Nordic collaboration in mathematics education research

NORMA11

In this issue of NOMAD we are proud to announce the next *Nordic conference on mathematics education*, NORMA11. This will be the sixth conference in the series, and it will be held in Iceland from 11 to 14 May 2011. The conference is hosted by the School of Education at the University of Iceland and organised in collaboration with NoRME – the *Nordic society for research in mathematics education*. For the information of those who are new in the Nordic mathematics education community, and to refresh the memory of others, we could inform that the first NORMA conference was held in Lahti, Finland, in 1994, and then followed Kristiansand, Norway, in 1998, Kristianstad, Sweden, in 2001, Trondheim, Norway, in 2005, and the last one was in Copenhagen, Denmark, in 2008. All the conferences were documented with proceedings and a list of the various proceedings can be found at the Norme web page, www.norme.me. The proceedings from Norma05 can even be downloaded in full text here.

Information about NORMA11 can be found at the website http://www.vefsetur.hi.is/norma11/ which will be updated as the planning proceeds. Note that the call for papers is already out. You are invited to submit an 8 page paper to be peer reviewed and published in the conference proceedings. The paper should be written following the CERME template (can be downloaded from the webpage) and submitted by 15 December 2010. Note also the other formats for contribution, working groups and short communications. More details about this can be found on the webpage. A second announcement, where the plenary speakers are announced, is expected in late August or September.

The Nordic summer course in didactics of mathematics 2010

This year 35 doctoral students took part in the Nordic summer course that was held in the end of May at the University of Agder, Dømmesmoen

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Frode Rønning, *Sør-Trøndelag University College*

campus. The course was highly appreciated by all participants because of its richness in both the scientific and the social programme. The first lecture was given by Jeppe Skott from Aarhus University in Denmark and Linnaeus University in Sweden and he spoke about *The problems and prospects of belief research*. He pointed out that belief research on and with teachers has been a major field in mathematics education for several decades. He claimed that from the beginning it has been haunted by significant conceptual and methodological problems, most of which are still unresolved. These problems were taken as a point of departure and Skott suggested that it is time to challenge the position of beliefs as the dominant construct for the purpose of understanding the role of the teacher for emerging classroom practices. He suggested shifting the direction of research on and with teachers from *beliefs* to *patterns of participation* and argued with conviction for this changed direction.

The second lecture was presented by Birgit Pepin from of Sør-Trøndelag University College, Norway and her theme was *Student learning in transition into higher education mathematics*. She investigated students learning mathematics in transition from school or college to university mathematics, more particularly the different types and levels of feedback available to and used by students, in their efforts to adapt to and engage in learning mathematics in higher education, either for mathematics or mathematics related subjects (e.g. engineering, physics etc). Firstly she outlined the main project (TransMaths), its predecessor (TLRP) and the parallel projects that were conducted at the University of Manchester, including the methodological characteristics of the studies, in addition to the research literature in the field. Secondly, she addressed particular findings. Transiting into higher education mathematics students are generally assumed to become independent learners "by themselves". This assumption was challenged and she claimed that any self-regulated activity is supported by "feedback", and that feedback is one of the main ingredients and an inherent catalyst for successful learning. Leaning on the literature feedback was reconceptualised and she developed a framework for studying feedback at different levels (e.g. task, process, self) which was subsequently used for the analysis of selected data. The aim of the presentation was to give the audience an overview of issues involved with "transition" into higher education, the methodological challenges of studying transition, and to provide a flavour of selected findings and conclusions

Jo Boaler from University of Sussex in England visited the course for one day and lectured on *Bridging the gap between research and practice: international examples of success*. She considered the pervasive gap that exists between research and practice in mathematics education and reported on a small survey of research studies that had made an impact

in seven different countries. An illustrative look around the world, with examples collected from Asia, North America, Europe, and Australasia revealed some interesting cases, both of research that has had a tremendous impact on practice, changing the experiences of students in thousands of school classrooms, and country systems that serve to encourage the transfer of research knowledge into practice. In conclusion she considered the importance of researchers paying careful attention to the issue of teacher learning in the design of research studies.

Willi Dörfler from University of Klagenfurt in Austria talked about *Mathematical objects as indices in diagrams: the case of real functions.* He pointed out that when reading text books on *real analysis* a kind of stylistic analogy or similarity can be observed among propositions from natural sciences and propositions in mathematics generally and specifically in analysis. Both types of propositions make assertions about properties of and relationships between the investigated objects. The question is about the quality of this analogy and further what in mathematics corresponds to the role of observation and experiment in the natural sciences. He investigated this by using examples of proofs from real analysis. The tools for this investigation were the semiotic notion of sign by Peirce and the concept of rule following as discussed by Wittgenstein. A main insight is that the mathematical objects like numbers and functions occur within the proofs as indices in diagrams, the meaning of which is regulated by a system of rules. Mathematical observation concerns the diagrams and their transformations. Thereby the intended mathematical objects are symbolically constituted, which means that the symbols and their use determine the referents and not the other way round. In other words, the mathematical objects appear as variables (indices) regulated by rules which thereby constitute the range of possible referents. What a sign stands for is not determined by its objects but by the operation rules we apply to it.

The final lecture was given by Fulvia Furinghetti from Dipartimento di Matematica dell'Università di Genova in Italy and dealt with *Reflection and action in teacher training: an example from algebra.* She opened with the claim that "teachers teach the way they have been taught". Many authors share this opinion. Starting from the acknowledgment of this situation she planned a course for pre-service teacher training. The students have (at least in theory) a strong mathematical background because they have a degree in mathematics or physics, but they have not sufficiently meditated on some subjects that they will teach.

She reported as an example how she acts in the case of algebra. The topics of her work are the following: Discussion on understanding; The construction of mathematical objects; Discussion on the nature of school algebra; Proposals of historical problems; Collective discussion of the

solving processes carried out by the pre-service teachers attending the course; Reflection on the passage from arithmetic to algebra. The subject for her talk was chosen because it combined her different interests in research: students' learning, teacher education, history of mathematics, and history of mathematics education.

These five lectures were highly appreciated by the participants and all of them created much discussion in the sessions, revealing that the content related to the doctoral works represented. In addition to these five lectures the participating students experienced three workshops:

Designing research to impact practice was the title of Jo Boaler's workshop where participants considered the ways that research may be designed to impact practice. They considered some reflections from successful researchers, considered different aspects of the research cycle and thought together about ways participants' own studies may be designed to have a greater impact.

Barbro Grevholm from University of Agder in Norway gave the workshop *How to read a scientific paper, and how to write one for a journal*. It was mainly intended for newcomers in the doctoral studies. The workshop included discussion and sharing of experiences from reading a common paper. Important issues to consider when you write a paper yourself were presented and discussed. Participants were invited to sketch their next paper and hand it in for comments.

Claire V. Berg from University of Agder in Norway gave a workshop on *Mathematics education as a design science: addressing the centrality of designing, implementing and analysing mathematical tasks*. This workshop consisted of two parts. In the first part an overview of research projects concerning task design and analysis was offered. Here reference to several research projects was given, while emphasising the adopted theoretical framework. The aim was to present "the state of the art" in this field. In the second part participants were invited to engage with some mathematical tasks. This part builds on the participants' reflections as a means to conduct an analysis of the presented tasks. Finally they tried to link the results of the micro-analysis to the wider picture drawn during the first part of the workshop.

The main part of the Nordic summer course was as always taken up by the working group sessions, where students worked together in groups of 8 or 9 led by the invited international experts. These sessions, in total 13.5 hours, were extremely intense and the learning from them is to be reflected in the examination papers by the participants. But besides hard work there was also time for informal discussions, story telling, singing and building new friendships. The evaluations show that the doctoral students are very grateful to NordForsk and the organisers for this opportunity to meet.

The summer course reported on above was the first one to be organised after the NoGSME period. It was initiated by NoRME and organised by University of Agder with financial support from NordForsk. As we reported in the previous issue of Nomad a similar initiative was taken to try to organise a summer course in Finland in 2011. Unfortunately we have just been informed that this initiative will not be supported. This is sad since we know that the summer courses have been highly appreciated by the participants but we shall try to follow up later in order to keep this important activity alive.

New doctoral theses in the Nordic countries

Troels Lange defended his dissertation at the department of Education, Learning and Philosophy at Aalborg University in Denmark already in 2009, but the thesis was not accessible to us until recently, and hence it is presented here with some delay. *Difficulties, meaning and marginalisation in mathematics learning as seen through children's eyes* is the title of his work. He asks what children with difficulties with mathematics might teach us about mathematics education and has the aim to give voice to a group of children by exploring their stories about their experiences with mathematics. The aim is to understand these stories in a larger socio-political context. The sub-questions were: How do children experience being in difficulties with learning mathematics? What meanings do these children ascribe to mathematics and mathematics teaching and learning? How do these children experience processes of inclusion and marginalisation connected to mathematics teaching? How may these children's narratives be contextualised and theorized? A narrative approach within a socio-political perspective was used. The thesis consists of four chapters used as a frame around the core of six peer-reviewed published papers. Children make sense of their lived experience with mathematics teaching in a comprehensive way and from a holistic life perspective. Those children, whose belonging to the social field of normality is questioned, were particularly insightful. The author claims that it increasingly made sense to see mathematics education as a socially constructed practice because it opens for ethnographic and sociological approaches to the research. It enabled him to better understand how the individual is enfolded within the social when it comes to children with difficulties in mathematics. The lived experiences of the children are narrated into stories about identity and meaning. There are two kinds of identity narratives, the actual and the designated. The author indicates that it is in the gap of those identities that learning intentions and learning endeavours arise. He also points out that the model used is a simplification of a hugely complex set of interactions but it helps to understand

how changes can be made. It suggests three places to intervene to better support children who are in difficulties with mathematics – the learning activities, the valorisation used and the socio-political environment that children interpret as their foreground.

This thesis is one of few in the Nordic countries lately that relates to special needs education in mathematics and makes use of the voices of small children learning mathematics.

On 19 February Marcel Gahamanyi defended his thesis *Mathematics at work, a study of mathematical organisations in Rwandan workplaces and educational settings* at the University of Linköping, Sweden. This work was based on a desire to link the school mathematics in Rwanda closer to the local context in order to make it more meaningful for the pupils than the formal mathematics teaching of today. Gahamanyi has studied how mathematics is applied on local workplaces such as taxis, restaurants and construction sites in Rwanda, and based on this knowledge he has worked out contextualised mathematics tasks. These tasks have been given to student teachers in mathematics to give them an insight in workplace mathematics, an insight which they later can make use of in their teaching in school. Further, the student teachers constructed their own tasks meant for upper secondary school students, which, after having been worked on by the researcher, were given to a group of upper secondary school students.

Using theoretical tools from Activity theory (Engeström) and Antropological theory of didactics (Chevallard) the candidate studied how the mathematics applied was structured and how it was perceived. He also studied how the local context and the type of mathematics was preserved or changed between the three contexts, workplace, teacher education and school. Findings from workplace settings revealed that mathematics performed by workers is characterised by techniques which are functional for the problem at hand, by the cultural constraints and the educational background of the workers. As long as the techniques are sufficient to reach the goals of the activity no further justification is needed. On the contrary, at the university and the secondary school, students justified the used techniques throughout the teaching of the related mathematical content.

The didactical transposition between the three contexts turned out to be strongly dependent on the institutional conditions and limitations, and the mathematical work within the various institutions was interpreted and controlled based on the goals and the criteria for knowledge characterising the particular institution.

A new feature of Nordic cooperation in mathematics education

A joint Nordic master programme in didactics of mathematics has been developed and is due to start in September 2010. Already in spring 2007 a partnership was created between University of Agder, University of Tampere, Åbo Academy University, Danish School of Education (now part of Aalborg University) and Copenhagen University in order to create a joint Nordic master programme in didactics of mathematics. The first application to NordForsk for financing of the planning in 2007 was unsuccessful because of the many applicants. But the appreciating comments to the plan inspired to continued efforts. The application was repeated in spring 2009 and now it was with success. One million Danish crowns (DKK) were given to the partners to carry out the planning process. A new Nordic programme was created at University of Agder and it builds on the cooperation between the partners. Each master student is expected to study for example one year at University of Agder and one year at Copenhagen University. A core planning group consisting of Barbro Grevholm, Tomas H. Jensen, Carl Winslöw, Ole Björkqvist and Harry Silfverberg has, with support from many other colleagues, strived for the whole academic year to get everything in place for the Nordic master programme and in the beginning of June the signatures of all the rectors were in place on the common agreement of cooperation. The recruitment to the programme is going on and anyone interested may consult the description at http://www.uia.no/no/portaler/studietilbud/studier/didactics_of_mathematics_joint_nordic_master_programme2

There are many possible study-combinations through this cooperation and students may create a programme with more mathematical emphasis or with a more didactical profile. The master student has the opportunity to work with the thesis in close cooperation with any one of the experts at the five different universities. Questions about the studies can be directed to Trine Engeland (trine.engeland@uia.no).

The Nordic society for research in mathematics education

Recently some work has been done to get the home page of NoRME, www.norme.me, in a reasonable shape, and it is kept updated as relevant information is received. You could all help in making this home page a good place for finding information about events and links relevant for our community. If you have information that you think should be available on the home page, please send a mail to chair@norme.me.