The Nordic graduate school in mathematics education – plans for 2009

Graduate school plans for 2009

The funding of NoGSME from NordForsk will run out during 2009 but the board has planned to use the final resources for a summer school for doctoral students in August 2009, either in Estonia or in Denmark and for one more supervisors' seminar in the spring. The preliminary date for the seminar is April 23–24 and it will take place in Kristiansand in Norway, at University of Agder, the home institution of NoGSME. The theme of the seminar is suggested to be *Critical review of research methodologies in mathematics education.*

The expectation from NordForsk is that after the 5 Million NOK have been spent by NoGSME during 2004–2009, there will be strength enough in the participating units to carry on the activities and the networking. To support this to happen the Nordic Society for Research in Mathematics Education (NoRME) was created this year and it is the hope that NoRME will be able to inspire groups of Nordic and Baltic universities in the NoGSME network to apply for funding for common doctoral courses, summer schools, seminars and research workshops. In order to be eligible to apply from NordForsk there has to be at least three different Nordic countries involved in the application. Deadline for most of the offers from NordForsk is in March and April so the time for starting to prepare applications is already approaching. The NoRME board had a meeting in Denmark on October 8 during the NoGSME seminar and has taken several initiatives for applications.

The tenth NoGSME seminar – an important international event

The greatest and most spectacular supervisors' seminar in NoGSME took place in Schæffergården, north of Copenhagen on October 8–11. The theme for the seminar was *Local, global and international perspectives in mathematics education research.* The number of participants was 36 and the size and length of the seminar, four days, was possible thanks to a generous grant from the Danish-Norwegian Collaboration Foundation. The international collaborating centres of NoGSME generously

contributed through the presence of some of their most outstanding researchers in mathematics education.

As a background to the work during the seminar an introductory lecture was given by Mogens Niss about the development of the Nordic collaboration in mathematics education research and the sociology of that development, and by Barbro Grevholm about NoGSME, the idea, its development and life – a historical sketch. In the historical overview Mogens took us all back to the 1950's and Nordic LMFK-congresses, the Nordic committee for mathematics teaching in school, the isolated early individual researchers and up to more recent initiatives like the Danish Mathematics and democracy in the beginning of the 90's, the start of Nomad in 1993 and the Norma-conference in 1994, initiated by Erkki Pehkonen.

The first international guest in the seminar was Jeremy Kilpatrick, asking critical questions to a panel consisting of the members in the NoGSME board. The main questions were: What have we learnt from the Nordic collaboration? What is the current situation in mathematics education research in the Nordic countries?

Jeremy Kilpatrick gave a lecture on *Mathematics education research in the Nordic countries – trends and development seen from an international perspective*, where he drew from his longstanding collaboration with Nordic universities and the NoGSME activities. He contrasted and compared the research situation in the Nordic countries to the situation in the Iberian countries and pointed to a number of interesting aspects. Questions from the audience and a lively discussion followed. Jeremy related research to what he called the instructional triangle with corners the student, the teacher and mathematics. From his sources, which were overviews of Nordic research and Nomad, he found that most of the studies were in the corner the student and with some links from student to teacher and to mathematics. For the Iberian research he found focus on students but also much on teachers and gave examples of such studies. Jeremy then raised the question of the impact of research on ordinary classrooms. He emphasised the following criteria for impact:

> Teachers can borrow (Bishop): Procedures, data or constructs from research.
>
> Most important are constructs and theories.
>
> Teachers should be collaborators in research.

He then asked us: How are the discourses of mathematics education in Nordic countries affected by your research?

The lecture by Hyman Bass was about *Scientific challenges in mathematics education as a discipline and research domain*. Three challenges were carefully explored in the talk:

Mathematical integrity.

Integrity with respect to practice and pedagogy.

Methodological rigor.

From the discussion about these challenges Hyman Bass drew conclusions for doctoral education. The implications for doctoral training demands from us that we attend to the following three challenges:

Develop *mathematical knowledge* needed for mathematical integrity in the practice of research.

Develop grounded *understanding of phenomena and practice*.

Build fundamental *research skills*, *design capabilities*, *standards* and *dispositions*.

The next international speaker was Willibald Dörfler and he presented on *The place of mathematics education research in the academic system – links between mathematics, mathematics education and other disciplines*. One important message from him was that we have neglected to transform the results of research to products useful in the classroom. He asked how people in our field are finding their theoretical frameworks. The tension created by specialisation was discussed. Willi claimed the there is no relation to mathematics and referred back to the time when mathematics education research in Bielefeld was flourishing. Finally he talked about semiotics and diagrammatic thinking, which caused a heated scientific debate among all participants in the session after the presentation.

Between the lectures participants were active in group work and groups were asked to compare and contrast some of the traditions in research education in the Nordic and Baltic countries and internationally. The theme *Structure and organisational forms – how do they influence the content of our work?* evolved around the following questions:

What can be noticed about traditions for the form of the thesis – monograph or collection of papers with "kappa"?

What about the traditions for supervision? Are there hidden traditions in supervision? How many and what kind of supervisors?

What qualifications for supervisors? What forms for supervision? How is the work structured?

What about the way to evaluate the thesis? How is it done? Is it the supervisors who decide when it is time to hand in the thesis, and how is it done? Is there a committee to evaluate before decision is taken? Are international evaluators engaged? How and when? Is it possible to fail?

What criteria are used to evaluate the thesis? Are they local or national? Are they explicit, published? What instructions are there for the evaluators?

What traditions are there concerning choice of language for the thesis? What are our experiences from that? What are the pros and cons for the choices?

What do we know about the supervision for the writing process? How is the need to develop academic writing abilities met in the ph d education? What is the experience from courses on academic writing?

What traditions are there for the dissertation day? How is this influencing quality of the thesis? What about the public character of the scientific discussion of theses? Has that anything to say about quality issues?

What traditions exist for the follow up publications of a thesis? Which theses are made visible after the dissertation in scientific journals or other media? Are theses published by publishing houses or official channels?

Can we learn something from this contrasting and comparing of traditions? What?

In one of the groups narratives were created based on the questions posed. Here is one of them (written one sentence after the other by different participants):

Mathematics education research has advanced a lot in the Nordic countries over the last years. One main issue is: What is the impact? The ideas of including teachers (and student teachers) in research could be a promising way ahead. Networking within the Nordic countries and also more widely internationally will allow ideas to develop. The bridging between 'university researchers' and teacher

> educators is the big demanding task now. That gap will be wider, according to how funding is distributed. What can be done to secure funding for research projects that include the collaboration between researchers and teachers?

Finally Michele Artigue talked about *Balancing national and international experiences and perspectives in the training and supervision of researchers in mathematics education*. She gave a careful and detailed insight into doctoral education in France and its development since 1975. The doctoral programmes in France seem to be much more homogenous than the different programmes in the Nordic countries. She ended her talk by presenting some evident challenges of being a supervisor.

> Each supervision has been and still is, for me, a human adventure and something unique. Helping an individual to become a researcher is a particular challenging task:
>
> > helping the doctorate student transform rather vague or too much ambitious ideas into something accessible to research, compatible with the doctorate constraints, the human and material means accessible, seeing and keeping in mind how it can be inserted into more global perspectives;
> >
> > orientating and often re-orientating because things do not work as expected, supporting, leading, without imposing your views;
> >
> > pushing, stimulating without generating too much anxiety;
> >
> > facing the psychological fragility revealed by engagement in research work.
>
> The success of the enterprise does not only depend on your scientific expertise, and you learn from it as much as your student. But it is a so rewarding task and you are so proud when your student for the first time speaks of his (her) thesis better than you could do.

The concluding activity of the seminar was a panel debate and discussion with Jeremy Kilpatrick, Michele Artigue, Willibald Dørfler, Hyman Bass, Ole Björkqvist and Mogens Niss over the theme *The future of mathematics education research in the Nordic area and internationally*. During this panel discussion many important suggestions for future work were made. Here is just the place to mention a few of them: There is a need to accumulate, organise, systematise and criticise what we have achieved so far. We should look critically to what we call theories in our field. We are just able to make contributions to research. Research results can only be provisional. It is important to recognise the value of our research

for decision makers and be sensitive to that. Concepts that are closer to everyday notions should be preferred, if possible, and we should not use different concepts for similar phenomena. The dominance of qualitative research should be complemented by quantitative studies and casual effect could be estimated. We need to provide a rational framework for decision-making and educate practitioners and decisionmakers. We have been doing the right thing, when we coordinated actions, but we should now try to make the totality more than the pieces. A number of small studies with different methods at hand can offer a collection of results that indicate directions. Survey such work and search for different aspects of a common problem. We are facing a collective enterprise and it can not be done by individual researchers. There is an inner diversity in the Nordic community which makes us stronger from some aspects than for example the research environments in France. There is a necessity of doing some deep evaluations and negotiate what we consider to be good research.

Participants in the seminar probably listened to different parts of the suggestions and advice and other narratives can be told, but the hope is that all were inspired for the future work by this final panel from the international guests and some Nordic voices.

New Nordic dissertations in mathematics education

In June Tone Bulien defended her thesis at Tromsø University. The title is *Matematikkopplevelser i lærerutdanningen: en fenomenologisk orientert narrativ analyse av studenttekster* (Mathematical experiences in teacher education: a phenomenologically oriented analysis of students' texts). The thesis, in the form of a monograph, is a study of texts from and interviews with six Norwegian student teachers in a compulsory course in mathematics. The aim was to listen to the students, sharing their experiences while studying mathematics, through the author's critical constructive descriptive investigation. The work is a contribution towards defining the didactic challenges teacher training is faced with. The thesis is written from a phenomenological perspective, using narratives as an important feature in both the analysis itself and the presentation of the results. A description of the students' perceptions of teaching and learning mathematics, both prior to and in the course of the compulsory course, is made visible through narratives. The methodology is narrative analysis. The students' experiences are divided into four main areas of beliefs: beliefs about mathematics in general, beliefs about themselves as practitioners of mathematics, beliefs about teaching mathematics, and beliefs about how mathematics is learnt. One indication is that students' experience

of the compulsory course in mathematics did not depend on their previously held beliefs on mathematics education or their attitudes towards mathematics in general. About half of the students had higher expectations about their grade at the beginning of the semester than what they actually ended up with. It is likely that the way mathematics is taught in a teacher education program differs from the students' previous experiences in how to learn mathematics. The author suggests that this should be taken into consideration in prospective mathematics programs, for instance by supervising the students about their own beliefs in a meta-perspective by analyzing their own narratives and how they are subject to alterations during the course.

In September Antti Viholainen defended his thesis at University of Jyväskylä in Finland. The title of the dissertation is *Prospective mathematics teachers' informal and formal reasoning about the concepts of derivative and differentiability*. His study, which is a collection of six papers and an extended summary, examined informal and formal understanding of the concepts of derivative and differentiability and the use of informal and formal reasoning in problem solving situations, where these concepts were needed. The subjects of the study were mathematics education students in the middle or in the final phase of their studies. The data were based on a written test given at six Finnish universities and on some oral interviews. The methods used could be called an explanatory mixed method design and the sample included 146 student teachers. One outcome was that connecting informal and formal reasoning was often difficult for the students. In particular, the students seemed to have a tendency to avoid using the definition of the derivative in problem solving situations. This was a considerable obstacle in problem solving processes and in some cases led to erroneous conclusions. Inability to use the definition is not a sufficient reason to explain this tendency, as several students were able to use the definition when they were asked to do so. The author recommends that the teaching of mathematics should support the development of coherence of students' knowledge structure. It should also strengthen the understanding of connections between informal and formal representations.

The common characteristics of these two theses are that they study teacher education and they focus on student teachers. Bulien's thesis explores student teachers' beliefs about aspects of mathematics and its teaching and learning, while Viholainen's thesis investigates student teachers' reasoning and understanding in relation to two central mathematical concepts, derivative and differentiability. It is reported internationally that research on mathematics teacher education is increasing and these two Nordic theses seem to align the Nordic trend of research

interests with the international. Nordic studies on mathematics teacher education have not been so common earlier, although there are a few such studies.

Winterschool for doctoral students in Sigtuna in November

The summerschool is going to be a winterschool for 2008 in order to avoid collision with ICME11 in Mexico. There will be 29 participants from all the Nordic countries and one Baltic country and two students from Freudenthal Institute in the Netherlands. Groupleaders will be Morten Blomhøj from Roskilde University, Cyril Julie from University of Agder and Joao Pedro da Ponte from University of Lisboa in Portugal.

We look forward to the cooperation while we make use of the final parts of the funding from NordForsk and welcome doctoral students as always to apply for travel stipends and mobility stipend. They have become increasingly popular.

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