

Nordic mathematics education in Europe

The year 2011 contains two important events for the Nordic community in Mathematics Education, the conferences CERME 7 and NORMA 11. Given that CERME takes place every second year and NORMA every third year, we easily find that the two events coincide every sixth year. Naturally, these two events have brought about much activity in the community. CERME 7 took place in Rzeszów, Poland, from 9 to 13 February and was well represented by Nordic researchers. One of the plenary talks was given by Markku Hannula from the University of Helsinki. The title of his talk was *Structure and dynamics of affect in mathematics teaching and learning*. In his talk he gave a broad overview of the research on affect over the last almost 20 years. He looked at different dimensions of the affective domain, research instruments, and pointed to directions for future development.

The conference was organised around 17 Working groups, and four of these were chaired by Nordic researchers. Maria Luiza Cestari from Norway was the chair of the working group for *Mathematics and language* (WG 9), Paola Valero from Denmark chaired the group for *Diversity and mathematics education* (WG 10), Eva Jablonka from Sweden chaired the group for *Comparative studies in mathematics education* (WG 11), and Uffe Thomas Jankvist from Denmark chaired the group for *History in mathematics education* (WG 12). Furthermore, there were some Nordic researchers acting as co-chairs in some of the working groups. The large majority of working groups contained paper presentations by Nordic researchers. In total approximately 50 persons from the Nordic area were involved in the presentation of about 40 papers, out of a total of close to 300 papers. Seen in relation to the population we think this is a high rate. All five Nordic countries were represented but, going through the programme, we could not find any from the Baltic region. We hope they will come stronger at the next CERME!

In addition to this, the Nordic community was represented by Markku Hannula (Finland) and Carl Winsløw (Denmark) in the programme committee for CERME 7, and Christer Bergsten (Sweden) is a member of the ERME board. During the conference in Rzeszów, elections were held for new members of the board, and the outcome of this was that two more Nordic researchers became members of the board, Markku Hannula, and Eva Jablonka. It can therefore be said that the Nordic community has a strong position in European mathematics education.

NORMA 11 in Iceland is now soon coming up with more opportunities for the Nordic researchers to present their work. During the conference the first regular General Assembly of NoRME, after the foundation, will be held. A call for the General Assembly, along with an Activity Report, has been distributed in the member societies. These documents can also be found on the NoRME website, www.norme.me. In the next issue of NOMAD we will report from NORMA 11 and the General Assembly of NoRME, and in that issue there will also be more news from the Nordic area, such as short descriptions of recent PhD dissertations.

About this issue

In this issue we present two papers that are addressing research questions related to university students' understanding of particular mathematical concepts. The first paper *Different views – some Swedish mathematics students' concept images of the function concept* by Olov Viirman, Iris Attorps and Timo Tossavainen reports from a survey on 34 engineering students' conceptions of the function concept. In their analyses of the students' conceptions the authors draw on the theory of concept images developed by David Tall and Shlomo Vinner (1981), and on the model for formation of mathematical concepts developed by Anna Sfard (1991). In the analyses, the students' activated definitions are also related to the historical development of the function concept within the science of mathematics. Many of the students seem to run through some of the same mathematical ambiguities and difficulties that mathematicians have struggled with in the history of the development of the function concept. For the vast majority of the students their conceptions of functions are characterized as operational or even preoperational, and only some 10% of the students express a structural understanding of the function concept. The study contributes to the research and eventually to the development of practice by deepening the understanding of the mathematical difficulties that engineering students' encounter in their learning of functions.

In the second paper, *Assessment of university students' understanding of abstract binary operations* by Timo Ehmke, Martti E. Pesonen and Lenni Haapasalo, the focus is on assessing and analysing the students' mathematical understanding of the abstract concept of binary operations in a linear algebra course. The paper presents a theoretical framework which has been used both for designing the course and as a basis for developing test items. The course is structured in three phases: definition recognition, concept identification, and concept production. In each of these phases the students are challenged to work with the interplay between three different forms of representations in terms of verbal, symbolic and

graphic representations including both static and dynamic figures, diagrams and tables. The sample of 92 students, primarily first-year mathematics or physics majors with the dominant prospect of becoming secondary teachers, were tested in four computer based tests during the course and in a post-course paper and pencil test. By using latent class analysis the authors show that in the sample, the students can be categorized rather convincingly in three groups according to their results in the computer tests and their related understanding of binary operations. The three groups are labelled the *procedure-bounded* (44 %), the *procedure-oriented* (36 %) and the *conceptual* (21%) student group. These groups are shown to have some explanatory force of the students' performance in the post-course paper and pencil test. Based on their results, the authors advocate a differentiated approach to the teaching of abstract mathematical concepts such as binary operations. For students not included in the conceptual group the concept recognition elements in the concept production phase should be postponed to a later state and the students' conceptual understanding should be supported by means of more systematically developed tasks.

The third paper is concerned with teacher students' transition from students to teachers. The title of the paper is *Identity development in limbo: teacher transition from education to teaching*. The author, Hanna Palmér, reports from an ongoing longitudinal study on the process of identity development among teacher students and novice primary mathematics teachers. The aim of the paper is two folded. Firstly, the paper undertakes the theoretical challenge of elaborating and connecting the notions of beliefs, identity and identity development into a framework that can serve as a basis for analysing the process for developing an identity as a mathematics teacher in the transition from teacher education to the practice of teaching. The author starts from a critique of the notion of beliefs as something attributed to the individual teacher and with determining effects on the development of the teacher's practice. By combining the notion of *patterns of participation* from Skott and Wanger's notion of *communities of practice*, the author establishes a framework for investigating the development of professional identity in which the notion is made operational for investigation from an inside perspective. Secondly, the paper illustrates in detail how this framework can be used to analyse a particular case of identity development for a novice mathematics teacher. Through analyses of interviews with Jenny in the beginning of her teacher education, just before graduation, shortly after her graduation, and one semester after graduation we get a close insight into her development of an identity as a mathematics teacher. For Jenny, the identity development is dominated by the dilemma between her thoughts

about how she would like to bring new reform based ideas about mathematics teaching into school practice, and her thought about how she would have to adjust herself to the existing practice of mathematics teaching at the school where she will eventually be teaching when she gets a job. It is evident from the analyses that the developed framework can be used to analyse and understand this phenomenon.

Thanks to authors and reviewers

Finally, we would like to thank all the authors that have submitted papers and book reviews to NOMAD in 2010. We are very pleased that also in 2010 we have experienced an increasing number of submissions. In our review process we have been drawing on a large number of reviewers, and we are very keen on expressing our gratitude for the hard and important work done by all of these in 2010. We sincerely thank everybody for their engagement with the journal. Below you find the list of reviewers for the papers processed in 2010.

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