# The great variation in the field of mathematics education

In this issue you will find three very different papers. A paper about the philosophy of mathematics, a paper analysing quantitative data about young children's geometrical transformations of polygons, and a paper based on a developmental project at lower secondary level. The project aims are to develop the students' methods for metal calculations and their reflections about choices of methods for simple calculations.

This variation reflects the ambition of NOMAD to present a broad coverage of the field of mathematics education and to channel both research papers and reports from developmental projects. The editorial process gives priorities to authors from the Nordic countries. Joined papers, by Nordic and non-Nordic authors, are of course most appreciated, and we also intend to continue to publish papers by non-Nordic authors addressing issues of interest to the Nordic community.

## About this issue

Jessica Carter has written a paper challenging two of the basic claims in von Glasersfeld's radical constructivism, namely that there are no such thing as objective knowledge and that exact knowledge about another person's knowledge is an illusion. Her point of departure is the position that a philosophy of mathematics and mathematical learning, which is indeed included in the domain of radical constructivism, should be in accordance with the practice of mathematical research and the practice of mathematics teaching, respectively. Illustrated with examples of the development of advanced mathematical concepts, Carter argues that even though concepts are constructed by human beings in the practice of mathematical research, mathematical knowledge about these constructions and their representations can still be seen as objective knowledge.

With learning still seen as a personal construction of meaning, this view on the ontology of mathematical concepts and the epistemology of mathematical knowledge allows for inter-subjectivity in a community of

mathematics learners. Inter-subjectivity is normally rejected by radical constructivism despite the fact that inter-subjectivity is evidently present in the practice of mathematics teaching. Carter names her position Constructive Realism and ends up by drawing a few basic implications for mathematics education. The genesis and the motivation for the introduction of the mathematical concepts should be made subject to the teaching, and the process of assigning meaning to symbolic representations through which the students may gain access to the mathematical concepts should be in focus in mathematics teaching.

The paper "Exploring young children's geometrical strategies" reports on a large quantitative research project involving 291 children form Cyprus. One of the very interesting findings in this project is that in all cases more than 40% of the 4-6 year old children are able to efficiently transform simple polygons and draw series of similar triangles, squares and rectangles with increasing or decreasing sizes. Moreover, it is documented that there is a tendency that older children (6-8 years), who have already attained one or two years of mathematics teaching, more frequently use inadequate one-dimensional strategies when transforming simple polygons. Such findings raise interesting and challenging questions about how to identify and recognise young children's geometrical knowledge and intuition when they enter the school system. More research and developmental projects are needed in order to find ways to use young children's knowledge and intuition as a basis for mathematics teaching. This is indeed most relevant in relation to the ongoing political discussion about the subject matter content in pre- and early school activities.

However, the main focus of the paper is to investigate the relationship between the children's strategies working with geometrical transformation tasks, the children's IQ-level, and their ability to recognise the relevant geometrical shapes. An extensive statistical analysis shows that the IQ-level is directly associated with the children's use of transformation strategies and that children with low recognition of the geometrical shapes tend to have defective transformation strategies. Such results are in themselves of scientific interest, but moreover they give rise to an important discussion about the role of mathematics in pre- and early schooling. Can mathematics teaching play a progressive role in the educational system by identifying and helping children with special needs? The problematique concerning students with special needs in mathematics is precisely the theme for the coming thematic issue of Nomad (no. 4, 2006), and this specific issue will most certainly be discussed here.

The last paper, by Frode Olav Haara, reports and analyses a developmental project, which aims at making lower secondary students more reflective about their choice of method for elementary arithmetic

calculations. In this particular case, mental calculations were observed to be disregarded by the students when they had a calculator at their disposal – even for very simple calculations. Research literature confirm this to be a general tendency and expose concerns about the possible consequences for the students' conceptions of the base 10 number system and their number sense in general. In the developmental project, a special didactical intervention is designed and carried through. The intervention includes the students' work with traditional drill exercises under time limits but also a strong emphasis on the teacher's dialogue with the entire class and with individual students about their choice of method. In what sense and what degree the intervention can be considered in accordance with a social constructivist view on learning and with a critical perspective on mathematics teaching is interestingly discussed in the paper.

The intervention, which is quite easily implemented in practise, seems to make the students use mental calculations more frequently in their work with mathematical problems. In addition to this, all students improved their mental calculations during the intervention. The author's analysis of the class dialogue indicates that the intervention also made the students more aware of their choices of calculation methods. The paper is rounded off with considerations on important frame conditions concerning the practical implementation of the intervention.

In addition to the three papers you will find information on the activities of The Nordic Graduate School in Mathematics Education. This time, Barbro Grevholm, director of the graduate school, reports on six new dissertations, which all have been successfully defended. Added to the five dissertations presented in the previous issue of Nomad, we are witnessing a historical growth rate in the Nordic community of researchers in mathematics education, and in the very near further, more are coming. From the perspective of Nomad the future looks bright in terms of excepted subscriptions and submitted papers.

We wish all readers a pleasant summer.

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Nomad Editors