

Several Nordic research initiatives to follow up the funding of the Nordic Graduate School in Mathematics Education

Planning for future NoGSME-activities

Much activity has been going on in March and April to secure further funding of the Nordic network that NoGSME has created. At the moment NoGSME consists of over 40 participating institutions, over 120 supervisors and about 90 doctoral students. Almost one hundred new Nordic doctors with theses in the area of didactics of mathematics have graduated during the period of NoGSME (2004–2009). The funding for NoGSME from NordForsk will end after the summer school in September 2009. There is no new opportunity to apply for Nordic graduate schools but NordForsk expects the graduate school, which have been funded over five years, to be able to continue to exist by the help of the participating institutions. Thus we are now approaching the minute of truth, where we will find out if the NoGSME-activities will continue after 2009.

The viability of NoGSME is at least strong enough to produce a number of promising applications for future activities. Thus Frode Rønning, as the chair of the Nordic Society for Research in Mathematics Education, NoRME, has handed in to NordForsk an application for funding of the network NoRME over three years. This is meant to give NoRME some basic resources to plan and act for joint Nordic activities in mathematics education. Another initiative was taken by Morten Misfelt and colleagues in Denmark to apply for a researcher network with focus on studies of use of ICT in mathematics education. Contacts have been made with colleagues in other Nordic countries, as an application to NordForsk has to be supported by institutions in at least three Nordic countries. A third application for resources for researcher networks has been constructed by Madis Lepik at Tallin University, who is planning for networking among Baltic and Nordic researchers in order to carry out some comparative studies in three different areas.

NoRME has asked didacticians at University of Agder to initiate an application for a summer school (doctoral course) in 2010. Thus

contacts have been made with Åbo Academy University, Roskilde University, Iceland University and Linköping University. A joint application for a summer course in May 2010 has been sent to NordForsk. Additionally we are considering repeating the application for a Nordic Master programme, which was sent in 2007. NordForsk has opened a second opportunity to apply for Nordic Master programmes and there seems to be a wish to try again with this application. In 2007 there were extremely many applications for such master programmes, but maybe it will be more reasonable this time.

We can only hope that all or at least some of these applications will be successful. There are also other kinds of contacts going on in order to ensure continued Nordic collaboration in mathematics and science education. We thank all the applicants for the good initiatives and the work done and wish them luck with the continued work.

The eleventh seminar for supervisors of doctoral students

On April 23–24 the final and eleventh seminar for supervisors organised by NoGSME will take place at University of Agder. There will be 35 participants from all the Nordic countries, which is the most ever in the seminars. The theme of the seminar is *Critical reviewing of research methodologies in mathematics education*. Guest lecturer will be professor emeritus Frank Lester from University of Indiana. He will give two main presentations during the seminar. The first one will be about *Making mathematics education research more effective: philosophical, theoretical & methodological considerations*. Here is Frank's description of what he intends to illustrate in the lecture:

The basic argument I will present in this presentation is that the choice of research methods must be made in view of: (1) the researcher's philosophical and theoretical stance, and (2) what the research community considers the purpose of doing research to be. I will also argue that the purpose of our research should be to make lasting changes in both practice and policy; that is, it should be transformative in nature. Furthermore, I will argue that there often are forces – both political and ideological – at work that influence the methods we use and, consequently, the sorts of questions we seek to answer. Finally, I will argue that some research methods are more likely to lead to the sorts of transformative change that I think are needed.

The second lecture by Frank will have the title *Preparing future researchers: what methods should they learn and how should they learn them?* This is his abstract for that lecture:

Over the past 40 years, numerous research methods, both qualitative and quantitative in nature, have been developed having particular promise for studying questions related to teaching and learning. Many of these have been "borrowed" from other fields – anthropology, sociology, and psychology come readily to mind. Indeed, there are so many research methods to choose from that it can seem nearly impossible to decide which ones to emphasize and which to ignore. Then, there is the matter of how to go about developing expertise in the use of the methods that are selected. In this presentation I will address these issues with the intent of generating discussion that may be useful in the continuing development of graduate programs in mathematics education.

The question about how to develop expertise in the use of research methods is of course crucial for supervisors and doctoral students. We can expect a lively debate in the seminar about that question. Frank's lectures will be followed by discussions in groups and three of our Nordic experts will give shorter presentations preparing that discussion. These presentations will be given by Simon Goodchild, Mogens Niss and Eva Jablonka. In a final panel the members of the NoGSME board will discuss *The way forward for research in mathematics education? What are the challenges for the Nordic mathematics education research community?*

The NoGSME summer school 2009

In September 21–26 the summer school will take place in Sømimestationen in Holbæk, Denmark. This year's summer school will be organised according to the traditional content and layout, but will also be a doctoral course run by Roskilde University (giving 7.5 ECTS for those who pass the exam). Sømimestationen is a course house owned by Roskilde University and it has excellent opportunities for the summer school and beautiful surroundings near the Isefjord. The second announcement has been sent out in the beginning of April and doctoral students are asked to apply to the summer school before April 30. We expect around 30 participants, as in earlier summer schools.

Two recent doctoral theses in mathematics education

At Lund University Ingrid Dash defended her thesis in social sciences on January 30, 2009. The title in English is *Flexibility in knowing school mathematics in the contexts of a Swedish and an Indian school class*. The main objective of her thesis was to obtain insights into flexible modes of knowing in school mathematics in two school class contexts. Dash

wanted to find out how the contexts relate to modes of being a learner in them, with specific focus on learners' flexible ways of discerning parts and delimiting wholes, and how they understand part- and whole-relationships while doing mathematics. The theoretical exploration was informed by perspectives from phenomenography, variation theory and by constructionist theoretical standpoints. Empirical material was collected from a school class in Southern Sweden and a school class in Orissa, Central-Eastern India. Using contextual analysis, the meaning of the learners was analysed, as it was expressed during interviews and observations, verbally or with the help of mathematics.

The main results of the thesis are different categories of description. The claim is that three modes of knowing emerged from the empirical material. These were according to the author: associative flexible experiencing; compositional flexible experiencing and contextual flexible experiencing. These modes of knowing feature distinct differences: in the depth of understanding mathematics, in how learners use variation when dealing with an object of knowledge, and in learner identity. The associative mode of knowing involved the learner in arbitrary ways of making sense of the material s/he was working with, with a focus on arbitrarily discerned aspects in chains of associations. The compositional mode of knowing meant that the learner made an effort to understand, keeping a focus on compositions, such as number-relations or formulas. The contextual mode of knowing engaged the learners in ways of understanding the context from which critical aspects were to be discerned.

The contexts gave meanings to the content. The knowledge about the context, mathematical and also reality-based, gave meaning to the theoretical constructs. The logic of the mathematical context and content was understood in a more differentiated way than within the two other modes of knowing. The compositional flexible mode of knowing predominated in all parts of the empirical material. The dominant mode of being a learner in the Swedish school class context was simultaneously independent and collaborative, as well as creative and productive. In the Indian school class context, the dominating mode of being a learner was autonomous and committed. Dash claims that in mathematics education there is a need to give pupils tasks containing possibilities both for experiencing variation and for authorship. This also demands of the teacher to observe and evaluate the individual pupil's understanding and use of the possibilities offered.

On April 2 Unni Wathne defended her thesis at University of Agder, Norway. The thesis is written in Norwegian and the title is *Barns tilnærming til analogiske og kombinatoriske resonnement. En longitudinell studie av*

samspill i smågrupper (Children's approaches to analogical and combinatorial reasoning. A longitudinal study of collaboration in small groups). The aim of the study was to make empirical and theoretical contributions to the understanding of how children in the lower grades in primary school (grades 1–4) appropriate tools in mathematics. The study focused on children's analogical and combinatoric reasoning and Wathne studied the appropriation of these tools through collaborative problem solving in four small groups. The study also investigated children's approaches in solving combinatoric problems.

A sociocultural perspective on learning and development was used. Thirteen children aged between 8–10 years were observed while they worked on combinatoric problems in small groups in a natural school setting. The data material consists of videotapes of group sessions, field notes, and copies of the childrens' inscriptions.

The analysis is divided into three distinct parts. In the first part of the analysis, three strategies were identified that the children used to solve combinatoric problems: *counting all*, *grouping* and *learned product*. The study also identified instances when children used combinations (hybrids) of these strategies in order to find a solution of the problem at hand.

The second part of the analysis elucidated children's appropriation of combinatoric problems. Important results are that the children were engaged in common activity, they achieved a common attention by focusing on understanding the problem, on understanding the structure of the problem, and by utilising inscriptions in their problem solving process. Further, the children developed shared meanings for concepts and utterances, they identified connections between their earlier experience with combinatoric problems and their engaging in similar problems. The children were involved in a transformation process where they appropriated tools, actions and remarks from other children through collaboration and used these as tools in solving the problem or other problems encountered later.

The third part of the analysis identified indications of analogical reasoning through the children's appropriation. When children made an analogy on the background of contextual properties identified in the problem, they were aware that a problem encountered earlier could be helpful in solving the new problem. They were unable to make use of the analogy. When the children made an analogy on the background of structural properties identified in the problem, they were able to identify corresponding relationships between the problem encountered earlier and the new problem. The children realised the connection between

earlier experience with such problems and their work with this tool in small groups. The children were involved in a process where they were appropriating the tool and the structure.

The two theses are examples of studies, where the doctoral students have decided to go in the footsteps of the supervisor, when it comes to choice of theoretical framework. Another common feature is that the supervisors are rather general educationalist than researchers in the didactics of mathematics. Do such facts have an influence on the results of the studies and on the impact of them? An open debate among supervisors on such questions would be refreshing. To find a forum for such debates could be one important issue for future work in doctoral programmes.

Future plans for doctoral courses in mathematics education

At the University of Agder two doctoral courses will be given in the autumn of 2009. Although NoGSME cannot offer travel support for Nordic doctoral students any more, the courses are open to all students in the Nordic and Baltic area. The courses are Theory of science from a mathematics education perspective (5 ECTS) and Theories of teaching and learning mathematics (10 ECTS). Students who are interested in these courses can contact Elna Svege at the university (elna.svege@uia.no).

We hope that in the spirit of NoGSME doctoral courses given at other universities will also be open to all students in NoGSME. Announcement of such courses can still be done via the NoGSME emailing list. Material can be sent to me for further information. For information about NoGSME and activities see www.nogsme.no.

NoGSME is also grateful to Jo Boaler at Sussex University and her colleagues in UK for offering a workshop on classroom research in mathematics education, which has attracted interest from many Nordic doctoral students. The workshop runs over a couple of days rather late in spring. Another upcoming yearly event is the 10th conference *Teaching mathematics: retrospectives and perspectives* that will be held May 14–16, 2009 at Tallinn University, Institute of Mathematics and Sciences. This year the conference will be followed by a one day research seminar on May 16 with participants from the Nordic countries. Information regarding the Conference will be updated on the conference web-page <http://www.tlu.ee/bcmath2009>.

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