

PLENARY TALKS

BORROMEIO FERRI, Rita

University of Kassel, – GERMANY

Thursday, 07.04.2016, 08:30-10:15, room S0.108

Title: Global Mathematical Modelling – a journey on theory, research and practice of an upcoming topic

Abstract: Mathematical modelling became a key competence within school curricula and educational standards in many countries of the world. The presentation gives insights into the current situation concerning research, theory and practice and as well teachers' motivations and needs of this upcoming topic.

HEFENDEHL-HEBEKER, Lisa

University of Duisburg-Essen, – GERMANY

Tuesday, 05.04.2016, 14:00-15:45, room S0.108

Title: Qualitative methods in mathematics education research

Abstract: Qualitative research methods in mathematics education are interested in questions how meaning is created in interactions related to mathematical subjects and how such processes can be described by representative concepts in order to develop explanatory theories. The underlying theory of knowledge assumes that knowledge arises through acting and interacting of self-reflective beings within an existing cultural matrix.

The presentation will demonstrate examples of a qualitative research designs and discuss some fundamental methodological and epistemological questions related to the approach.

HOYLES, Celia / NOSS, Richard

University College London, – UNITED KINGDOM

Tuesday, 05.04., 08:30-10:15 / Wednesday, 06.04., 14:00-15:45, room S0.108

Title: Researching the potential of digital technologies in mathematics learning: theory, design and the challenges of scaling innovation - Part I / Part II

Abstract: In these sessions, we will present a range of research studies that demonstrate the potential of digital technologies in mathematics learning. We will discuss and critique the theoretical frameworks that underpin them and the methodologies adopted. We will focus some attention on the challenges of scaling innovation, again by presenting some examples for discussion. In addition, we will for sure also keep in mind the idea of perspectives in the next decade (not a problem with our topic).

KRAUSS, Stefan

University of Regensburg, – GERMANY

Thursday, 07.04.2016, 10:45-12:30, room S0.108

Title: Quantitative research methods in mathematics education

Abstract: Research articles (or dissertations) using quantitative methods in the domain of teaching and learning mathematics share some specific commonalities with respect to planning an empirical study, collecting and analyzing data, and reporting on the respective results. In an introductory talk, important features of quantitative studies will be illustrated and the typical structure of a quantitative research report will be explained. In a subsequent workshop, participants will be able to practice some fundamental techniques, such as formulating research questions, operationalizing psychometric constructs, or applying basic statistical methods.

MENGHINI, Marta

Sapienza Università di Roma, – ITALY

Friday, 08.04.2016, 08:30-10:15, room S0.108

Title: From practical geometry to the laboratory method: the search for an alternative to Euclid in the history of teaching geometry

Abstract: Practical geometry, created to give a concrete help to people involved in trade, in land-surveying or in astronomy, underwent a transformation that underlined its didactical value and turned it first into a way of teaching via problem solving, and then into an experimental-intuitive teaching that could be an alternative to the deductive-rational teaching of geometry. The historical evolution of this topic can introduce on the one hand the debate on the role of history of mathematics education as a field of research; on the other hand it can direct the discussion toward the methods of teaching geometry and their role in helping the passage from a level of geometric thought to a higher one.

NISS, Mogens

University of Roskilde, – DENMARK

Wednesday, 06.04.2016, 08:30-10:15, room S0.108

Title: Priorities and challenges for mathematics education research

Abstract: As I see it, one of our major priorities in mathematics education research is to bridge the gap between research (and researchers) and practice (and practitioners), both in terms of content and in terms of structural and organisational matters. One reason for this is an increasing pressure from practitioners and society (as represented by authorities, politicians, administrators, employers, and media) on mathematics education research to "deliver" relevant and specific outcomes of our research for the improvement of teaching and learning of mathematics. In my presentation I shall discuss this issue and present a special Danish further teacher education programme designed to bridge this gap. The programme addresses upper secondary school teachers and was established in 2012. It also seems to me that we have a challenge concerning the predominant research publication paradigm in our field. The bulk of research publications, especially in journals, present empirical results, oftentimes from small-scale qualitative studies, which are embedded in (or at least pay homage to) some sort of theoretical framework. While such studies can indeed be most relevant and of a high quality they shouldn't stand alone. Our field is far from mature enough to be allowed to "canonise" a particular kind and form of research papers. In my presentation I shall elaborate on this challenge and discuss its relations to the above-mentioned priority.

ULM, Volker

University of Bayreuth, – GERMANY

Friday, 08.04.2016, 14:00-15:45, room S0.108

Title: Mathematical Giftedness: Conception, Diagnosis & Students' Support

Abstract: The contribution will focus on three key topics:

- (1) What is "mathematical giftedness"? How can "mathematical giftedness" be conceptualized? What are the relations to standards of mathematics education?
- (2) How can mathematically gifted students be identified in school? How can their special abilities be diagnosed?
- (3) How can mathematically gifted students be supported in school – especially in regular lessons (and not only by enrichment offers)?

There has been some research on these topics in the last decades – but often with a focus on students in primary school. It is a challenge for research in mathematics education to develop answers to these questions with respect to secondary school students and to implement the results in the educational system. Supporting gifted students is one aspect of dealing with the natural diversity in school.

SHORT TALKS

ALJARRAH, Ayman

internal id: 22

University of Calgary, Calgary – CANADA

Supervisor: Dr. Jo Towers

Poster:

Presentation:

Tuesday, 05.04.2016, 16:15-16:45, room S1.101

Title: Exploring Collective Creativity in Elementary Mathematics Classroom Settings

Abstract: Based on Sawyer's (2011) argument that effective creative learning and effective creative teaching need the collaboration of teachers and students while they are improvising together within the structures provided by the curriculum and the teachers, and considering Martin's et al. (2006) suggestion that doing and understanding mathematics are creative processes, that should be considered at both the individual and the collective levels, my doctoral study will explore possibilities and potentials of integrating a combination of theories related to creativity and theories related to collectivity with other teaching and learning practices in mathematics classroom settings in order to: investigate the nature of collective creativity in mathematics learning, offer needed empirical findings concerning collective creativity in Canadian elementary schools, explore ways in which collective creativity might be fostered in such settings, and generate understandings about the role of teachers in this endeavor.

Research: My doctoral study will integrate a combination of theories related to creativity and theories related to collective process in classroom settings in order to Investigate the nature of collective creativity in mathematics learning, offer needed empirical findings concerning collective creativity in Canadian elementary schools, and offer understandings about the role of teachers in this endeavor. By studying collective action in classrooms I will: develop and refine my definition for collective creativity as it applies to elementary mathematics classroom contexts, document the emergence of collective creativity in elementary mathematics classroom settings and, explore ways in which collective creativity might be fostered in such settings. My study is driven by the following questions: 1- What can be learned from the process of developing and refining an emergent definition of collective creativity for the elementary mathematics classroom? 2- Does collective creativity emerge in elementary mathematics classroom settings? 3- How can we foster collective creativity in elementary mathematics classroom settings? 4- What is the teacher's role in fostering collective creativity? And 5- What use might the construct of collective creativity be to teachers of mathematics? I propose to take as a starting point for my study the description of collective creativity which I obtained from blending different approaches to creativity in classroom settings with Beghetto and Kaufman's (2011) conception of disciplined improvisation and Martin and Towers' (2009) conception of improvisational coaction. In addition, I will employ, both, Sinclair's, et al. (2013) approach for studying mathematical creativity, and Martin and Towers' approaches for studying collective mathematical understanding (Martin & Towers, 2003, 2009, 2011) and adapt their work to the study of collective creativity in elementary mathematics classroom contexts. Supervisor: Dr. Jo Towers"

BARROS, Rossana

internal id: 30

University of Oxford, Oxford – UNITED KINGDOM

Supervisor: Terezinha Nunes

Poster:

Presentation:

Tuesday, 05.04.2016, 17:15-17:45, room S1.101

Title: Testing predictors for learning fractions

Abstract: This study aims to test whether two theoretically different abilities, reasoning and arithmetic, can be measured separately, as part of a longitudinal study that investigates the roots of reasoning about fractions in children. Reasoning focuses on mathematical relations, for example knowing that if a cake is shared in equal parts between three children, then each one gets $1/3$ (Hallett, Nunes, & Bryant, 2010; Hecht, Close, & Santisi, 2003). Arithmetic involves procedures and rules, such as carrying out arithmetic operations like multiplication and division. In total 124 9-year old children participated who were at the end of Grade 4. They completed a reasoning task, an arithmetic task and a non-verbal intelligence test. Results from factor analyses confirm these two abilities should be treated as different skills, while analyses of covariance between schools suggest emphasis on teaching arithmetic. The first phase of the study is currently completed: children's multiplicative reasoning and knowledge of arithmetic have been assessed. The second sweep of data will take place in January 2016; the presentation would include the second set of results.

Research: MSc in Child Development and Learning, my dissertation topic was: Individual Differences between Age and Mathematical Abilities, 608 primary school children were assessed in conceptual and procedural knowledge in fractions, non-verbal intelligence and mathematical ability. Results showed that mathematical ability had a stronger correlation with conceptual knowledge than with procedural knowledge. My supervisor was: Prof Peter Bryant. DPhil in Education, my thesis topic is: Factors contributing to Children's Understanding of Fractions, Reasoning and Arithmetic. We are investigating how children develop their understanding of fractions and ways to help them with their learning of fractions. The aim of the study is to evaluate a model of causal relations between two kinds of mathematical abilities, reasoning and arithmetic, and their independent contribution to the understanding and learning of fractions and overall mathematical achievement. The study uses a combination of longitudinal and intervention methods in two separate studies, to investigate this hypothesised causal relation with children in Year 4 and Year 5 of primary school. My current supervisor is: Terezinha Nunes"

BECK, Johannes

internal id: 109

Universität Würzburg, Würzburg – GERMANY

Supervisor: Prof. Hans-Georg Weigand

Poster:

Presentation:

Wednesday, 06.04.2016, 16:45-17:15, room S1.106

Title: CAS in exams – How to document the solutions?

Abstract: Digital technologies like computer algebra systems (CAS) open a variety of new learning possibilities for the mathematics classroom. If they are allowed in exams one question is how the solutions to the tasks should be documented. In these situations the following research questions are of interest:

- RQ1: Which problems and challenges do teachers in CAS-allowed classes see regarding written documentations?
- RQ2: Which problems and characteristics occur in students' written solutions in CAS-allowed exams?
- RQ3: How can students' written solutions be described in a category-system by means of a text analysis?
- RQ4: How could a model look like that describes the development of documentations through the years of CAS-use in secondary education and explains features regarded as good with exemplary documentations to typical tasks?

This presentation gives insight into an analysis of authentic written solutions of the Bavarian CAS final exam (year 12) and a category-system that allows to describe what students actually write down on paper. On this basis a proposal for a model is made that offers possible trajectories for the development of documentations through the years of CAS-use. Furthermore, some examples of good documentations are given and their characteristics discussed.

Research: The work is set in the intersection of learning mathematics with digital technologies and mathematics and language. Most works in the first field focus on the development of students' knowledge or the relationship between human being and machine but neglect the role of pen and paper altogether. In the second field very often general or philosophical issues are addressed or the development of students' use of mathematical language in a certain area of mathematics education is of interest. This study focuses on the use of language (both mathematical and every-day) in CAS-allowed exams and attempts to generalize the findings for the preceding lessons and for the use of digital technologies in general.

BUFORN LLORET, Àngela

internal id: 83

Universidad de Alicante, Sant Vicent del Raspeig – SPAIN

Supervisor: Salvador Llinares

Poster:

Presentation:

Friday, 08.04.2016, 10:45-11:15, room S1.101

Title: Evaluation of students' knowledge of proportional reasoning by prospective teachers

Abstract: This study is focused on the relationship between prospective teachers' mathematical content knowledge and the mathematical knowledge for teaching. Our goal is to analyse the role played of prospective teachers' mathematical content knowledge in identifying students' understanding of proportional situations. 91 prospective teachers solved two tasks. In the first task, prospective teachers had to solve twelve problems related to proportional reasoning, identifying the key mathematical elements that should be used to solve them. In the second task, prospective teachers had to analyse three primary school students' answers to each of the twelve problems, attending to the mathematical elements used by primary school students to solve the problems and how this reflects some features of students' understanding. Finally, prospective teachers had to propose a change in the problem in order to help primary students to progress in their understanding. In this talk, the first analyses and results are presented.

Research: [Prospective primary teachers' learning](#). [Primary teacher education](#). [Professional noticing](#). [Proportional reasoning](#).

CARANTE, Paola

internal id: 75

Università degli Studi di Torino, Torino – ITALY

Supervisor: Arzarello & Robutti

Poster:

Presentation:

Friday, 08.04.2016, 12:15-12:45, room S1.101

Title: Teachers' education and task design: shared mathematical meaning in MERLO activities

Abstract: My research involves a didactical and methodological tool, which is called MERLO (Meaning Equivalence Reusable Learning Objects). MERLO was initially introduced by Uri Shafir and Masha Etkind in Canada. It consists in an organized collection of items covering selected and appropriate concepts within a discipline, through multi-semiotic representations in different sign systems. The application in mathematics education requires a particular attention and a deep reflection on the theoretical framework at the basis of the use of MERLO items in mathematical activities.

During my PhD I worked with Italian in-service secondary school teachers in the design and experimentation of activities involving the use and application of MERLO items. Hence, one of my research interests is to analyze the teachers' evolution and teachers' changes, through their engagement in the MERLO activities design process. The idea is to use the Meta-Didactical Transposition model (Arzarello et al., 2014) as lens for the analysis.

Another research interest is to explore the impact that activities with MERLO have on students. Students were involved in teaching experiments where the activities have as task the solution of MERLO items. This solution involves students in individual and group working. The aim is to analyze the way and the opportunity that a MERLO activity provides to students for encountering mathematical concepts, and for showing a deep understanding of them. At the moment, we have results about the teachers' evolution process, and data on students' solutions, the analysis of which requires more work to be able to provide some final conclusions.

Research: I am a PhD student at the University of Torino. I am working with the supervision of Ferdinando Arzarello and Ornella Robutti. This is my last year of PhD and I am writing the thesis. I would like to present something about my research work, because I am sure that I will receive important feedback for going on in writing my PhD thesis. My research area is in mathematics education. In particular my interest is in teachers' education and task design of a particular kind of activity, called MERLO.

CARLSEN, Louise

internal id: 64

Univeristy of the Faroe Islands, Tórshavn – FAROE ISLANDS

Supervisor: Carl Winsløw

Poster:

Presentation:

Friday, 08.04.2016, 10:45-11:15, room S1.106

Title: A lesson study inspired course on algebra for mathematics teacher students

Abstract: The focus of my study is the development on knowledge of student teacher on the use of CAS based teaching and what faces of the lesson study cycle supports this development. The framework of ATD and instrumental orchestration will be used to study the student teachers development through the course.

Research: In this project, the three main aims are:

- a) A more refined examination of different types of spontaneous orchestrations of CAS by teachers in lower secondary school, with a special focus on school algebra (abstracted arithmetics, equation solving, functions and function modeling);
- b) Investigate new formats to enhance teachers' autonomous work with such orchestrations, including tools to assess the impact of specific CAS use on student learning;
- c) To identify potentials and obstacles for the idea that CAS-use might serve to introduce students to more advanced mathematical topics and working modes (such as modeling, and simple theoretical reasoning).

Based on the anthropological theory of the didactic, in particular the notion of instrumented technique, I will investigate these questions in the setting of mathematics teacher education practice at the University of the Faroe Islands. In part a) I will examine different types of orchestration arising spontaneously among novice and experienced teachers through observations in the classrooms but also with follow up interviews. Based on b), the student teachers will implement different types of orchestration in carefully designed teaching situations while in practice. This will be done using the format of lesson study from Japan in order to give the teachers enough insight to carry out the intended research lesson and get insight to the teachers' considerations and concerns when handling CAS based teaching but also in order to set focus on the types of orchestration in use.

CETIN, Ibrahim

internal id: 13

Abant Izzet Baysal University, BOLU – TURKEY

Supervisor: Ed Dubinsky

Poster:

Presentation:

Wednesday, 06.04.2016, 17:15-17:45, room S1.106

Title: Reflective Abstraction in Computational Thinking

Abstract: Wing used the term computational thinking and proposed that it is not a skill that is only useful for computer scientists, but it is a fundamental skill that should be learned by everyone. She argued that "to reading, writing and arithmetic, we should add computational thinking to every child's analytical ability". Wing's arguments were influential in a broad spectrum of the academic community. Although researchers have accepted that abstraction is a central concept in computational thinking, they are quick to disagree on the meaning of it.

In this presentation I will consider different views related to abstraction. Piaget contended that the main mechanism behind the development of logico-mathematical structures is reflective abstraction. Dubinsky and his colleagues reconstructed reflective abstraction in the context of advanced mathematics education and developed APOS (Action-Process-Object-Schema) theory. Our main aim in this chapter is to construct a theoretical bridge between computational thinking and APOS theory and show that reflective abstraction can be used in the context of computational thinking.

Research: [Mathematics Education and Computational Thinking, I completed my PhD. My PhD topic was "Students' Understanding of Limit Concept: An APOS Perspective"](#)

EKMEKCI, Adem

internal id: 5

Rice University, Houston, TX – UNITED STATES

Supervisor: Anne Papakonstantinou

Poster:

Presentation:

Friday, 08.04.2016, 11:15-11:45, room S1.106

Title: The Relation between Teacher-Related Factors and Student Mathematics Achievement

Abstract: Mathematics education literature shows that that teachers' content knowledge and their beliefs about teaching and learning mathematics are associated with effective teaching practices. This presentation will explore the extent to which K-12 math teachers' educational beliefs and math knowledge for teaching (MKT) have an impact on student math achievement in an urban school district. Results may have implications for teacher professional development programs as well as education policies at both district and state level.

Research: [Elementary and secondary math teachers' content knowledge and educational and motivational beliefs.](#)

FERRARI, Giulia

internal id: 84

Università di Torino, Torino – ITALY

Supervisor: Ferrara Francesca

Poster:

Presentation:

Tuesday, 05.04.2016, 11:15-11:45, room S1.101

Title: Wii graphing technology to study movement and function at secondary school

Abstract: My interests in mathematics education have started with my Master Degree research, by examining the ways in which grade 9 students gain fluency with digital technologies for modelling motion and studying the mathematics of change. The particular technology I have used consists of a software application, WiiGraph, which interactively leverages two Nintendo Wii controllers (Wiimotes) to detect and graphically display the location of users as they move along life-size number lines. The software has the potential of displaying two distance-time graphs at a time on the same Cartesian plane, associated to the controllers' positions, and also allows for the creation of other types of graphs, like composite operations, maze traversals, shape tracing.

Research: My area of research is Mathematics Education. In particular, my MSc. thesis focused on two major themes: the role of technology and the role of the body and embodiment in the teaching and learning of function through the use of a specific software for modelling motion. My supervisor in this work is prof. F. Ferrara (University of Torino).

GAIO, Aaron

internal id: 44

University of Palermo, Palermo – ITALY

Supervisor: Di Paola, Benedetto

Poster:

Presentation:

Wednesday, 06.04.2016, 16:15-16:45, room S0.107

Title: Development of teaching activities in discrete mathematics, in the Italian school system

Abstract: My thesis proposal is for a design research (design experiments [Brown, 1992; Cobb et al., 2003], in a developmental approach [Plomp, 2007]) project aiming at bringing new mathematical knowledge and competences to students and involving teachers in the activity designing process. The topic chosen is that of discrete mathematics, dealing with graph theory, cryptography and algorithms in particular. Discrete mathematics in this sense is not a topic that we deal with in the classroom so often. Activities of this kind are missing almost entirely, both in the school programs and in textbooks, despite many agree that they can be really useful to improve both general skills, such as reasoning and modeling, and skills particular to discrete mathematics, such as algorithmic and recursive thinking. A survey among various grades teachers confirmed this.

Pedagogical content available on this is, as a consequence, also quite poor. An overview of the Italian situation in teaching discrete mathematics in primary and middle school has been done, together with reference to the national teaching guidelines; moreover, from some first surveys we can see that a good majority of teachers is interested in it and sees discrete mathematics as a good way to improve “computational thinking” in the school environment.

From this starting point we are beginning to develop a project to design and refine teaching activities in the subject; grades chosen are 3rd to 8th in a vertical curriculum approach. Some interesting facts have been observed and some examples of activities can be done.

Research: Mathematics Education, learning (and teaching) of topics in discrete mathematics, computational algebra, graph theory, cryptography and algorithms.

GAJSER, David

internal id: 91

University of Ljubljana, Maribor – SLOVENIA

Supervisor: Matija Lokar

Poster:

Presentation:

Tuesday, 05.04.2016, 17:15-17:45, room S0.107

Title: Connections between reasons to like mathematics and success

Abstract: Students decide to study mathematics for several reasons. One of the most common ones is that they like mathematics. However, high school mathematics is quite different from undergraduate mathematics and many of the students who loved mathematics before actually studying it, do not do well in the first year of their mathematics studies.

- Why did they like mathematics before enrolling to a math faculty?
- What are the main issues they face?
- Is there a correlation between some reason for loving mathematics and (not) doing well at the university level?

Our research focuses on students who participated in the high school mathematical summer camp MaRS (mars.dmfa.si) and later studied at a mathematics faculty. The camp is organized once per year for roughly a decade. It is meant for high school students who love mathematics and mathematical talent is not a prerequisite for participation. We noticed that some of the former participants had great troubles in their mathematical studies. Why? Although our research is in a very early stage, we expect that we will be able to present some results in the beginning of April when the spring school begins. We expect to get insights about what reasons for loving mathematics usually accompany good results.

Research: I am primarily a mathematician. More specifically, my just finished PhD was in the field of theoretical computer science. However, my interests are deeply connected with mathematics education: I have a bachelor's degree in Mathematics education, I am currently teaching in a high school as well as in a math faculty (I teach mathematical classes as well as classes for mathematics education), I co-organize a mathematical summer camp for high school students who love math and I work a lot in popularization of mathematics. All this said, I have a tendency for stepping into the field of research in mathematics education, more specifically, to study the relation between students that love mathematics and the mathematically gifted students. Needless to say, there is a big intersection between the two groups of students. While it is not hard to detect students that love mathematics: we just need to ask them; it is a bit harder to formally detect and even define mathematically gifted students. Special tests have to be performed or, alternatively, we could consider how students do in mathematical competitions and how »easily« they pass hard mathematical courses. Then at least two interesting questions arise: Why do mathematically gifted students love math and what are the reasons of others to love math? My motivation for research on the topic arises from the math summer camp for high school students that we organize (mars.dmfa.si) for roughly a decade. Talented and untalented students come, and they all typically have an unforgettably good time (we always do an evaluation after the camp). The level and spectrum of mathematical talent each student has can partially be detected during the week of the camp. However, the talent becomes more important later, after the camp, especially for the students who want to pursue mathematics studies. Several (but not many) of those are not successful in their future mathematics studies, some are even unable to pass the first year.

GEORGE, Lois Grace

internal id: 31

University of Southampton, Southampton – UNITED KINGDOM

Supervisor: Charis Voutsina, Keith Jones

Poster:

Presentation:

Tuesday, 05.04.2016, 10:45-11:15, room S1.106

Title: How does new fraction learning emerge alongside existing knowledge?

Abstract: It is well recognized that children find the learning of fractions difficult. One of the reasons for this is that fractions is a multi-faceted construct and so has several meanings. The part-whole meaning of fractions is the first that children often encounter in formal schooling. This presentation reports preliminary findings from an investigation into how a sample of year 5 children, from the Commonwealth of Dominica, who have only been taught the part-whole subconstruct of fractions, derive the fraction associated with solving partitive quotient problems in a sequence of problem solving sessions. The methodological approach utilized is that of a microgenetic, qualitative, case study. The data largely consists of video recordings and the written work of the children involved in the research study. Some potential implications of the findings for teaching and learning of fractions will also be discussed.

Research: This study has two foci. First, it investigates how a sample of year 5 children, from the Commonwealth of Dominica, who have only been taught the part-whole subconstruct derive the fraction associated with solving partitive quotient problems in a sequence of problem solving sessions. Second, it examines in what way(s) does evidence support or not support a particular feature (the Don't Need Boundaries) of the Pirie-Kieren Theory for the growth of mathematical understanding. The methodological approach utilized is that of a microgenetic, qualitative, case study. The data largely consists of video recordings and the written work of the children involved in the research study.

GONO, Ebert Nhamo

internal id: 29

University of London, London – UNITED KINGDOM

Supervisor: Dr. Cosette Crisan

Poster:

Presentation:

Tuesday, 05.04.2016, 11:45-12:15, room S1.101

Title: Interactive Dynamic Mathematics software in probing understanding of mathematics

Abstract: Technology has become an essential tool for doing mathematics in today's world. The development and rapid growth of the Internet and its increasing accessibility for teachers and learners has opened up a whole new digital world in the field of education. This situation has evolved rapidly. The introduction of free dynamic mathematics software such as GeoGebra and DESMOS has made technology affordable. The spread of small individual computing tools such as: iPads, laptops, calculators, android and smartphones has rapidly and profoundly modified learners' equipment in and outside mathematics classes. This study examined the experience of learners using GeoGebra to investigate modulus functions within a constructivist paradigm. It presents a reflective journey into the contributions of technology in understanding modulus functions and concentrates of learners' experiences while using GeoGebra. The contributions of technology in the teaching and learning of mathematics were examined firstly by exploring literature that deals with the use of dynamic mathematics software in teaching and learning mathematics. This lead to an examination of theoretical frameworks selected for this study. Qualitative research methods of data collection were used and data was analysed following the Interpretive Phenomenological Analysis framework. Video recordings and observations were used as primary sources of data to develop an understanding of learners' experiences in using GeoGebra. Finally the implications of the findings are discussed. The study found that GeoGebra-assisted instruction, as a supplement to traditional classroom instruction, allowed participants to explore aspects of modulus functions beyond the confines of the A Level Core 3 specifications.

Research: [Use of digital technologies mathematics teaching and learning](#)

HILL, Janelle

internal id: 12

Monash University, Clayton – AUSTRALIA

Supervisor: Helen Forgasz

Poster:

Presentation:

Wednesday, 06.04.2016, 16:15-16:45, room S1.101

Title: Gender and mathematics and literacy learning with iPads – a case study

Abstract: The aim of my PhD research was to undertake a case study to determine the impact of the use of iPads in the teaching and learning of mathematics and literacy in a range of year levels at one school, with a particular focus on gender differences in students' attitudes and perceived achievement. Teachers', parents' and students' beliefs about the use of iPads in the teaching and learning of mathematics and literacy were sought and investigations as to whether the use of this technological tool differentially affected female and male students' attitudes and perceived performance in mathematics and literacy was undertaken.

Research: My research area focuses mainly on gender differences in the use of technology in the learning of mathematics. The topic of my Master of Education thesis was female attitudes to the use of advanced calculators in senior secondary mathematics learning. Helen Forgasz and Gilah Leder are my current PhD supervisors. Helen Forgasz was also my M. Ed. supervisor.

HOFMANN, Rita

internal id: 98

University of Koblenz-Landau, Landau – GERMANY

Supervisor: Prof. Dr. Juergen Roth

Poster:

Presentation:

Wednesday, 06.04.2016, 16:45-17:15, room S1.101

Title: Diagnosing Students' Mistakes While Working with Graphs of Functions

Abstract: The ability to construct and to interpret graphs of functions is an essential part of mathematics education. In order to support the students in the development of these competences the teacher must become aware of the students' skills, problems and misconceptions. The specific objective of our study is to foster the diagnostic skills of preservice mathematics teachers by using suitable tasks. The diagnoses should be based on students' protocols and especially on videos which show their actions and communication while working in groups on graphs of functions.

Research: Fostering diagnostic skills of pre-service mathematics teachers with videos-vignettes "How do students work on graphs of functions? The interpretation and construction of graphs of functions are essential skills not only in mathematics education. Their abundance in our everyday life (e.g. functional relationships or graphical representations of data) makes them indispensable in teaching and learning. Nevertheless, previous research has shown that dealing with graphs of functions can be difficult and easily leads to misconceptions (e.g. Bell and Janvier, 1981; Leinhardt et al., 1990), which should be uncovered in time to be resolved. In order to receive diagnostic information about the students, it is important to use appropriate tasks revealing the students' conceptions (Hußmann et al., 2007; Sjuts, 2007). The ability to diagnose these issues is crucial for teaching professionals. Thus, these skills should already be fostered during preservice teacher training. **Method:** We first compile tasks involving graphs of functions which are expected to reveal students' difficulties and misconceptions. Students will work on these tasks in groups, each composed of four 7th or 8th graders. We intend to videotape the working process and analyze the videos with regard to their diagnostic potential. Subsequently, we will use those video-sequences containing situations in which the students' mistakes and misconceptions or skills are apparent to train preservice mathematics teachers' diagnostic skills. For this purpose we will combine the videos with the students' materials. In order to verify the effects of this training on the preservice teachers' diagnostic skills we will conduct an intervention study with pre- and posttest. Supervisor: Prof. Dr. Juergen Roth"

IVARS SANTACREU, Pere

internal id: 81

Universidad de Alicante, Sant Vicente del Raspeig – SPAIN

Supervisor: Salvador Llinares

Poster:

Presentation:

Tuesday, 05.04.2016, 16:45-17:15, room S1.106

Title: How preservice teachers learn to notice students' mathematical thinking related to fractional scheme

Abstract: Research literature concerning teachers' attention to and work with students suggests that learning about students' mathematical thinking results in changes in teachers' instructional practices and beliefs and improves students' mathematics achievement. So, an important skill that a teacher should develop is the skill of noticing students' mathematical thinking conceptualised as three interrelated skills: attending to students' strategies, interpreting students' mathematical thinking and deciding how to respond "as teachers" taking into account students' mathematical thinking. Previous research has shown that this skill could be developed in initial teacher training programs but has shown that it is not an easy task and deserves further studies. Our study is embedded in this line of research and is focused on how pre-service primary school teachers learn to notice students' mathematical thinking related to the fractional scheme. Our aim is to identify what factors influence pre-service primary teachers' learning of noticing. We have designed a learning environment to help pre-service teachers to notice students' mathematical thinking of the fractional scheme. The design of the learning environment is presented in this talk.

Keywords: pre-service teachers, learning trajectory, fractional scheme, teachers' knowledge"

[Research: Prospective primary teachers' learning](#)

JAFARABADI, Ali

internal id: 3

Shahid Beheshti, Tehran – IRAN, ISLAMIC REPUBLIC OF

Supervisor: Education

Poster:

Presentation:

Tuesday, 05.04.2016, 12:15-12:45, room S0.107

Title: The Effects of using calculator on Reducing Mathematics Anxiety

Abstract: The relatively recent introduction of new technologies into the mainstream of education is accompanied by hot debates. The terms “technological tools” and “ICT” encompass a range of hardware and software with not necessarily the same effects on educational process and this makes the debates so outstanding and complicated. For this reason, we cannot approve a single rule for all the cases and therefore the educators are supposed to investigate the cases separately. I am willing to concentrate here mainly on calculator. As it seems, and my teaching experience also supports, there is a complex relationship between technology-aided mathematics education and mathematics anxiety; accordingly the aim of this paper is to investigate the effects of calculator on mathematics anxiety reduction in teaching and learning of secondary level mathematics.

Research: I have developed a software for teaching mathematics in a digital environment that is being used in Iran. I have received acceptance letter from IOE, London, after a video online interview and also from Prof Luc Trouche, ENS, Lyon, to continue my studies there but because of some problems i could not move there and continued my studies here in Iran in PhD level. My supervisor in Master Degree was Dr Asghari, UK, and Dr Zahra Gooya, Shahid Beheshti University. Since I was in university, I have believed that education is an important factor in a life. All human activities in several fields such as information technology, economics, physics, social and others will run well if they are cited in a good educational framework. This circumstance stimulated me to attend faculty of education and chose Mathematics Education as my specialization even though at that time, there weren't many people know about it and few students choose it as their specialization. I had numerous opportunities to do many activities. For example I achieved in the master entrance exam with the rank of 14 amongst the thousands of volunteers of entering Sharif University - which is one of the best, universities of I.R. Iran - in the field of industrial engineering. Besides studying and researching, I was also active in international areas and became the Program Officer of Education Department of the Islamic Educational, Scientific & Cultural Organization (ISESCO). I have participated in some related workshops and seminars as participant and lecturer.

JESSEN, Britta Eyrich

internal id: 66

University of Copenhagen, Copenhagen C – DENMARK

Supervisor: Carl Winsløw

Poster:

Presentation:

Tuesday, 05.04.2016, 12:15-12:45, room S1.106

Title: Possible changes in current teaching paradigm in upper secondary teaching in Denmark

Abstract: My PhD project is focusing on different ways to design teaching of mathematics at upper secondary level in Denmark. My theoretical framework for my PhD study is the Anthropological Theory of the Didactics (ATD). In my work I have focused on design and test of these designs of teaching fitting with current curriculum and guidelines for upper secondary mathematics education in Denmark. My designs are based on the notion of Study and Research Paths (SRP), which is a design tool developed as part of ATD. In Denmark we have a high stake exam, which is a bidisciplinary written report students hand in during their last year at upper secondary. Students choose which disciplines along with a topic of their special interest they prefer to combine in the project. Teachers of the discipline formulate some questions the students must answer in their report. I have designed such questions in terms of a "generating question" for a SRP. Further I have designed teaching based on open generative questions trying to exploit some of the potentials from SRP in everyday teaching. Both studies carry an element of modelling. The first study covers mathematical modelling of a biological system, namely the dosing of painkillers in order to get relieved from pain without getting an overdose. The last case, mainly focus on what could be called "intra-mathematical modelling". Lately my work has focused on what is needed from school system and society in general in order to change teaching into activities where students potentially develop more broad mathematical competencies and become able to apply their mathematical skills in other contexts than the ordinary classroom.

Research: My focus is the teaching of mathematics in upper secondary level in Denmark. My study covers both everyday pure mathematics teaching as well as bidisciplinary teaching combining mathematics with biology, history and physics. Hence I have worked with different perspectives on modelling. My primary theoretical framework is the anthropological theory of the didactics.

KÉZÉR, Ildikó

internal id: 69

University of Debrecen, Debrecen – HUNGARY

Supervisor: András Ambrus & Robert Freud, Gabriella Ambrus

Poster:

Presentation:

Wednesday, 06.04.2016, 17:15-17:45, room S0.107

Title: Some problems on the sum-of-divisors function

Abstract: We investigate some problems related to the distribution of the divisors of a number in different residue classes. We denote by $f(n)$ the ratio $\frac{\sum d}{\sum d'}$, where the sums are extended for all divisors d, d' of n such that $d \equiv -1 \pmod{3}$ and $d' \equiv 1 \pmod{3}$.

We examine the range of $f(n)$. We show that $f(n) \neq 1$, and characterize the values of n , for which $f(n) > 1$ and $f(n) < 1$, resp. We verify that $f(n)$ can assume arbitrarily large and arbitrarily small positive numbers, as well. We exhibit infinitely many numbers c for which $f(n) = c$ has infinitely many solutions in n . We discuss also some generalizations and unsolved problems.

In the proofs we use elementary methods that mostly can be discussed in secondary school, mainly within the framework of group study sessions and we do think that observing these types of questions gives children a chance to make some experimentations, and we show how we can use several mathematical softwares in these discoveries.

Research: [Number theory - the teaching of arithmetic functions in secondary school.](#)

KLÖCKNER, Vanessa

internal id: 21

Universitaet Koblenz-Landau, Koblenz – GERMANY

Supervisor: Prof. Dr. Hans-Stefan Siller

Poster:

Presentation:

Friday, 08.04.2016, 11:15-11:45, room S1.101

Title: Activities in (extracurricular) learning centers – a basic module in teacher education?

Abstract: In my PhD thesis I am going to research, whether activities with pupils in (extracurricular) learning centers are relevant for teacher education to close the gap between university and school. I want to explore whether the activities with pupils in (extracurricular) learning centers benefit the students didactical capacity to act. Therefore, I am going to create extracurricular learning centers at University of Koblenz-Landau, campus Koblenz and guide students to work with pupils on mathematical problems. There will be a pre-test before working in the extracurricular learning centers and a post-test afterwards. In both tests the didactical capacity to act shall be explored.

Research: On the one hand, my area of research is mathematical modeling and on the other hand, I am involved in the teacher education at University. We organize modeling activities with pupils and students. This means that pupils work on modeling problems and will be accompanied by students.

MICHAILIDOU, Theognosia

internal id: 67

University of Leeds, Leeds – UNITED KINGDOM

Supervisor: Dr. Matt Homer, Prof. John Monaghan

Poster:

Presentation:

Friday, 08.04.2016, 12:15-12:45, room S1.106

Title: Non-mathematics majors doing statistics at university level in Cyprus

Abstract: The presentation in the 2016 Spring School can be started by providing a brief description of the background and the context of my doctoral research study, the main aims and goals and the significance and its potential contribution. I will mention some definitions and background issues in order to familiarize the audience with the topic along with some findings from research and empirical studies in this area of study. A description of the research methodology, the design and the execution of the data collection process and some preliminary findings will be presented.

Research: My supervisors are: Dr Matt Homer and Professor John Monaghan My specialization is in Mathematics education. The provisional title of my Ph.D. thesis is "Non-mathematics majors doing statistics at university level in Cyprus: Factors behind their performance". The main consideration guiding my research work is the exploration of a number of cognitive, affective and motivational factors and their relationship with the students' academic performance in introductory statistics courses offered at tertiary institutions in Cyprus. The factors under investigation include students' feelings, attitudes and beliefs regarding statistics; types and levels of anxiety related to statistics; students' perceived self-efficacy regarding statistics; motivational orientations, achievement goals, outcome expectations, interest in statistics, students' engagement with statistics (such as effort, persistence, learning strategies); resilient behaviour characteristics when learning and studying statistics; prior mathematics or/and statistics background and performance; attitudes, anxiety feelings and self-efficacy regarding mathematics. My goal is to get an insight and understanding into non-mathematicians' perceptions, challenges and experiences when undertaking a statistics course as a part of their undergraduate degree programs. In order to unravel and meet the research objectives, a mixed-methods research design (that is a combination of quantitative and qualitative data collection methods) has been employed. A self-reported questionnaire, which was designed and developed specifically for the purposes of the doctoral study, has been administered to the participants, followed by individual face-to-face interviews with selected (volunteer) students who had completed the questionnaire. The quantitative component of the study was longitudinal in nature, meaning that it was executed in two phases - at the beginning and at the end of the instruction of the various statistics classes.

MUNGENAST, Sebastian

internal id: 102

Universität Würzburg, Würzburg – GERMANY

Supervisor: Prof. Hans-Georg Weigand

Poster:

Presentation:

Tuesday, 05.04.2016, 16:45-17:15, room S0.107

Title: Metacognition and mathematics – an interview study with prospective university students

Abstract: In the upcoming presentation a short overview about metacognition as a concept in relation to mathematics education and about the current state of the dissertation project will be given.

Metacognition is usually understood as cognition about (one's own) cognition: Declarative meta(cognitive) knowledge refers to knowledge about one's own knowledge and cognitive processes, whereas procedural metacognition denotes thinking processes (e.g. reflection) about such knowledge and cognition. (cf. Schneider 2010, Sjuts 1999) It has been shown that the ability to use this kind of knowledge and cognition in a strategic way can be of advantage when working with and learning mathematics. (cf. Schneider 2010)

As part of this dissertation project, qualitative interviews with first-year students in mathematics have been conducted in order to document occurring utilisation of metacognition and meta knowledge and to specify and possibly refine existing categorisations of metacognition. (cf. Mayring 2010, Schneider 2010)

The mathematical problem/task that was used during these interviews and had to be worked on by the students has been taken from the analysis/calculus curriculum of year 11. Calculus/Analysis as a field was originally chosen for this study due to, e.g., the dichotomy of the concept of limit. The integration of an intuitive notion (dynamic aspect) of the limit concept with its formalised counterpart (static aspect) poses a challenge that requires a change in perspective, which seems to demand for intense metacognitive reflection. (cf. Friedrich 2001)

Research: My research field includes the application of metacognitive knowledge and abilities to learning processes and problem-solving in late high school and early university mathematics. Where there has been a larger amount of research work concerning metacognition in primary and lower secondary education, studies with advanced students still seem to be rather scarce. The first objective of my dissertation project is the documentation of existing metacognitive knowledge and abilities (and their application) in prospective mathematics students at university level by means of qualitative interviews. Furthermore, these interviews are used as a basis for refining existing categorisations of metacognition with respect to mathematics and – if possible – to identify domain specific sub-categories.

Overall, the project is set in the field of mathematics education with a strong connection to psychology as an associated science. While the project focuses on high school students/ graduates there naturally exists a connection to school-university transition issues.

NEDRENCO, Dmitri

internal id: 77

Universität Würzburg, Würzburg – GERMANY

Supervisor: Prof. Weigand / Prof. Grundhoefer

Poster:

Presentation:

Wednesday, 06.04.2016, 16:45-17:15, room S0.107

Title: Axiomatisation and paper folding

Abstract: Mathematical paper folding may be seen as a fruitful tool to start a course with some axiomatisation issues of a mathematical theory. In an iterative series of university courses for prospective secondary level mathematics teachers, a branch of mathematical paper folding has been taught and utilized to start with a study of axiomatisation of the Euclidean plane. The study is still in progress and only few results can be presented. Hence, the main focus of this talk will be on the theoretical foundations, the method of data collection and evaluation of our approach.

Research: My research concerns mathematical paperfolding, both mathematical and educational aspects of it. For the educational part I investigate how can paperfolding and mathematics of paperfolding be taught to prospective mathematics teachers and which benefits of this activity can be observed.

NOLL, Anna

internal id: 100

University of Koblenz-Landau, Landau – GERMANY

Supervisor: Prof. Dr. Juergen Roth

Poster:

Presentation:

Friday, 08.04.2016, 11:45-12:15, room S1.106

Title: How to Design Educational Material for Inclusive Classes

Abstract: The project investigates which design elements of work assignments influence the performance of pupils in inclusive classes positively. Within the framework of an empirical study we will analyze whether the use of simple language or enriching text with symbols facilitates pupils' comprehension better. The aim is to deduce design criteria for work assignments, which improve the students' performance in mathematics in inclusive classrooms.

Research: The conviction that the inclusion of children with disabilities into mainstream schools is necessary and life-enhancing expanded in our society during the last decades (Bundschuh 2012). Nevertheless, concerning the planning and realization of inclusive lessons only few empirically based findings exist. Ensuring that all pupils in an inclusive setting are able to read the work assignments would be a major step into this direction. So far, only little research has been conducted to investigate how the educational material used in inclusive classes should be designed. For example, whether the adding of symbols to written text improves comprehension for people with disabilities has not yet been empirically based. Even though theoretical considerations support this assumption (cf. Frenkel & Bourdin 2009), results of present studies are contradictory (cf. Jones, Long & Finlay 2007; Poncelas & Murphy 2007). Students with and without learning disabilities will participate in the present study. In the context of a qualitative pre-study different varieties concerning the simplification of texts will be tested. The benefits of the use of simple language (cf. Network Simple Language, <http://www.leichtesprache.org>) as well as the advantages of linking text and symbols will be analyzed. An adequate register and an appropriate use of symbols shall thus be identified. For the main study a within-subject counterbalanced design is intended. The participants' reading and mathematical ability as well as their IQ will be elevated beforehand. With regard to content the pre-study and the main study will, for example, focus on fractions and bodies. An activity-oriented approach which includes the work with hands-on materials will be pursued.

PÉREZ ISTÚRIZ, Maitane

internal id: 95

Universidad de Cantabria, Santander – SPAIN

Supervisor: Tomas Recio/Jose Diego

Poster:

Presentation:

Tuesday, 05.04.2016, 11:15-11:45, room S0.107

Title: Do Algorithms and Routine Tasks Help to Develop Children's Reasoning?

Abstract: Several studies suggest that algorithms are not important for training students mathematically (Fernandez, 2005). The aim of traditional schools was to train citizens for working in jobs where it was important to do calculations and simple operations. Nowadays this aim is changing, considering aspects such as thinking logically and solving real-world problems to be more important. Educational laws and educators' beliefs about the way students have to learn is thus progressively changing. The question address is: are routine tasks in mathematics useful any longer?

Research: The goal of this thesis is to investigate about what mathematical content should be taught at schools and why it should be taught. It is important to design effective mathematical curricula to train constructive, concerned and reflective citizens (PISA, 2013). There is controversy about whether (or not) algorithms and routine tasks are important in the learning of mathematics and whether they are useful for developing child reasoning (Arcavi, 1999). So the main aim of this study is to understand how students learn Mathematics and whether or not algorithms are important to learn Mathematics. Much mathematical content is taught in a routine way, using methods, algorithms, formulas, and procedures. This is because traditionally the aim was to train citizens to become skilful in certain tasks necessary for the everyday life (e.g. Counting, calculating, applying rules). Nowadays some researchers suggest that this type of skills are important but that the actual society requires also a more effective way of thinking (e.g. Reasoning, creativity, developing strategies) (Fernández, 2005). This study analyses, from two different perspectives, whether or not routine tasks are useful for developing student reasoning. Firstly, Mathematics-teachers' beliefs about the usefulness of routine tasks will be evaluated. And secondly, psychologists and neuroscientific's beliefs about the convenience of doing routine tasks for developing cognitive aspects will also be evaluated.

POKHREL, Tika Ram

internal id: 16

Kathmandu University, Lalitpur – NEPAL

Supervisor: Bal Chandra Luitel

Poster:

Presentation:

Friday, 08.04.2016, 12:15-12:45, room S0.107

Title: Games in learning mathematics

Abstract: Students especially young learners like to play games. Games can be classified from play activities to high competitive sports. Generally games are played for physical development. Games are also good means of developing physical as well as social and emotional aspects of students. There are several games developed for the mental development. Strategic games are examples of such games. There are variety of games developed to be played using ICT. Most of the young people share their experience about the progress in the games and even in social media. As an educator working in mathematics, I have several concerns in my mind to be addressed. Some of these concerns are mentioned here. How to use games in learning of mathematics? Do students really learn mathematics through games or enjoy games? How are games organized for instruction of different mathematical objects like concept, skills and application? In short, how games can be used in learning of mathematics in school is the major concern of the paper.

In this paper, I will share my experience of using games in different level of students and their learning of mathematics and other skills. Among different games, I will share my experience of developing students mathematical skills and beyond with the games: Who can count first?, How much is at my back?, Who will be fakir (emptied)? and a Salute. These games made me excited in exploring other games because students were started developing their thinking skills which are essential to developing number sense. In Nepalese context, the talk and work with playing card is directly perceived as negative. However, most of these games were played by using playing cards. I was worried about the negativity of using cards in the school and perception of parents regarding cards. I excited to hear from parents that some of the students started to teach their parent about mathematical games and parents also played with their kids.

Furthermore, I will share my experience of developing and engaging students in Frango (a fraction game similar to bingo), integer games, coordinate games, and “Flips, Slides and Turns” of different objects in Nepalese context and their learning of mathematics by the students of grade 6-8. Finally, I will share my experience of using games to secondary level students: Find your height, Hexagonal Zig-saw, find the center of the circle, and estimate the height of the tower as learning of mathematics.

These games were used as an intervention in learning mathematics in a school of Kathmandu valley as to test how these are useful in learning of mathematics. The author collaborated with mathematics teacher of the school in order to carry those games in the school. The major learning from the games is that games can be the excellent means for learning mathematics.

Based on the intervention of the games with different level of learners from primary to secondary level in Nepal, I have come to learn that games are greater energizers for young learners for learning of mathematics. [...]

[Research: Teaching and Learning of Mathematics using activity based instruction](#)

PUTRA, Zetra

internal id: 50

University of Copenhagen, Copenhagen – DENMARK

Supervisor: Carl Winsløw

Poster:

Presentation:

Tuesday, 05.04.2016, 16:15-16:45, room S1.106

Title: Research based on the anthropological theory of the didactic: the case of pre-service secondary teachers' knowledge on rational numbers

Abstract: This study is a pilot study of my PhD research about a comparative study of pre-service elementary teacher knowledge's on rational numbers. Five hypothetical teacher tasks (HTTs) about rational numbers inspired by Durand-Guerrier, Winsløw and Yoshida's work (2010) were designed and tested to 11 pre-service secondary teachers (PsST) from Metropolitan University College (MUC), Denmark, on January 2016. The PsST worked in pairs except a group who consists of three students. The data were collected through their work and video recording during their discussion in a group. The anthropological theory of the didactic (ATD) is used as a framework to design and analyse the result. Based on the ATD, the object of knowledge learnt by a human activity related to mathematics can be identified into two aspects, a practical block and a knowledge block, which are main components of praxeological reference models (Chevallard, 1992). The practical block consists of a type of task (T) and a technique (τ), and the theoretical block consists of a technology (θ) and a theory (Θ). In this study, each type of task (T) contains a mathematical and didactical problem that can accesses PsST's mathematical and didactical knowledge on rational numbers.

Research: My PhD research is about a comparative study of pre-service elementary teachers' knowledge on rational numbers between Indonesia and Denmark. I will design series of hypothetical teacher tasks (HTTs) based on anthropological theory of the didactic. The praxeological reference models and the level of didactic codetermination are used as a tool to analyse the result. Meanwhile, my master was about realistic mathematics education (RME), I did my study in Sriwijaya University (Indonesia) collaboration with Utrecht University (the Netherlands). I designed a hypothetical learning trajectory (HLT) about addition up to 20 and tried it in grade one in an elementary school in Indonesia. In general, my research interest is about how students at elementary school and pre-service elementary teachers' knowledge on mathematics, and how we can design HLT/HTT to evaluate as well as develop their knowledge.

RAFIEPOUR, Abolfazl

internal id: 15

Shahid Bahonar University of Kerman, Kerman – ISLAMIC REPUBLIC OF IRAN

Supervisor: Professor Zahra Gooya

Poster:

Presentation:

Friday, 08.04.2016, 11:45-12:15, room S1.101

Title: Ethnographic Study of Iranian Carpet-weavers for Designing Modelling Activities

Abstract: This study examined the life style of two expert carpet-weavers and their culture. Carpet weavers can do mathematics and solve real world problems without academic education in mathematics. Indeed, they use mathematics according to their needs through practical activities. Purpose of this paper is to investigate the mathematical ideas in the art of carpet weavers. Ethnography approach used as methodological framework in this study. Findings of the study show that there are many mathematical concepts in the carpet weaving process, such as symmetry, parallel and diagonal lines, geometric shapes, ratio and proportion, and so on. In this paper we concentrate on calculating basic arithmetic and using ratio and proportional reasoning and use these ideas for designing modelling activities.

Research: [Mathematical Modeling & Application](#); [Ethno-Mathematics & Ethno-Modeling \(Informal mathematics\)](#)

RATNAYAKE, Iresha

internal id: 8

University of Auckland, Auckland – NEW ZEALAND

Supervisor: Prof. Michael O. J. Thomas; Co-supervisor: Dr. Greg
Oates

Poster:
Presentation:

Tuesday, 05.04.2016, 10:45-11:15, room S0.107

Title: Teaching algebra with digital technology: Factors influencing mathematics teachers' task development and implementation

Abstract: Enhancing teacher involvement in the development of student tasks using digital technology has been identified as a crucial step towards improving the conceptual use of digital technology in the mathematics classroom. Hence, this study seeks to identify teacher factors that influence digital technology algebra task development and implementation in secondary schools. The identification of these factors that appear to assist or inhibit teachers in digital technology algebra task development will be useful to improve the design of professional development programmes that may facilitate the training of teachers in the use of digital technology in teaching mathematics with the goal of improving students' conceptual understanding.

Research: The use of digital technology (DT) in the mathematics classroom helps students to understand mathematical concepts meaningfully and the effectiveness of using DT in teaching clearly depends on the DT tasks used and here the teacher needs to play a crucial role in designing and implementing DT tasks since implementing existing tasks requires significant refinement for their classroom (Gravemeijer, 2004). Hence, this research focuses on teachers designing their own DT tasks and the factors that influence such a development.

This researches a case study methodology implemented in three stages. Firstly groups of three Sri Lankan teachers were engaged in designing and developing digital technology algebra tasks for Grade 12 students (17-18 years old). The intervention by the researcher involved a discussion of the tasks developed and some theoretical principles of rich DT task design. Then the teachers had an opportunity to modify their task before one of them implemented it in the classroom while the other group members observed the lesson with the researcher. The two groups that will be discussed here comprise Group A from Central province who are all male teachers and Group B from Western province, are female teachers. Both groups are heterogeneous in nature on the variables of mathematics qualifications and years of experience in teaching mathematics.

The data collection process involved teachers answering a semi-structured interview where they talked about their experience in teaching; experience in teaching with DT; their knowledge, beliefs and confidence in using DT in teaching; and professional learning experiences in relation to technology. Then the participant teachers completed a questionnaire including a Likert-style attitude test with five subscales comprising attitudes to: mathematics; teaching with technology; technology in general; digital technology task development by teachers; and technology in learning mathematics. The teachers were free to select any topic from the A-level combined mathematics syllabus and the task development was video and audio recorded. Group A chose graphs of quadratic functions and group B chose domain and range of functions and both chose GeoGebra as their DT. Following the intervention the teachers had an opportunity to modify the tasks and then took part in a group interview focused on their planning during task development, how it worked in practice, the modifications to the tasks implemented after the discussion and their reflection on the factors that influenced their task development. The next phase was the task implementation with students in the classroom. An experienced teacher from Group A and a novice teacher from Group B, chosen by each group, taught the class. Finally, a post implementation discussion was held with the researcher where participant teachers had an opportunity to reflect on their work after which they could modify the task again based on the implementation and then answered a final questionnaire.

Data is just beginning to be analysed from these two groups and I hope to present some initial findings regarding the tasks produced by the teachers and the factors influencing the outcomes. Gravemeijer, K. (2004). Local instruction theories as means of support for teachers in reform mathematics education. *Mathematical Thinking and Learning*, 6(2), 105-128.

ROOS, Anna-Katharina

internal id: 103

Julius-Maximilians-Universität Würzburg, Würzburg – GERMANY

Supervisor: Prof. Appell/ Prof. Weigand

Poster:

Presentation:

Wednesday, 06.04.2016, 17:15-17:45, room S1.101

Title: Where and why do students have problems when dealing with extreme points?

Abstract: The aim of our study is to detect students' problems related to real functions, with a particular emphasis on the concept of extreme point. To be more precise, we want to answer the following research questions:

- Which errors and misconceptions can be found concerning the concept of extreme point?
- What are reasons for these errors?

Participants are mathematics students after their first year analysis course. We give a short overview over the existing literature, research methods, and first results. For example, different categories of the occurring mistakes will be presented. Finally, we give an outlook of our ongoing research to identify possible reasons for such mistakes.

Research: My area of research is university didactics in real analysis. The topic of my PhD thesis is "Mistakes and Misconceptions of Mathematics Students Concerning the Concept of Extreme Point".

ROULEAU, Annette

internal id: 14

Simon Fraser University, Burnaby – CANADA

Supervisor: Dr. Peter Liljedahl

Poster:

Presentation:

Tuesday, 05.04.2016, 16:15-16:45, room S0.107

Title: Tensions in Teaching Mathematics: The Case of Naomi

Abstract: Tensions are endemic to the teaching profession. Viewed as dichotomous forces, tensions shape the experiences of mathematics teachers, affecting both their practice and professional growth. In this article, we use Berry's (2007) framework to identify and examine some of the tensions experienced by Naomi in her practice of teaching mathematics. While previous research presents the image of teachers as dilemma managers who accept and cope with continuing tensions, our research suggests that a desire to resolve these tensions may impact teaching practice and professional growth needs.

Research: The role of tension in mathematics teachers' intentions, actions, and professional growth. I am a second year student in the Mathematics Education Doctoral Program at Simon Fraser University and have ten years of experience as an elementary school teacher. During my first summer in the PhD program, I had the opportunity to teach two elementary mathematics methods courses at SFU. This was an amazing experience, and one during which I became acutely aware of the tension of trying to reify my elementary mathematics teaching experience for my pre-service teachers. Tension is something that I came to realize is an ever-present part of being a teacher, whether of adults or children. This led me to wonder about the role tensions play in the lived experiences of K-12 teachers, and reminded me of my previous experiences as a facilitator of professional development for teachers in my school district. I was always curious why there was such a variety of teacher responses to professional development - from boundless enthusiasm to foot-dragging reluctance. What were these teachers experiencing that could result in such a gamut of approaches? As such, I have become very interested in the role that tensions play in mathematics teachers' intentions, actions, and professional growth. Under the supervision of Dr. Peter Liljedahl of Simon Fraser University, I have had the opportunity to delve further into this. The notion of tensions in teaching is emerging under his tutelage and has proven to be an intriguing area for research.

SCHEURING, Michaela

internal id: 97

University of Koblenz-Landau, Landau – GERMANY

Supervisor: Prof. Dr. Juergen Roth

Poster:

Presentation:

Tuesday, 05.04.2016, 11:45-12:15, room S0.107

Title: Real experiments or computer-based simulations - How to foster functional thinking?

Abstract: Functional thinking is one of the central areas of mathematical education. Nevertheless, studies suggest a lack of pupils' functional understanding. This concerns particularly the fundamental aspects correspondence, covariation and function as object.

The aim of our research is to find out if working with real material (real experiments) or using computer-based simulations (GeoGebra) can foster the functional understanding of 7th graders more effectively. In an experimental setting the two treatments are compared. The outcomes shall lead to a suggestion on how to foster functional understanding in the classroom

Research: Functional relationships are part of teaching mathematics in every grade. Moreover, we encounter them everywhere in our everyday life. Nevertheless, pupils rarely recognize these functional relationships. Their functional understanding often proves to be weak and therefore needs to be fostered. The aim of our study is to figure out if two different experimental settings, one using real experiments and the other using simulations, support the development of functional understanding and which of them works better. Theoretical background. Functional thinking needs to be considered at two levels. On the one hand, at a normative level, functional understanding consists of three fundamental aspects (Vollrath 1989): correspondence, covariation and function as object. It can be described by actions that take place while working with functions (Vollrath 1986). On the other hand, the level of pupils' perception of functions needs to be taken into account. There is a distinction between their concept image and concept definition (Tall and Vinner 1981). Method . Our study focuses on pupils in grade 7. First we conceive a test for functional thinking considering the fundamental aspects. In a pre-study, we will verify if theory based real experiments and simulations prove effective in the implementation. In the main study, we will explore if real experiments or simulations (GeoGebra) lead to a different learning progress in functional thinking. Both settings will include the same content. Furthermore, we assume that pupils need more time to work with real experiments than with simulations. Therefore, there will be a third treatment using simulations. It will comprise more content than the other settings. Thus, pupils should need the same amount of time for the 3rd treatment as for real experiments.

SWIDAN, Osama

internal id: 1

Hebrew University of Jerusalem, Jerusalem – ISRAEL

Supervisor: Prof. Baruch Schwarz

Poster:

Presentation:

Tuesday, 05.04.2016, 10:45-11:15, room S1.101

Title: Automatizing cooperative learning of geometrical concepts

Abstract: In my current research project, I am working in collaboration with scholars from the learning sciences and learning analytics. Our aim is to develop an algorithm that trace the learning of geometrical concepts as they learned in dynamic and collaborative learning environments (DCLE) by middle school students. This algorithm aims to provide teacher an online feedback on what is going in small groups that are working together. Two research teams are working in this project. The educational team and the engineering team. I belong to the educational team. Our responsibility is to construct geometrical modules that boosting the argumentative discourse of the students as they learning with DCLE, and to analyze the learning processes. Our data will serve the engineering team as input for developing the algorithm. In the spring schools, I will discuss the principles that guided us in designing the tasks and sharing the audience ours primary results from this project.

Research: [Learning Geometry](#), [argumentation](#), [reasoning and proof](#), [learning analytics](#), [Artificial intelligent](#)

TAKKER, Shikha

internal id: 17

Homi Bhabha Centre for Science Education, Mumbai – INDIA

Supervisor: Prof. K Subramaniam

Poster:

Presentation:

Tuesday, 05.04.2016, 11:45-12:15, room S1.106

Title: Exploring Sensitive Research Methodologies for Understanding Mathematics Teacher Knowledge in Practice

Abstract: My research aims to investigate and enhance teacher's knowledge of students' mathematical thinking as manifested in their classroom practice. The study involved working with elementary school mathematics teachers in their classrooms for a period of two academic sessions, and making classroom observations as central to designing tasks for reflection and learning. Emanating from a practice perspective, the methodology of the study evolved in attempts to connect the teachers' and researchers' community. In this presentation, I will discuss instances of teaching practice where methodology played a central role in building a relation between teachers and researchers in discussing issues which are central to teaching and learning of mathematics in a classroom.

[Research: Exploring and Enhancing Teachers' Knowledge of Students' Mathematical Thinking in situ.](#)

TARANTO, Eugenia

internal id: 63

Università degli Studi di Torino, Torino – ITALY

Supervisor: Prof. Ferdinando Arzarello

Poster:

Presentation:

Friday, 08.04.2016, 11:15-11:45, room S0.107

Title: Teacher training through MOOCs

Abstract: My PhD project consists in pursuing a research about the possible changes induced in mathematics teachers' practices through the use of MOOCs (Massive Open Online Courses) for their in-service training. In my presentation I will illustrate the rationale of this project referring to a MOOCs program for Italian mathematics teacher training, in which I am working. [...]

Within this background, in my Department it was born a program for the development of MOOCs aimed at training mathematics secondary school teachers. [...] The MOOCs were designed, produced and delivered through the collaboration between some researchers from the Department of Mathematics of Turin University (proff. F. Arzarello and O. Robutti with the author of this presentation) and some in-service teachers, graduated from the second level Master "Trainers in Mathematics Education" held at the same Department. Hence these MOOCs have been created by teachers and researchers for teachers: they are open, free, and available online on a Moodle platform. They offer the use of materials created by the same students of the Master through technological tools, which foster communication and sharing. Thanks to the direct use of these resources, the teachers experience how to socialize their expertise, and are asked to think how implementing new practices through fresh technological formats in order to improve students' learning and to stimulate their interest.

Four MOOCs were designed, one for each of the main topics in the official Italian programs for secondary school: Numbers, Geometry, Data and Forecasts, Relations and Functions. At the moment the MOOC of Geometry has been delivered, while work is in progress for the other three. Each MOOC lasts from 6 to 8 weeks and is divided in one-week modules. The completion of the activities of each module is attested by the assignment of a badge that is obtained by participants passing a short test at the end of the module. At the end of the course, participants are asked to prepare a teaching activity; they can so get a final certificate that guarantees that the course has been completed successfully.

Differently from what happens in other countries, in Italy a program like this is a novelty. The project monitors the participation and involvement of teachers in this new way of training, the relapse of new proposals in their practices, their professional evolution, and the development of communities of practice among them.

The goal of my research consists in tracing if/how such a new way of training has an impact on teachers practices. Specifically my purpose is to check how it can generate a conscious improving of teachers' professionalism with respect to the needs of the new society in terms of ICT, creativity and sharing, and to monitor their steps in this possible evolution.

Research: I am a PhD student in Mathematics Education. My main research interests are teaching and learning of mathematics in the digital era and training teachers. In particular I deal with e-learning and training teachers through MOOCs. My PhD project consists in pursuing a research about the possible changes induced in mathematics teachers' practices through the use of MOOCs (Massive Open Online Courses) for their in-service training. In my presentation I will illustrate the rationale of this project referring to a MOOCs program for Italian mathematics teacher training, in which I am working.

THEENS, Frithjof

internal id: 80

Umeå Universitet, Umeå – SWEDEN

Supervisor: Ewa Bergqvist

Poster:

Presentation:

Tuesday, 05.04.2016, 11:15-11:45, room S1.106

Title: The relation between linguistic properties of mathematical tasks and their difficulty and demand of reading ability

Abstract: The mathematical PISA tasks are "real world problems" presented in a text, that is, a student needs to read and understand them to be able to solve them. This raises two problems: Firstly, the students need some reading ability to solve the tasks, but as mathematical tasks are supposed to measure mathematical ability, unnecessary demand of reading ability (DRA) should be avoided. Secondly, the tasks have to be translated to many languages, which may result in different levels of DRA in different language versions. In our ongoing study we addressed the following research questions:

- Which linguistic properties of a mathematical task are related to higher DRA and/or difficulty of the task?
- Are there differences regarding these properties in different language versions of the same task?

We analyzed the English (USA), German, and Swedish language versions of the 84 mathematical tasks of the PISA 2012 assessment in three steps: First, we calculated variables for several linguistic properties for each task such as average word length and average sentence length. For each task we then calculated variables for difficulty and DRA. Finally we searched for correlations between the linguistic properties and the values for difficulty and DRA of each task in each language version.

The first step of the analysis showed clear linguistic differences between the languages, mostly for word length and sentence length. But in contrast to some earlier studies, in none of the language versions there were any statistically significant positive correlations between the different linguistic properties and the DRA or the difficulty of the tasks. That the linguistic properties were not correlated to difficulty, may be explained by the fact that the tasks are supposed to mainly measure mathematical ability and, therefore, the demand of mathematical ability has a bigger part in the tasks total difficulty than linguistic aspects. The lack of correlations between the linguistic properties of a task and its DRA was more surprising. Our results indicate that the linguistic properties investigated in this study are not related to higher DRA of mathematical tasks. That is, the differences in DRA between the tasks must have other causes than these particular properties. We have planned additional studies to reveal these causes and to finally answer our research questions.

Research: My research is part of a project in which we aim to deepen the understanding of the relation between the language in mathematical test tasks and the tasks' difficulty and demand of reading ability. The results of our research may help to increase the comparability of international assessments, and also give guidelines to teachers, textbook editors or assessment designers when developing mathematical tasks.

TŮMOVÁ, Veronika

internal id: 93

Charles University in Prague, Prague – CZECH REPUBLIC

Supervisor: Nada Vondrova

Poster:

Presentation:

Tuesday, 05.04.2016, 16:45-17:15, room S1.101

Title: Results of Czech pupils in area and volume tasks

Abstract: The goal of my project is:

- a) to describe a hypothetical learning trajectory (HLT) for concepts of area and volume,
- b) to validate the HLT by monitoring individual LTs of selected pupils.

The HLT I have proposed is based on: a) relevant research of pupils' understanding of area and volume concepts and b) analysis of selected local textbook series and curricular documents. The HLT consists of two intertwined parallel subtrajectories – i.e., numerical (quantification) and non-numerical (transformation of shapes, conservation of area etc.). Tasks were created for each HLT level, with the aim to use them (after appropriate pilot testing) as diagnostic tasks on large number of pupils. In September 2015 more than 1200 pupils from Czech schools, grades 4 to 9 were tested. This testing had two goals: verify necessity of both subtrajectories and their interconnection and map the levels across different grades. Some results of this testing will be presented – for example I was able to identify relatively strong correlation (Pearson correlation of 0,62) between numerical and non-numerical skills of pupils, which seems to confirm the necessity of both subtrajectories. Currently I'm preparing second part of my research project – i.e. observation of individual learning trajectories of selected pupils based on semi-structured clinical interviews.

Research: Hypothetical learning trajectory for concepts of area and volume In my research I focus on steps we go through while building concepts of area and volume. Based on existing reasearch and analysis of local texbooks I put together a hypothetical learning trajectory for these concepts, which I try to verify. First, I did some overall testing using tasks corresponding to proposed levels in the learning trajectory. The results should help me to map levels across age cathegories. The second part of the research will be interviews with individual pupils to see, what kind of tasks help them to advance from one level to the next. The overall testing is done - now IÃ'm trying to interpret the results and design the second part.

VOIGT, Matthew

internal id: 19

San Diego State University, San Diego – UNITED STATES

Supervisor: Chris Rasmussen

Poster:

Presentation:

Friday, 08.04.2016, 10:45-11:15, room S0.107

Title: Comparative analysis of learning gains and students attitudes in a flipped precalculus classroom

Abstract: Flipped classrooms are becoming increasingly prevalent at the undergraduate level as institutions seek cost-saving measures while also desiring to implement technological innovations to attract 21st century learners. This study examined undergraduate pre-calculus students' (N=427) experiences, attitudes and mathematical knowledge in a flipped classroom format compared to students in a traditional lecture format. Our initial results indicate students in the flipped format were more positive about their overall classroom experiences, were more confident in their mathematical abilities, were more willing to collaborate to solve mathematical problems, and achieved slight higher gains in mathematical knowledge.

Research: Currently, my research activities include collaboration on several national and international projects addressing research in undergraduate mathematics education. As part of the US NSF-funded Progress through Calculus grant, my work has included analyzing and coding census survey data regarding how institutions manage the precalculus/calculus sequence and identify common themes and exceptional institutions. In addition, I am working on discourse analysis with international partners from Israel to examine knowledge shifts in the mathematics classroom which entails the analysis of student understandings, collective practices, and how particular members of the classroom community support coordinated development of knowledge. My thesis research centers on the evaluation and implementation of flipped classroom technologies in undergraduate mathematics courses. For my pilot study, I conducted a quantitative analysis examining undergraduate pre-calculus students' experiences, attitudes and mathematical knowledge in a flipped classroom format compared to a traditional lecture format. In the next year I will be working with Norwegian researchers Simon Goodchild and Helge Fredriksen in order to develop a framework to analyze different didactic videos and conduct an international comparative study funded by the NSF.

WALKER, Claire

internal id: 71

University of Southampton, Southampton – UNITED KINGDOM

Supervisor: Dr. Charis Voutsina

Poster:

Presentation:

Tuesday, 05.04.2016, 17:15-17:45, room S1.106

Title: The attitudinal factors affecting the decisions of learners in England to study advanced mathematics

Abstract: This study explores the issue of attitude towards mathematics in three dimensions of attitude: mathematical self-concept, vision of mathematics, and the affective dimension. In addition to these factors, mathematical self-identity and normative influences are also examined. The impact that these components have on the decision of learners to study or not to study mathematics is explored, and conclusions drawn about the relative dominance of each attitudinal factor on students' decisions to study post-16 mathematics. This study takes a cross-sectional approach to analyzing the attitudes of learners in England towards mathematics, and how this is different in children of different ages. Using a mixed methods approach to gathering quantitative data using Likert-style questionnaires, and supporting the evidence gathered with qualitative data gathered using individual semi-structured interviews, this study provides some answers not only as to what the attitudes of learners in England are towards mathematics, but how these attitudes differ between students of different ages.

Research: I am investigating the attitudinal factors which affect the decisions of learners in England to study mathematics in post-16 education.

WEERASINGHE, Daya

internal id: 7

Monash University, Clayton – AUSTRALIA

Supervisor: Professor Peter Sullivan

Poster:

Presentation:

Wednesday, 06.04.2016, 16:15-16:45, room S1.106

Title: Parental Involvement and Academic Achievement of Secondary School Children in Mathematics Education

Abstract: Parental attitudes, beliefs, and expectations along with children's achievement in mathematics education is the main focus of my study. Generally, many parents expect the best for their children and want to involve in their children's education. This involvement may result in both positive and negative outcomes. In the past, little research has been done on negative pressure of parental involvement. Hence, this research aims to find answers to the following questions:

- (1) How do parental attitudes, beliefs and expectations in mathematics education vary between cultural backgrounds, genders, and year levels of children?
- (2) How can positive encouragement of parents be a negative pressure on children in mathematics education?
- (3) What is an appropriate balance between positive and negative outcomes? After reading through the literature, a conceptual framework is developed to guide the study.

Research methods include an on-line survey and face-to-face interviews for purposefully selected parents and children to collect detailed views. The participants are secondary school children and their parents in Melbourne, Australia and they are categorized into two groups as European-Australians and Asian-Australians. A mixed methods approach is used with an explanatory sequential design, in which quantitative data are explained in depth using qualitative data. While the quantitative phase is conducted sequentially using a deductive theoretical drive, induction is used in the qualitative second phase. The analysis integrates both sets of data and then draws interpretations based on combined strengths of mixed methods. Quantitative data being analyzed, currently qualitative data is used to enhance and support findings.

Research: Parental involvement in mathematics education of their secondary school children in Asia and Australia. Supervisors: Professor Peter Sullivan, Associate Professor Sivanés Phillipson"

ZEHNDER, Moritz

internal id: 41

Universitaet Bayreuth, Bayreuth – GERMANY

Supervisor: Prof. Dr. Volker Ulm

Poster:

Presentation:

Friday, 08.04.2016, 11:45-12:15, room S0.107

Title: Mathematical Giftedness and its identification in secondary school

Abstract: A main goal of my work is to create a set of exercises indicating mathematical giftedness in secondary school, that can easily be used by teachers to identify potentially mathematically gifted students in order to promote them. Since research on (mathematically) gifted children focused students in primary schools in the last decades, I want to focus on students in secondary school.

[...]

A naturally upcoming question after knowing what defines mathematical giftedness is: How can teachers identify mathematically gifted students? By now there are ways to do so in secondary school, for example the 'Münchner Hochbegabungstestbatterie für die Sekundarstufe' (MHBT-S) but none of the tests is suitable for a practical use by teachers in school. Some tests only pay attention to intelligence, some tests don't respect the special nature of mathematical activities such as problem solving and others can't be evaluated by teachers. For this reason I want to create a set of indicator exercises in dependence on Käpnick (1998) who already did that for students in primary school. The exercises will be designed considering the model of mathematical giftedness created before. The development will consist of three phases (cf. 130f.):

1. Construction of the exercises with an instruction for use and evaluation.
2. Testing of the so created materials.
3. Applying the (eventually revised) exercises to potentially mathematically gifted students and a comparison group.

[...]

At the moment I've got several questions I'd like to discuss during spring school: Should the test be done at a single point of time or should there be multiple test dates? Should intra- and interpersonal moderators be considered? And if so, how can they be measured and integrated in the result of the exercises? Where and how can mathematically gifted students be found? Should there be a separate process evaluation in addition to the product evaluation of the exercises? Can underachievers be identified using a set of indicator exercises?

[Research: Mathematical giftedness and its identification in secondary school](#)

POSTERS

DA ROSA, Fernanda

internal id: 27

Sao Paulo State University, Rio Claro, São Paulo – BRAZIL

Supervisor: Ivete Maria Baraldi

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Hearing Stories and Glimpsing Lives: The Inclusive Education in Rio de Janeiro, Brazil

Abstract: It is a qualitative research, specifically using the oral history methodology. Teachers and students with visual impairment, who taught/studied in special schools and in inclusive regular schools or universities, were interviewed with the aim to understand how they perceive inclusive education with a focus in mathematics. Note that the interviews were triggering to understanding the inclusion process, but also official documents, books and articles about inclusion were used as sources. This study is intended to contribute with Oral History Group and Mathematics Education (GHOEM) studies, a research group to which the student belongs. Also, it is argued that this research exercise will provide sources, narratives, and contributing with new elements related to inclusive education in the State of Rio de Janeiro.

Research: [Mathematics Education](#), [Inclusive Education](#), [Students with visual disabilities](#), and [Oral History](#).

HOFFMANN, Max

internal id: 57

University of Paderborn, Paderborn – GERMANY

Supervisor: Prof. Dr. Rolf Biehler, Prof. Dr. Joachim Hilgert

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Designing mathematical interface courses for highschool teachers at university

Abstract: My analysis of potential effects of interface courses on teaching skills and attitudes will be done using the model of professional competences of teachers from Baumert and Kunter (2011) as a conceptual framework. This leads me to four key dimensions:

1. the level of math a teacher needs to learn at university (mathematical expertise). The starting point will be to analyze the different German school curricula.
2. the students attitudes regarding to the relevance of the presented material for their future work
3. describing the learning opportunities (subjects as well as methods) in order to discuss them. In accordance with the outcome oriented structure of the German education system, I want to design a competency model. The goal is to include every part of the lecture, the exercises and the final exam in it.
4. the evaluation of the innovations

It is important to measure the increase of mathematical and methodical expertise as well as changes in the profession related beliefs. The focus of my Master thesis will be to design the interface course for "Reelle Analysis" in accordance to the four key dimensions outlined above. The formulation of the general process will be part of my PhD-project, in which I also want to test the portability of the procedure by applying it to a completely different subject (geometry).

Research: My main research interest is the question of how to teach university mathematics courses for future mathematics teachers. In my Bachelor thesis (Hoffmann, 2014) I designed specific exercises, which were used in a first semester math course called "Einführung in mathematisches Denken und Arbeiten" (short: EmDA). This course is compulsory for students who want to become mathematics teachers at German high schools. The content of this course consists of fundamental methods of mathematical reasoning applied to basic examples from the elementary number theory like divisibility rules or the greatest common divisor. Further it contains a rigorous construction of the real numbers starting from the natural numbers, based on the concept of equivalence relations (Hilgert, Hoffmann, & Panse, 2015a, 2015b). The theoretical foundation of my Bachelor thesis is the concept of interface exercises as developed in the work of Thomas Bauer (e.g. Bauer, 2013). I used his results to analyze and classify the exercises I designed. The key feature of the interface problems is to emphasize the connection between the subjects of the course and related subjects in school. There are different conceivable variants of such connections: they can either be built around the subject or built around the methods used. While the focus of the Bachelor thesis was on exercises, the next step will be to extend the idea of interface to an integrated course concept which one might call interface course. As a first step I plan to remodel an existing course from the Master of Education (M.Ed.) program into an interface course. I chose "Reelle Analysis", a traditional second year course from the Bachelor of Science (B.Sc), which in Paderborn is presently also taken by M.Ed. students. The goal is eventually to design a general procedure university teachers can follow to build interface courses on every level and for every subject of mathematical teaching in the B.Ed. and M.Ed programs.

KATONA, Dániel

internal id: 92

Eötvös Loránd University of Sciences, Budapest – HUNGARY

Supervisor: Dr. Vancsó Ödön, Dr. Ambrus Gabriella, Dr. Juhász Péter

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: The Pósa method – Problem solving and exploring mathematics

Abstract: Lajos Pósa, a favourite “child” of Pál Erdős, is one of the most prominent mathematics teachers in Hungary. Principally at weekend and summer camps, jointly with his disciples, like one of my supervisors, Péter Juhász, they facilitate the construction and development of gifted students’ ability to think, reason, create and (particularly) take delight in in the field of mathematics, that is, they teach. Pósa’s name and the effectiveness of his work is well-known and respected by (practically) all professionals, not like (in my supposition) what they are actually doing.

My future PhD research aims at the followings:

1. Collecting data (with qualitative methods) and the analysing the Pósa type ‘discovery learning’ of mathematics, presenting a (hopefully) throughout description of his method.
2. Investigating the prospects of the application of his approach in general secondary school educational settings, restricted to the field of algebra, more precisely to the conceptualization of numbers and operations, from fractions to exponents and logarithms, with a vertical curriculum approach, with the help of my other supervisor, Ödön Vancsó, an expert in curriculum design.
3. Comparing the Pósa method to other ‘exploratory learning’ or problem solving methods, focusing and questing present corresponding practices. Schools, like the Moore method, Enquiry-based learning, or the Hejny method seem to be promising associate approaches.

The poster presentation is intended to:

1. Reveal a brief summary of some elements of the Pósa method.
2. Present some underlying difficulties in the application of it in secondary school education, mainly in forms of questions
3. a) Provoke discussions on similarities and differences between Pósa’s approach and the aforementioned schools
b) (last but first and foremost) Continue the process of questing corresponding theories. I hope to collect some suggestions from the participants.

Research: I am particularly concerned about Problem Solving in Mathematics aducation and researching a special method of exploring Mathematics, based mainly on the way of structuring the content and the methodology of making questions and setting problems, which method was 'invented' and used by Lajos Pósa and his disciples, for example Dr. Juhász Péter (one of my supervisors. This method has been used succesfully for decades, although has never been reserched within the notional frames of the methodology of the Didactics of Mathematics. An other important aim of the researcs is to compare Pósa's method to other potentially similar methods or theories in Europe or in other countries.

NEßLER, Katherine

internal id: 40

University of Kaiserslautern, Kaiserslautern – GERMANY

Supervisor: Dr. Martin Bracke

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Supporting students gifted in mathematics through an innovative STEM talent programme

Abstract: Europe is facing an insufficient number of suitably qualified university graduates in the STEM subjects, due to an insufficient number of students choosing to study these subjects and high dropout rates. Furthermore, school-age students show a lack of understanding of the value of mathematics, and its potential use for solving real-life problem. We have been running an innovative talent programme for the last two years, which gives teams of school students the opportunity to study open-ended and unstructured truly interdisciplinary problems. We present results, which show a remarkable increase in understanding of the students' appreciation of the value of mathematics. We believe such a programme not only teaches students the value of mathematics but will also aid their transition from school to university.

Research: My research is involved with improving teaching methods for the STEM subjects (Science, Technology, Engineering and Mathematics) within schools, mostly using mathematical modelling. In particular, I am interested in devising teaching methods which encourage female students to pursue a STEM subject at university.

PIERARD, Marie

internal id: 52

University of Namur, Namur – BELGIUM

Supervisor: Valérie Henry

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Teaching trigonometry with dynamic geometry

Abstract: Trigonometry has an important place in mathematical Belgian education. At grade 10, students have to go from trigonometric numbers, with degrees and in triangles, to trigonometric functions, with radians and in the unit circle. This passage could be quite uneasy. To lighten this field, we analyzed the history of trigonometry and the Belgian programs and manuals. We are now questioning teachers and students. Afterwards, we plan to build a lesson using dynamic geometry to illustrate this passage.

Research: At grade 9, students discover trigonometric numbers in right-angled triangles (step 1). Sine, cosine and tangent are numbers: a quotient between the lengths of two sides of a triangle. At grade 10, they first extend the trigonometric numbers' definition in any triangle, measuring the angles in degrees and working only with positive angles (step 2). Then, they discover the unit circle, measure the angles with radians and work with any angle. Sine, cosine and tangent become functions (step 3). At grade 11 and 12, trigonometry appears in analysis with graphical manipulations, derivatives and integrals. We noticed that in France, our French-speaker neighbor, the curriculum is pretty different. We plan to build a lesson using technologies to bring students from step 2 to step 3. To do that, we follow the didactic engineering process of Artigue, in four phases. The first one consists on preliminary analysis. Firstly, we studied the history of trigonometry and the Belgian programs and manuals. Now, we are questioning teachers to know how they do teach trigonometry in their classrooms (we distributed a survey on early December 2015 so we would be able to present results at ICME-13). We are also questioning 11th grade students to detect their difficulties and compare them with those noticed by Canadian and French colleagues (Bloch, Proulx, Tanguay, Vadcard). Afterwards, we will study the pertinence of using dynamic geometry in this discipline, on computer or tablets, leaning especially on the artifact/instrument theory of Rabardel. Today, we hope that geometric manipulations would make students see mathematical objects like sine or cosine. Moreover, we want to use dynamic geometry to avoid drawing similar figures again and again. For example, we will draw a unit circle only once, and then adapt it to illustrate any trigonometric situation.

POHL, Maximilian

internal id: 85

Universität Duisburg-Essen, Essen – GERMANY

Supervisor: Prof. Dr. Florian Schacht

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Students' Use of Mathematics Textbooks in the Light of Digital Innovations

Abstract: In the last couple of years, technologies have gradually become an integral component of our everyday lives. Still, digital inventions seem to have missed useful integration in (German) classrooms. One way of eluding the yet-neglected investment of digital technologies in mathematics classes is to rethink the most commonly used medium in mathematics classes – the textbook. Approaching this topic involves knowledge of both the structure of (traditional) mathematics textbooks and the use of mathematics textbooks by students. Rezat's (2009) study on mathematics textbooks as an instrument for students helps approaching these two aspects. On the other hand, insights about current concepts of digital (mathematics) textbooks need to be acknowledged (cf. Pepin et al. 2015) in order to analyse whether the new digital textbooks concepts adapt to the actual student's use. By doing so, the following research question seem promising:

- (1) How do students use digital textbooks in the mathematics classroom?
- (2) How do affordances and constraints of digital textbooks influence concept formation processes and how can we reconstruct them?

In other words, which concept formation processes can be determined and how do obstacles – as well as possibilities – arise from the use of digital textbooks?

Research: Due to the facts that I finished my studies of English and Mathematics in December 2015 and have just started working at the department of Mathematics Education in February this year, I have not really had time to finalize my research area. Still, I am very interested in the research of the use of Mathematics textbooks, their potentialities and constraints. As a consequence thereof, the question of digital textbooks arises to me - again, accompanied by their potentialities and constraints. The follow-up question could be: "How does a shift - if valuable - from a standard to digital textbook change students' concept formation processes.

SANTOS, Luciane

internal id: 9

UDESC - Universidade do Estado de Santa Catarina, Joinville – BRAZIL

Supervisor: Elisa Henning

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Conceptions of Mathematics and Didactics of Mathematics noted by teachers in initial training

Abstract: This paper presents results of a study aimed to identify and analyze conceptions of Mathematics and Didactics of Mathematics expressed in drawings produced by teachers in initial training. The study was conducted with 16 students who attended "Didactics of Mathematics", a subject of Degree in Mathematics of Santa Catarina State University, Brazil. These students drew in a sheet of paper their conceptions concerning mathematics and the didactics Mathematics. The productions of these teachers in initial formation indicate a tendency to adhere to the models that conceive the mathematics as a tool and science and didactics of mathematics as a facilitator for the understanding of mathematics or an accessory to make mathematics more accessible. Results like these give evidence that in the same person who experiences an initial process in teacher training can coexist contradictory conceptions about mathematics and its teaching.

Research: Training of teachers who teach mathematics, information and communication technologies in mathematics education, mathematics literacy , production of meanings for math content , oral history.

SANTOS, Lucio

internal id: 10

UDESC - Universidade do Estado de Santa Catarina, Joinville – BRAZIL

Supervisor: Isabela Gasparini

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Potentialities and challenges of teaching programming language for students of Basic Education

Abstract: In this paper, I present some results of a master's research project being conducted at the Graduate in Science Education Program, Mathematics and Technology of the State University of Santa Catarina / Brazil and it investigates potential and challenges of teaching languages programming for students of Basic Education (Primary and Secondary Education) to contribute to the teaching and learning of mathematics. This is the discussion on studies that indicate that access to this new area related to technology - teaching programming in the schools - can help students understand concepts related to mathematics and other curriculum subjects, because to learn abstract concepts , it requires the development of problem solving strategies using the logical-mathematical thinking. Learning to program can start in literacy stage and programming can be part of the curriculum of basic education.

Research: [Educational technologies.](#)

STROM, Jessica

internal id: 4

Bemidji State University, Bemidji – UNITED STATES

Supervisor: Glen Richels

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: Manipulatives in Mathematics Instruction

Abstract: This paper is a review of research pertaining to the use of manipulatives in middle and secondary school mathematics instruction. It covers the research on the rationale for using manipulatives, the psychology behind learning with manipulatives, the common mistakes when teaching with manipulatives, and the suggested process to follow when using manipulatives in the classroom. There is a large amount of research and information on manipulatives in the classroom. One of the most prevalent topics addresses that the concrete characteristics of manipulatives allow students to progress through a natural learning process on their way to an abstract understanding of mathematical properties. They also provide an avenue for communication, which is a valuable resource in mathematics education. Common mistakes include not providing enough time, assuming the meaning behind the manipulatives is transparent to students, not helping students make the connection between the object and the mathematical concept, and not providing enough communication. The suggested process includes time given to students to work at a concrete level, then progress to a representational level, and finally to an abstract level. The teacher's role is to provide appropriate activities that bring students through the process and to pursue communication that reveals students' thinking and provides learning opportunities.

Research: My research is in the area of the use of physical manipulatives to teach mathematics concepts. I looked at how to properly use them in instruction and their benefits to all learners.

UMAMEH, Michael

internal id: 2

University of Leeds, Leeds – UNITED KINGDOM

Supervisor: Doctoral student

Poster:

Presentation:

Wednesday, 06.04.2016, 10:45-12:30, room S0.101

Title: The mathematics teachers' appropriation of digital resources: understanding the impact on classroom practices and the implications for teacher education

Abstract: In this presentation, I outline the key stages of my developing PhD research. The core of my study is to understand the mathematics teachers' appropriation and integration of digital resources into mathematic teaching, its impact on classroom practices and the implication for teacher education. The teachers' appropriation of digital resources occur in a complex contexts and the abundance of wide varieties of resources bring with it challenges and opportunities for the teachers in adapting resources for teaching mathematics. Hence, interactions with digital resources in the context of practice has become a focus of attention.

This exploration combines an activity theoretic approach with the more recent 'documentational approach' from the French didactics as theoretical tools for developing an understanding of, and building up a coherent explanation for, the phenomena under investigation.

Research: [The mathematics teachers' appropriation of digital resources: Understanding the impact on classroom practices and the implications for teacher education.](#)