News from Nordic mathematics education

The NoRME column in this issue of Nomad reports on several past and future activities taking place in the Nordic region. Included is also a summary of recent doctoral dissertations with a focus on mathematics education written within the Nordic/Baltic countries. Readers having information relevant for this column, and for the NoRME web page (norme.me), are encouraged to contact Christer Bergsten, the Chair of NoRME, by e-mail: christer.bergsten@liu.se

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Nomad workshop

The last two years there has been held a meeting of the editors of Nomad combined with a one-day workshop for PhD students. This year's workshop took place in Gothenburg on 10 April 2013 and was organised by the editors of Nomad in collaboration with NCM and Centre for Educational Science and Teacher Research at the University of Gothenburg.

The workshop was open to PhD students from the Nordic and Baltic region and students were invited to submit a draft of a paper to be shared among the participants in advance. Each participant was given the task to read carefully and comment on one of the papers during group work at the workshop. In addition at least one Nomad editor participated in each group. In total eight papers were submitted for the workshop and three of those have later been submitted for publication in Nomad and are now in the review process.

As an introduction to the workshop the Nomad editors gave a presentation of the editorial process in Nomad and presented and discussed quality criteria for publication. It is intended to arrange a similar event also in 2014. (Reported by Frode Rønning)

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One of the participants at the workshop, Hoda Ashjari (PhD student at Linköping University) here gives a short report about her experience of the workshop: The 10th of April 2013 a group of mainly doctoral students from different universities in Sweden and Norway gathered in Gothenburg to have a one-day workshop with the editors of Nomad. During the workshop we had the chance to meet with the editors of the journal and get an insight into the workings of Nomad, today and its history. Further, a much appreciated component was that the editors gave us a good account of the process from submitted manuscript to possible publication, detailed descriptions of the different stages and requirements, as well as the time frame for the process. This in turn, gave us a fair insight into the publication process in general. Moreover we had the chance to learn more about the structuring of a paper, and given guidelines on the matter, which was followed by a large portion of the workshop, dedicated to the participants' texts. Each text was given feedback, both from at least one editor and other participants. In this manner, we also had the opportunity to discuss and learn from each other's work.

Symposium in Finland, 6-8 November 2013

The next *Symposium of the Finnish Mathematics and Science Education Research Association* takes place at Åbo Akademi in Vasa 6-8 November 2013. The theme of the conference is *Spaces for learning: past, present and future*. Conference languages are Finnish, Swedish, and English. Keynote speakers are Paul Andrews, University of Stockholm (title: The cultural construction of school mathematics and student achievement), Elke Sumfleth, University of Duisburg-Essen (title: Trends in science education research from a German perspective), and Pirjo Aunio, University of Helsinki (title: Students with mathematical learning difficulties. Who are they? How to support their mathematics learning?). Forms of presentation are papers, short communications, workshops, and posters, with deadline 27 September 2013 for abstract and registration. For further information and contact addresses, see the conference web page at www.abo.fi/institution/mafykedidaktik .

MADIF9, 4-5 February 2014

The biannual conference MADIF arranged by SMDF (The Swedish Society for Mathematics Education Research), a member society of NoRME, is next time taking place 4-5 February 2014 in Umeå, Sweden: MADIF9 (The Ninth Swedish Mathematics Education Research Seminar). Invited speakers are Koeno Gravemeijer (Eindhoven University

of Technology) and Beth Herbel-Eisenmann (Michigan State University). Deadline for submission of research reports and short oral presentations is 1 November 2013. For further information, see the conference web site at ncm.gu.se/media/smdf/madif9.html .

NORMA 14, 3-6 June 2014

The Seventh Nordic Conference on Mathematics Education, NORMA 14 will take place in Turku (Åbo), Finland (www.turku.fi) on 3-6 June 2014. The conference is hosted by the Department of Teacher Education at the University of Turku and organised in collaboration with NoRME - the Nordic Society for Research in Mathematics Education. NoRME is open for membership from national societies for research in mathematics education in the Nordic and Baltic countries.

The conference will give Nordic and Baltic researchers in mathematics education opportunities to present their research by regular (10 pages) and short (1 page) papers. The conference is also a forum for the discussions and constructive meetings of researchers, teachers, teacher educators, graduate students and others interested in research on mathematics education in the Nordic context. The proceedings of the conference will be published electronically.

The official language of the conference is English. The estimated conference fee is 350 euros. The deadlines for submitting papers and further information about the conference will be published at the conference webpage www.utu.fi/norma14 .

(Reported by Harry Silfverberg for the Local Organising Committee; email: harry.silfverberg@utu.fi)

New doctoral dissertations

In this issue of the NoRME news column eight recent doctoral dissertations will be briefly presented, two from Finland, three from Norway, and three from Sweden. They represent different theoretical and methodological approaches, dealing with a variety of research issues, thus illustrating both the width and the complexity of the research field. The theses will be presented in chronological order.

Ribas Salatiel Madaucane Guambe defended his thesis entitled *Decontextualized language, logic, and algebra: the relationship between Mozambican students' achievement in school mathematics and their language and social background* at Luleå University of Technology on 19 November 2012. Given the gate-keeping role of school algebra for careers in higher education, the study explored students' inclination to engage

with decontextualized language in school algebra and logic in relation to their socio-economic and language background in Mozambique, where most of the pupils do not have the language of instruction (Portuguese) as their first language. The study focussed on the following two research questions: (i) What are the students' strategies and preferences when solving problems that are based on school algebra and logical reasoning in relation to students' socio-economic and language background? In particular: (ii) Are their ways of reasoning linked to their mother tongue or most used language, to their socioeconomic background, or to both? Data were gathered at a school in a semi-rural area for 41 students from grade 10. As to their general success at school, about two thirds of the students from the study achieve an unsatisfactory average in at least one subject and there are only very few students who have higher marks than just around the threshold in mathematics and other subjects. As to their first language, the students from this study are predominantly speakers of Xichangana.

As research instruments, the study employed a written test, a group task, a student background questionnaire (first and most spoken language; socio-economic status) and interviews. The outcomes show that the students who use their second language more often than their first language in everyday conversations (independently of the fact whether their first language is Portuguese or not) performed better than main Portuguese speakers in those tasks of the test, which rely on some flexibility in changing perspective and register. A couple of examples from students' responses in the written test and the discussion in the interviews showed some surface level misunderstandings due to a lack of language proficiency in Portuguese. The students' solutions to the word-problem that was set in a mathematical context, point to a more intrinsic relation between language and mathematical strategy. Some of the students' typical misinterpretations of algebraic notations cannot be seen as linked to the particular context of the study, as they resemble findings repeatedly found in international studies, also with monolingual students whose language of instruction is their first language. As to the students' socio-economic background, the outcomes reveal that students from different status groups tended to use different strategies in approaching the tasks. While the high status group preferred formal strategies that are in line with school algebra, the middle group used mixed ones, and the low status group more often drew on informal strategies. There was some evidence that for some students their language flexibility (bilingualism) compensated for the low socio-economic status. The outcomes of the study also point to a need of further researching the possibilities of developing mathematics registers in languages that are more fundamentally different

in grammar and social use in relation to the language of instruction than in contexts where most of the research on bilingualism and code-switching in mathematics classrooms has been carried out.

At the University of Helsinki, Sanna Patrikainen defended her thesis *Luokanopettajan pedagoginen ajattelu ja toiminta matematiikan opetuksessa* [Class teacher's pedagogical thinking and action in mathematics education] on 15 December 2012. As the editor of the NoRME News column does not read Finnish, the English abstract provided in the thesis will be reproduced here:

The purpose of this research was to describe and understand class teacher's pedagogical thinking and action in mathematics education. At first we investigated how teachers taught mathematics as well as their reasons for their pedagogical decisions. Based on these empirical findings, the second essential aim was to consider the quality of mathematics education relative to socio-constructivistic curriculum thinking and to model it with theoretical conceptions. The conceptualizing of mathematics education was based on the didactical relation included in the didactical triangle.

The research is qualitative by nature and can be characterized as a qualitative collective multiple-case study. The participants—three class teachers—were followed up during one mathematical teaching-studying-learning process. The research material was gathered by two different methods: first the teachers' pedagogical action was observed using video recordings, and then the pedagogical thinking connected to this action was depicted with the help of stimulated recall interview. The video data was analysed using a theory based set of concepts which described the mathematics teaching-studying-learning process. The purpose of the theory-bounded interview data analysis was to deepen the tentative understanding of mathematics education gained through the video analysis.

The results describe the teachers' pedagogical thinking and action in the context of mathematics education. All three teachers shared a constructivistic conception of mathematics teaching and learning, but each emphasized different viewpoints. These personal conceptions of teaching were defined as humanistic-constructive, cognitive-constructive and contextual-constructive. Finally, a model of mathematics education consisting of four factors was constructed. This model also included the didactical relation which was defined as the teacher's relation to the student, the content and the life-world.

The research results and methodological inventions can be used in the context of school teaching, teacher education and research on teaching. Teachers and teacher students can utilize the results when reflecting

on their own pedagogical thinking and action. In addition the research provides topical information concerning Finnish mathematics education as well as new perspectives for national and international research and development work.

On 22 January 2013, at the University of Oslo, Ove Gunnar Drageset defended his thesis *A research and evidence-based vision for better mathematics teaching and learning in Norwegian schools*. As the editor of the NoRME News column has not had access to the thesis, the English abstract provided on the web will be reproduced here:

This doctoral thesis is within the academic field of mathematics education and presents results from both quantitative and qualitative research.

The quantitative part is based on data from 356 teachers answering a test and a questionnaire. Three main findings are reported. First, findings from the test confirm empirically the existence of the constructs of SCK (specialized content knowledge) and CCK (common content knowledge) in a Norwegian context. Second, findings from the questionnaire established the two constructs of rules and reasoning. Third, findings from a study of the connection between beliefs and knowledge indicates that connections between knowledge and both education and experience varies with different emphasis on rules and reasoning.

The qualitative part is the larger part of the thesis. The data in this part comes from videotaping five of the 356 teachers practice, all teaching at upper primary level (grade 5-7, students aged 10-13). All mathematics teaching for one week was filmed, typically four or five lessons of 45 minutes. Also in this part there are three main findings. First, a framework for describing teachers' comments were developed using a grounded approach. The redirecting, progressing and focusing actions framework consists of thirteen categories describing how teachers use or not use student comments to work with mathematics. Second, a similar framework describing student comments were developed. Third, the categories of teacher and student comments were used to study student comments and the subsequent teacher comments. This revealed how one teacher used redirecting, progressing and focusing actions differently when responding to different types of student comments.

The frameworks developed in the qualitative part are the main contribution to the academic field of mathematics education and might be used both as research tools and in teacher education to understand or change teaching practices.

At Agder University, Toril Eskeland Rangnes defended her thesis on 30 January 2013 with the title *Elevers matematikksamtaler – Læring i og mellom praksiser* [Students' mathematical conversations – Learning in and

between practices]. It is a monograph where mathematical conversations and learning of students in and between different practices are investigated: How can such conversations be characterized, and what potential does the participation in the conversations, in and outside school, have for critical learning of mathematics? One focus of the study is on how students learn mathematics by participating in a school / business collaboration. Empirical data come from an 8th grade class that collaborated with a construction firm in a school project to learn geometry. Physical objects as well as drawings and mathematical concepts, were critical for the communication among the participants at school and between the students and a carpenter. A socio-cultural perspective of learning was adopted. Learning was thus seen to happen in participation in practices and dialogues. In this qualitative study, empirical data from a group of five students participating in conversations between themselves, between students and the teacher and between the students and the carpenter were analysed on the basis of Bakhtinian dialogism. When students work practically, learn mathematics and learn how to use mathematics for different purposes, they meet new and complex issues. In the company, the emphasis is on reality and rules and regulations, while at school, the focus is on learning mathematics. The students need to deal with this tension between school and business, and differences in language, tools and ways of thinking. As students reflect on and choose among expressions from business and school, critical mathematical learning can be realized. Being genuine participants, the students can influence topics and conversations along with the teacher and the carpenter. Political themes and tensions among different goals for mathematics are not explicitly discussed, and can be seen as unrealized potential for critical mathematical learning. The study shows that learning in and between practices, is not a matter of transferring or translating from one activity to another, but a hybridization and transformation where the participants together make something new.

In February 2013, Teija Holst defended her thesis *Vertaileva tapaustutkimus kuusivuotiaiden opetus – oppimis -vuorovaikutuksesta, matematiikkaepisodeista ja lukukäsitteen osaamisesta* [Comparative case study of teaching–learning -interaction, math episodes and early numeracy of six-year-old learners]. As the editor of the NoRME News column does not read Finnish, the English abstract provided in the thesis will be reproduced here:

This international, comparative case-study investigated teaching–learning -interaction, and early numeracy of six-year-old learners' learning environments in Finland, England and Sweden. The objective was to compare implemented teaching–learning-processes with the intended

overall- and mathematical goals presented in curriculums and attained early numeracy competence skills of six-year-old learners. The empirical data was based on learners' (N=99) quantitative early numeracy test results and qualitative video-observations of total number of seven weeks teaching–learning- interaction during math lessons (880 minutes).

Nearly half of the minute by minute analyzed study weeks´ math lessons teaching–learning -interaction indicated teacher orientation, third of the interaction indicated learner orientation and nearly fifth of the interaction indicated shared interaction. The meaningful teaching–learning -interaction episode analysis indicated that of all the math episodes (N=371) over half were teacher oriented and third were the combination of teacher orientation and shared interaction. The mean duration of all the investigated math episodes was nearly two minutes in this study.

The research results indicated differences in teaching–learning -interaction, types of math lesson construct models and competence levels of early numeracy test results.

Multiple learning environment with more shared interaction, than the other samples in this study, referred higher early numeracy competence level test results than the mean score. Teacher oriented learning environment referred to the mean of early numeracy competence level test results. Learner orientated learning environment referred to lower early numeracy competence level test results than the other samples in this study. These research results indicated to the various issues of teaching–learning -processes, which might be useful in different school subjects in similar formal learning environments.

Hilde Opsal defended her thesis at Agder University on 22 March 2013 with the title *Bruk av elevbøker i matematikk på ungdomssteget: ein kasusstudie* [Use of student-books in mathematics at lower secondary school: a case study]. The thesis investigates how students and teachers work with the so-called student-book ("elevbok") in mathematics in lower secondary school and how it is integrated in learning activities, in particular regarding algebra. A student can in this book write down, in her own words and at her own responsibility, concepts, formulas and other things important to understand and remember in mathematics, as a pedagogical tool for learning. The study is part of a research project on classrooms, Kvalitet i opplæringa (KIO) (Quality in education). Both quantitative and qualitative data, mainly from questionnaires and interviews of teachers and students, form the basis of the analysis. 282 students and 73 teachers have responded to questionnaires, and 14 students and two teachers have been interviewed. Theoretically, the study draws on research on writing to learn in mathematics, activity theory and commognition. Distinguishing between the student-book as a tool on tests and as an artefact for

learning, it is found that students use their student-book mainly when new topics are introduced in the beginning of the lessons, often copying from the board and the teacher's dictates. In addition, students are mainly doing presentation writing rather than reflective writing. Opsal here uses the term product writing, as focus is on producing the best possible help for the tests.

It is concluded that the introduction of the student-book in mathematics has not led to changes in how students act in learning mathematics, and that writing to learn is not commonly used in the mathematics classroom. In this study, most students write mainly in a recount and summary mode rather than their own preparations and reflections on mathematics, as was the intention with the student-book. In summary, it is found that the student-book is not implemented in line with the official documents, as most of the students have not used student-book writing to learn mathematics.

Anna Ida Säfström defended her thesis *Exercising mathematical competence: Practising representation theory and representing mathematical practice* at the University of Gothenburg / Chalmers on 26 April 2013. The dissertation consists of a preamble that aims to bring together two papers in mathematics with two papers in mathematics education. The mathematical papers deal with representation theory, while the mathematics education part develops an analysis guide and a competency graph to be able to represent the exercising of competence in mathematical practices, based on an earlier framework of competence as mastery (MCRF: Mathematical Competency Research Framework). The outcome consists of two different modes of competencies, i.e. the productive and the analytic mode, and the five competencies representations, procedures, connections, reasoning and communication that reflect key aspects of mathematical practice. The productive aspect involves use, application, and development, ranging from imitative to constructive activities, while the analytic aspect concerns reflection, evaluation, and monitoring of the productive aspect. The framework that is developed is applied to empirical data from videotaped interviews with four preschool children's work with whole numbers, and a reanalysis of data from a videotaped group work session with university students doing proofs (mathematical induction). The explanatory power of the framework is thus highlighted for two different mathematical practices: It is found, in the first set of data, that the analytical tools can explain the children's mathematical practice in relation to a concept, an activity and how different representations come into play. In the proving activity, the analytic aspect and the reasoning competency were significant, while the productive aspect and the other competencies also played important roles.

At the Linnaeus University in Växjö, Hanna Palmér defended her thesis *To become, or not to become, a primary school mathematics teacher: A study of novice teachers' professional identity development*, on 14 May 2013. The focus of the thesis, which is an ethnographically oriented case study, is on understanding the professional identity development of novice primary school mathematics teachers, taking the perspective of these teachers. Seven teachers have been observed from the end of their teacher education and two years through their work with the teaching of mathematics. The ethnographic approach aimed to make the process of identity development visible, the individual as well as the social part. For the analysis of the data, consisting of observations and interviews, as well as self-recordings, grounded theory inspired methods were employed along with a conceptual framework, developed to be used as a lens. This framework aims to combine Etienne Wenger's theory of identity development in a community of practice, and Jeppe Skott's theory of patterns of participation, to be able to account for both the individual and the social aspects of identity. In the thesis, four closely examined cases show different routes into, and out of, the teaching profession. Not only do patterns of participation of teaching mathematics change when they enter new communities of practice including mathematics teaching, but the data also indicate that such communities of practice seem not to be common and that the working conditions limit possibilities to become a member in those that exist. There seem to be a low level of feedback given to the performance as a mathematics teacher. None of the respondents had, after two years of work, developed a professional identity as being a mathematics teacher in primary school. It is suggested that memberships in communities of practice, having mathematics as a shared repertoire, must be accessible, both during and after teacher education.