. Dehler Jessica	j.dehler@iwm-kmrc.de	31
15. Deimann Markus	Deimann@uni-erfurt.de	32
16. Dignath Charlotte	c.dignath@paed.psych.uni-frankfurt.de	33
17. Dorner Helga	helgadorner@axelero.hu	34
18. Eklund Ann-Charlotte	ann-charlotte eklund@ped.gu.se	35
19. Endedijk Maaïke	m.d.endedijk@ivlos.uu.nl	36
20. Filisetti Laurence	laufil@yahoo.com	37
21. Fragou Olga	ofragou@ppp.uoa.gr	38
22. Giacosa Norah S.	norah@correo.una.edu.ar	39
23. Glueck Daniela	d.glueck@paed.psych.uni-frankfurt.de	40
24. Gonzales Fernanda	fgonzalez@psi.uned.es	41
25. González Manuel Rodríguez	manuel.rodriguez@uam.es	42
26. Grenon Vincent	Vincent.Grenon@USherbrooke.ca	43
27. Helle Laura	laura.helle@utu.fi	44
28. Hertel Silke	silkehertel@web.de	45
29. Herweg Constanze	herweg@ipn.uni-kiel.de	46
30. Hohensee Fanny	hohensee@ipn.uni-kiel.de	47
31. Hyvönen Pirkko	Pirkko.Hyvonen@ulapland.fi	48, 49
32. Ibarra Canedo Sabrina	sabrinacanedo@hotmail.com	50
33. Inal Sevim	inal.sevim@gmail.com	51
34. Issaeva Elisabeth	issaieva@tiscali.fr	53
35. Jakavonyte Daiva	daivairtomas@delfi.lt	54
36. Jokic Boris	boris@idi.hr	
37. Kangas Marjaana	Marjaana.Kangas@ulapland.fi	48, 49, 55
38. Kärner Anita	anita.karner@ut.ee	56
39. Kask Klaara	kkask@ut.ee	57

40. Kawanabe Takashi	lt133024@lt.ritsumei.ac.jp	58
41. Kicken Wendy	Wendy.Kicken@OU.nl	59
42. Kobarg Mareike	kobarg@ipn.uni-kiel.de	60
43. Kocher Miraim	mikochoer@gmx.net	61
44. Kübar Külli	kulli.kubar@ut.ee	62
45. Kurland Hanna	hkurland@oranim.ac.il	63
46. Laius Anne	anne.laius@ut.ee	64
47. Leuhin Illar	Illar.Leuhin@ut.ee	65
48. Lichtenfeld Stephanie	lichtenfeld@mip.paed.uni-muenchen.de	66
49. Lindström Paulina	Paulina.Lindstrom@lucs.lu.se	67
50. Luik Piret	Piret.Luik@ut.ee	68
51. Madsen Lene Møller	lmmadsen@cnd.ku.dk	69
52. Mägi Katrin	kamagi@cc.jyu.fi	70
53. Michael Marina	marinam91@yahoo.com	
54. Molkenthin René	Rene.Molkenthin@uni-mainz.de	72
55. Moolenaar Nienke	N.M.Moolenaar@uva.nl	73
56. Näykki Piia	piia.naykki@oulu.fi	77
57. Nieder Tanja	nieder@paed.psych.uni-frankfurt.de	74
58. Nielsen Niels Bech	nbn@dcs.gla.ac.uk	
59. Nishimuko Mikako	mnishimuko@ioe.ac.uk	75
60. Norman Phillip	phil.norman@plymouth.ac.uk	76
61. Papageorgiou Maria	sepgmp6@ucy.ac.cy	98
62. Pasternak Deborah Pino	dsp26@cam.ac.uk	78
63. Pata Kai	kpata@ut.ee	79, 90
64. Pearson Mary	Mary.Pearson@USherbrooke.ca	80
65. Pedaste Margus	margus.pedaste@ut.ee	81
66. Peltonen Juhani	jupelto@utu.fi	71
67. Persson Bivall Petter	pbp@itn.liu.se	82
68. Rähkä Pekka	piraiha@edu.jyu.fi	87
69. Rasinen Tuija	tuija.rasinen@cygnnet.jkl.fi	83
70. Rexwinkel G.B. Trudy	rexwinkel@nqa.nl	84
71. Rienties Bart	b.rienties@algec.unimaas.nl	85
72. Romero Margarida	mail@margarida-romero.com	86
73. Schults Astra	astra.schults@ut.ee	88
74. Schwindt Katharina	schwindt@ipn.uni-kiel.de	89
75. Sepp Evald	votteli@ut.ee	90
76. Siegle Thilo	siegle@ipn.uni-kiel.de	91
77. Stamouli Ioanna	stamouli@cs.tcd.ie	92
78. Sturm Heike	heike.sturm@uni-bayreuth.de	93
79. Tapola Anna	Anna.Tapola@hik.se	94
80. Teppo Moonika	moonika.teppo@ut.ee	95

81. Thoma Gun Brit	thoma@ipn.uni-kiel.de	
82. Török Erika	torok.erika@gamf.kefo.hu	34
83. Ubani Martin	martin.ubani@helsinki.fi	96
84. Uibu Krista	Krista.Uibu@ut.ee	97
85. van Ewijk Reyn	r.vanewijk@uva.nl	99
86. Villalón Ruth	r.villalon@uam.es	100
87. Villako Heli-Anneli	heliala@ut.ee	20
88. Vuopala Essi	essi.kallio@oulu.fi	101
89. Walraven Amber	amber.walraven@ou.nl	102
90. Wang Li	ang.li@ped.su.se	103
91. Ward Sophie Claire	s.c.ward@durham.ac.uk	104
92. Wernberg Anna	anna.wernberg@bet.hkr.se	105
93. Wildschut Hilde	h.wildschut@ond.vu.nl	106
94. Wyss Corinne	cowyss@gmx.ch	61
95. Yinon Hayuta	hyinon@construct.haifa.ac.il	107
96. Zander Steffi	szander@uni-göttingen.de	108

1	Introduction	1
2	1.1. The history of the book	2
3	1.2. The structure of the book	3
4	1.3. The notation	4
5	1.4. The terminology	5
6	1.5. The symbols	6
7	1.6. The abbreviations	7
8	1.7. The references	8
9	1.8. The appendixes	9
10	1.9. The index	10
11	1.10. The bibliography	11
12	1.11. The glossary	12
13	1.12. The list of figures	13
14	1.13. The list of tables	14
15	1.14. The list of references	15
16	1.15. The list of symbols	16
17	1.16. The list of abbreviations	17
18	1.17. The list of terms	18
19	1.18. The list of definitions	19
20	1.19. The list of theorems	20
21	1.20. The list of lemmas	21
22	1.21. The list of propositions	22
23	1.22. The list of corollaries	23
24	1.23. The list of examples	24
25	1.24. The list of exercises	25
26	1.25. The list of problems	26
27	1.26. The list of solutions	27
28	1.27. The list of answers	28
29	1.28. The list of questions	29
30	1.29. The list of comments	30
31	1.30. The list of notes	31
32	1.31. The list of footnotes	32
33	1.32. The list of endnotes	33
34	1.33. The list of appendices	34
35	1.34. The list of index	35
36	1.35. The list of bibliography	36
37	1.36. The list of glossary	37
38	1.37. The list of figures	38
39	1.38. The list of tables	39
40	1.39. The list of references	40
41	1.40. The list of symbols	41
42	1.41. The list of abbreviations	42
43	1.42. The list of terms	43
44	1.43. The list of definitions	44
45	1.44. The list of theorems	45
46	1.45. The list of lemmas	46
47	1.46. The list of propositions	47
48	1.47. The list of corollaries	48
49	1.48. The list of examples	49
50	1.49. The list of exercises	50
51	1.50. The list of problems	51
52	1.51. The list of solutions	52
53	1.52. The list of answers	53
54	1.53. The list of questions	54
55	1.54. The list of comments	55
56	1.55. The list of notes	56
57	1.56. The list of footnotes	57
58	1.57. The list of endnotes	58
59	1.58. The list of appendices	59
60	1.59. The list of index	60
61	1.60. The list of bibliography	61
62	1.61. The list of glossary	62
63	1.62. The list of figures	63
64	1.63. The list of tables	64
65	1.64. The list of references	65
66	1.65. The list of symbols	66
67	1.66. The list of abbreviations	67
68	1.67. The list of terms	68
69	1.68. The list of definitions	69
70	1.69. The list of theorems	70
71	1.70. The list of lemmas	71
72	1.71. The list of propositions	72
73	1.72. The list of corollaries	73
74	1.73. The list of examples	74
75	1.74. The list of exercises	75
76	1.75. The list of problems	76
77	1.76. The list of solutions	77
78	1.77. The list of answers	78
79	1.78. The list of questions	79
80	1.79. The list of comments	80
81	1.80. The list of notes	81
82	1.81. The list of footnotes	82
83	1.82. The list of endnotes	83
84	1.83. The list of appendices	84
85	1.84. The list of index	85
86	1.85. The list of bibliography	86
87	1.86. The list of glossary	87
88	1.87. The list of figures	88
89	1.88. The list of tables	89
90	1.89. The list of references	90
91	1.90. The list of symbols	91
92	1.91. The list of abbreviations	92
93	1.92. The list of terms	93
94	1.93. The list of definitions	94
95	1.94. The list of theorems	95
96	1.95. The list of lemmas	96
97	1.96. The list of propositions	97
98	1.97. The list of corollaries	98
99	1.98. The list of examples	99
100	1.99. The list of exercises	100
101	1.100. The list of problems	101
102	1.101. The list of solutions	102
103	1.102. The list of answers	103
104	1.103. The list of questions	104
105	1.104. The list of comments	105
106	1.105. The list of notes	106
107	1.106. The list of footnotes	107
108	1.107. The list of endnotes	108
109	1.108. The list of appendices	109
110	1.109. The list of index	110
111	1.110. The list of bibliography	111
112	1.111. The list of glossary	112
113	1.112. The list of figures	113
114	1.113. The list of tables	114
115	1.114. The list of references	115
116	1.115. The list of symbols	116
117	1.116. The list of abbreviations	117
118	1.117. The list of terms	118
119	1.118. The list of definitions	119
120	1.119. The list of theorems	120
121	1.120. The list of lemmas	121
122	1.121. The list of propositions	122
123	1.122. The list of corollaries	123
124	1.123. The list of examples	124
125	1.124. The list of exercises	125
126	1.125. The list of problems	126
127	1.126. The list of solutions	127
128	1.127. The list of answers	128
129	1.128. The list of questions	129
130	1.129. The list of comments	130
131	1.130. The list of notes	131
132	1.131. The list of footnotes	132
133	1.132. The list of endnotes	133
134	1.133. The list of appendices	134
135	1.134. The list of index	135
136	1.135. The list of bibliography	136
137	1.136. The list of glossary	137
138	1.137. The list of figures	138
139	1.138. The list of tables	139
140	1.139. The list of references	140
141	1.140. The list of symbols	141
142	1.141. The list of abbreviations	142
143	1.142. The list of terms	143
144	1.143. The list of definitions	144
145	1.144. The list of theorems	145
146	1.145. The list of lemmas	146
147	1.146. The list of propositions	147
148	1.147. The list of corollaries	148
149	1.148. The list of examples	149
150	1.149. The list of exercises	150
151	1.150. The list of problems	151
152	1.151. The list of solutions	152
153	1.152. The list of answers	153
154	1.153. The list of questions	154
155	1.154. The list of comments	155
156	1.155. The list of notes	156
157	1.156. The list of footnotes	157
158	1.157. The list of endnotes	158
159	1.158. The list of appendices	159
160	1.159. The list of index	160
161	1.160. The list of bibliography	161
162	1.161. The list of glossary	162
163	1.162. The list of figures	163
164	1.163. The list of tables	164
165	1.164. The list of references	165
166	1.165. The list of symbols	166
167	1.166. The list of abbreviations	167
168	1.167. The list of terms	168
169	1.168. The list of definitions	169
170	1.169. The list of theorems	170
171	1.170. The list of lemmas	171
172	1.171. The list of propositions	172
173	1.172. The list of corollaries	173
174	1.173. The list of examples	174
175	1.174. The list of exercises	175
176	1.175. The list of problems	176
177	1.176. The list of solutions	177
178	1.177. The list of answers	178
179	1.178. The list of questions	179
180	1.179. The list of comments	180
181	1.180. The list of notes	181
182	1.181. The list of footnotes	182
183	1.182. The list of endnotes	183
184	1.183. The list of appendices	184
185	1.184. The list of index	185
186	1.185. The list of bibliography	186
187	1.186. The list of glossary	187
188	1.187. The list of figures	188
189	1.188. The list of tables	189
190	1.189. The list of references	190
191	1.190. The list of symbols	191
192	1.191. The list of abbreviations	192
193	1.192. The list of terms	193
194	1.193. The list of definitions	194
195	1.194. The list of theorems	195
196	1.195. The list of lemmas	196
197	1.196. The list of propositions	197
198	1.197. The list of corollaries	198
199	1.198. The list of examples	199
200	1.199. The list of exercises	200
201	1.200. The list of problems	201
202	1.201. The list of solutions	202
203	1.202. The list of answers	203
204	1.203. The list of questions	204
205	1.204. The list of comments	205
206	1.205. The list of notes	206
207	1.206. The list of footnotes	207
208	1.207. The list of endnotes	208
209	1.208. The list of appendices	209
210	1.209. The list of index	210
211	1.210. The list of bibliography	211
212	1.211. The list of glossary	212
213	1.212. The list of figures	213
214	1.213. The list of tables	214
215	1.214. The list of references	215
216	1.215. The list of symbols	216
217	1.216. The list of abbreviations	217
218	1.217. The list of terms	218
219	1.218. The list of definitions	219
220	1.219. The list of theorems	220
221	1.220. The list of lemmas	221
222	1.221. The list of propositions	222
223	1.222. The list of corollaries	223
224	1.223. The list of examples	224
225	1.224. The list of exercises	225
226	1.225. The list of problems	226
227	1.226. The list of solutions	227
228	1.227. The list of answers	228
229	1.228. The list of questions	229
230	1.229. The list of comments	230
231	1.230. The list of notes	231
232	1.231. The list of footnotes	232
233	1.232. The list of endnotes	233
234	1.233. The list of appendices	234
235	1.234. The list of index	235
236	1.235. The list of bibliography	236
237	1.236. The list of glossary	237
238	1.237. The list of figures	238
239	1.238. The list of tables	239
240	1.239. The list of references	240
241	1.240. The list of symbols	241
242	1.241. The list of abbreviations	242
243	1.242. The list of terms	243
244	1.243. The list of definitions	244
245	1.244. The list of theorems	245
246	1.245. The list of lemmas	246
247	1.246. The list of propositions	247
248	1.247. The list of corollaries	248
249	1.248. The list of examples	249
250	1.249. The list of exercises	250
251	1.250. The list of problems	251
252	1.251. The list of solutions	252
253	1.252. The list of answers	253
254	1.253. The list of questions	254
255	1.254. The list of comments	255
256	1.255. The list of notes	256
257	1.256. The list of footnotes	257
258	1.257. The list of endnotes	258
259	1.258. The list of appendices	259
260	1.259. The list of index	260
261	1.260. The list of bibliography	261
262	1.261. The list of glossary	262
263	1.262. The list of figures	263
264	1.263. The list of tables	264
265	1.264. The list of references	265
266	1.265. The list of symbols	266
267	1.266. The list of abbreviations	267
268	1.267. The list of terms	268
269	1.268. The list of definitions	269
270	1.269. The list of theorems	270
271	1.270. The list of lemmas	271
272	1.271. The list of propositions	272
273	1.272. The list of corollaries	273
274	1.273. The list of examples	274
275	1.274. The list of exercises	275
276	1.275. The list of problems	276
277	1.276. The list of solutions	277
278	1.277. The list of answers	278
279	1.278. The list of questions	279
280	1.279. The list of comments	280
281	1.280. The list of notes	281
282	1.281. The list of footnotes	282
283	1.282. The list of endnotes	283
284	1.283. The list of appendices	284
285	1.284. The list of index	285
286	1.285. The list of bibliography	286
287	1.286. The list of glossary	287
288	1.287. The list of figures	288
289	1.288. The list of tables	289
290	1.289. The list of references	290
291	1.290. The list of symbols	291
292	1.291. The list of abbreviations	292
293	1.292. The list of terms	293
294	1.293. The list of definitions	294
295	1.294. The list of theorems	295
296	1.295. The list of lemmas	296
297	1.296. The list of propositions	297
298	1.297. The list of corollaries	298
299	1.298. The list of examples	299
300	1.299. The list of exercises	300
301	1.300. The list of problems	301
302	1.301. The list of solutions	302
303	1.302. The list of answers	303
304	1.303. The list of questions	304
305	1.304. The list of comments	305
306	1.305. The list of notes	306
307	1.306. The list of footnotes	307
308	1.307. The list of endnotes	308
309	1.308. The list of appendices	309
310	1.309. The list of index	310
311	1.310. The list of bibliography	311
312	1.311. The list of glossary	312
313	1.312. The list of figures	313
314	1.313. The list of tables	314
315	1.314. The list of references	315
316	1.315. The list of symbols	316
317	1.316. The list of abbreviations	317
318	1.317. The list of terms	318
319	1.318. The list of definitions	319
320	1.319. The list of theorems	320
321	1.320. The list of lemmas	321
322	1.321. The list of propositions	322
323	1.322. The list of corollaries	323
324	1.323. The list of examples	324
325	1.324. The list of exercises	325
326	1.325. The list of problems	326
327	1.326. The list of solutions	327
328	1.327. The list of answers	328
329	1.328. The list of questions	329
330	1.329. The list of comments	330
331	1.330. The list of notes	331
332	1.331. The list of footnotes	332
333	1.332. The list of endnotes	333
334	1.333. The list of appendices	334
335	1.334. The list of index	335
336	1.335. The list of bibliography	336
337	1.336. The list of glossary	337
338	1.337. The list of figures	338
339	1.338. The list of tables	339
340	1.339. The list of references	340
341	1.340. The list of symbols	341
342	1.341. The list of abbreviations	342
343	1.342. The list of terms	343
344	1.343. The list of definitions	344
345	1.344. The list of theorems	345
346	1.345. The list of lemmas	346
347	1.346. The list of propositions	347
348	1.347. The list of corollaries	348
349	1.348. The list of examples	349
350	1.349. The list of exercises	350
351	1.350. The list of problems	351
352	1.351. The list of solutions	352
353	1.352. The list of answers	353
354	1.353. The list of questions	354
355	1.354. The list of comments	355
356	1.355. The list of notes	356
357	1.356. The list of footnotes	357
358	1.357. The list of endnotes	358
359	1.358. The list of appendices</	



ISBN-13: 978-9949-11-394-1
ISBN-10: 9949-11-394-6