

New dissertations in mathematics education by doctoral students in the Nordic Graduate School

As I wrote in the issue 3-4 of *NOMAD* in 2005, the year 2006 will be exceptional because of the number of doctoral students who will finish their research education in mathematics didactics and defend their dissertations. Already in the first quarter of the year there have been at least five dissertations printed and made public. A short presentation of them will be made here, as they are likely to be of interest to the whole Nordic Graduate School and many Nordic researchers.

Five new dissertations in mathematics didactics

Morten Misfeldt defended his dissertation in January at the Danish University of Education. The title is *Mathematical writing* and it consists of a monograph, where all chapters except two build on earlier published work or work in progress (17 titles), such as one journal paper, 5 reviewed conference presentations, 3 book chapters and some other publications. The thesis reports research into the ways various technologies support mathematical writing. It comprises empirical and theoretical parts. One of the main theoretical outcomes is the attempt to view mathematical writing simultaneously as a creative writing process and as a mathematical problem-solving process.

Kristin Bjarnardottir defended her thesis at Roskilde University Center in February. Her thesis carries the title *Mathematical education in Iceland in a historical context of socio-economic demands and influences*. The data consists of historical documents from the development of school mathematics in Iceland and her dissertation is a monograph. The thesis consists of three parts and examines the history of mathematical education in Iceland and its position in comparison to its neighbouring countries. Mathematics education in Iceland differs primarily from its neighbours in the absence of demand for furthering higher mathematical education, nearly total dominance of a few institutions, and initiatives of individuals.

In March at the University of Helsinki, Iiris Attorps defended her dissertation *Mathematics teachers' conceptions about equations*. Her work is a monograph (a substantial volume with 231 pages). The aim of the study is to describe and clarify the mathematics teachers' subject matter and pedagogical content conceptions about equations. The research shows that some of the teachers included in the study do not have clear conceptions about what the pupils should learn in algebra at compulsory school. Both expert and novice teachers have various apprehensions of the pupils' difficulties concerning equations.

Kristina Juter defended her dissertation in the beginning of April at Kristianstad University. The thesis comprises six published papers and an extended summary binding them together (referred to as 'kappa' in Swedish). The title of her work is *Limits of functions – University students concept development*. She followed university students during their first course of tertiary mathematics and inquired into their development of the limit concept. One of her results is that many students complete basic courses in calculus without ever understanding the notion of limits, or even understanding that they do not understand limits. Kristina Juter interprets her findings to argue that connectedness and continuity are essential features of teaching and learning limits to prevent students from failing.

Lil Engström carried out the defence of the thesis later in April and the work is called *Möjligheter till lärande i matematik* (Opportunities to learn mathematics). It is a substantial (238 pages) monograph, written in Swedish. The study examines how teachers formulate mathematical problems, how they use the experiences students have gained and what use they make of the potential of computer software. One result is that the teachers' ability to pose thought-provoking open-ended problems is the most important factor as it significantly influences what the students learn. Lil followed three teachers (in Sweden and Switzerland) and a group of student teachers and the software used was Cabri-Geometrie.

It is not possible in the limited space here to do real justice to the content of the work of these five research students. We congratulate the new doctors in mathematics didactics and the research community in the Nordic countries for the new knowledge gained. I hope to have provoked the curiosity of the reader to explore the publications in more depth – they are certainly worth the effort.

The language and format of dissertations

The dissertations can be used to illustrate some of the questions that are constantly discussed by doctoral students in the Nordic Graduate

School. One question is what language to use in your dissertation. Here we see four dissertations in English and one in Swedish. Each doctoral student must create an overview of the pros and cons of writing in his or her own language or in English. This is one question that has been discussed also in the supervisors' seminars arranged by NoGSME. It is a complex issue and there is no general answer. Each individual must carefully consider her or his situation and how to best meet different needs.

Another question concerns if it is better to write a monograph or use a collection of published papers. In the five examples above we see one collection of published papers, three monographs and then the interesting case where Morten Misfeldt builds on his papers of different kinds but using the material by rewriting it in the chapters of the dissertation. This is a challenging hybrid of a collection of papers. He thereby avoids the hard question of what kind of journals are at an acceptable level for papers in a collection. Which journals are of acceptable scientific quality and which are not? As in the question of language my advice would be that the issue is best dealt with by the doctoral student and the supervisor together.

The next seminar for supervisors in NoGSME will investigate different doctoral programmes and look at differences and similarities between them. One obvious difference at the moment is the length of the programmes. Denmark and Norway have three-year (fulltime) doctoral programmes while Sweden has four years. The prerequisites are different at the moment. For example in Norway the doctoral students must have a masters' degree when they start but in Sweden a teacher education qualification can be accepted. Might all this be changed when all countries have taken the Bologna agreements into consideration?

To publish or not to publish the thesis?

Another visible difference between theses is whether they are printed as proper books or not. It appears that in Denmark the custom is to make compendiums, A4-format copies of the manuscript with no proper copy-page (with ISBN but not ISSN). The other countries appear to publish dissertations as books, in book-format and with both ISBN and ISSN. Are they all considered to be publications or is it as in the UK or the US that they are called unpublished dissertations? In Sweden there is a tradition that copies of the thesis are delivered to university libraries automatically and thus they are available all over the country.

As we know there are many more dissertations that will be completed during 2006, it will be interesting to see at the end of the year how many

are in English and how many are monographs. The demand for researchers to publish regularly in journals is emphasised today so maybe students will consider it fruitful to start to publish in journals already during the research studies. Those who publish monographs will hopefully soon try to write papers for journals based on their work. *NOMAD* is a good journal to start with for the Nordic doctoral students as we saw in the latest issue, nr 3-4 for 2005, with four contributions from doctoral students.

A good forum for discussion

It is to be hoped that the discussion among doctoral students and supervisors about choice of language and format for the dissertation will continue so that all arguments are clear for everyone. The summer school for doctoral students in Dømmesmoen in June will offer a good forum for such a discussion, as will the seminar for supervisors in May, which will focus on different doctoral programmes in mathematics didactics.

The board of the Nordic Graduate School welcomes suggestions for future doctoral courses, seminars and workshops covering different themes and we look forward to offers from different universities to host such events. It only requires an email to start a planning process.

Barbro Grevholm

Director of the Nordic Graduate School
Agder University College
Serviceboks 422
N-4604 Kristiansand
Norway
barbro.grevholm@hia.no