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## Bringing focus to mathematics education in multicultural and multilingual settings

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# Bringing focus to mathematics education in multicultural and multilingual settings

During the last three years the last number of a year volume in *NOMAD* has been dedicated to particular research topics which are of relevance in the Nordic region. This number is dedicated to mathematics education in multicultural and multilingual settings. We present some general reflections about this topic as well as introduce the papers in this thematic issue.

Asserting that mathematics education is connected to culture should not surprise many nowadays. Since the 1980's international research in mathematics education has shown that all human groups have developed practices, thinking and techniques that can be called mathematical, even though they are not similar or have not been formulated in the language and form of the Western, European mathematics. Alan Bishop's own research and his review of existing anthropological studies in different aboriginal groups have been one of the first systematic research work to argue for the emergence of mathematical practices in all human cultures (Bishop, 1988). The ethnomathematical program proposed by Ubiratan D'Ambrosio (D'Ambrosio, 1994) has also furthered our understanding of the way in which different human groups, from any aboriginal community to any professional community, produce mathematical thinking and knowledge. D'Ambrosio's defines the term emphasizing its three components: *ethno-mathema-tics*. *Mathema-* refers to a cultural group's understanding and coping with reality; *-tics* refers to the techniques and arts developed in the understanding and coping with reality; and together with the prefix *ethno-* it comes to mean the culturally embedded techniques of understanding developed by a cultural group. More recently the adoption of socio-cultural and anthropological theories for the study of mathematical thinking and learning have pointed to the fact that thinking and cognition in mathematics "are forms of reflective, mediated social praxis where the organization of individuals' sensuous cognitive processes are related to the meaning of things as they become objectified in practical and theoretical activity." (Radford, 2008, p.440) According to Luis Radford, meaning construction always happens in cultural, rational contexts, where the word "rational" refers to the particular

rationality determined in and by the practices of the human group where the thinking is situated. All this research has contributed to acknowledge the embeddedness of mathematics, mathematics thinking and mathematics education in culture and, more broadly in society. The fact that Ubiratan D'Ambrosio was awarded the ICMI Felix Klein Medal for 2005, announced at ICME-11 in Monterray 2008, illustrates the international recognition of the importance of the socio-cultural perspective in mathematics education research.

Simultaneously with this trend, there has been a growing amount of research focusing on the challenges that students' diversity pose for the teaching and learning of mathematics. As the world gets more globalised and migration of peoples around the world becomes a spread phenomenon, many classrooms have turned evidently diverse. This does not mean that classrooms have ever been homogeneous! Cultural differences always exist among people according to a series of factors. It suffices to look at any classroom in any big Nordic city to find differences among students according to their gender, family background, social and economic status, regional belonging and even dialect spoken. However, the meeting with others who are really different in ethnic group, language or religion have made diversity more visible. While in countries with a longer tradition of immigration research has for a long time investigated these differences mainly in relation to the challenges of multilingualism, for many European countries and not less for the Nordic countries the attention to cultural and linguistic diversity has been a recent phenomenon (Abreu, César, Gorgorió, & Valero, 2007). Nevertheless in the recent years some attention has been paid to how to understand the complexity of a learning and teaching situation when students and teachers seem to have little in common and, still, have to work together in schools and mathematics classrooms.

International research in multilingual and multicultural situations has illuminated aspects of such complexity. A first trend of studies has focused on the challenges posed to teaching and learning when there are differences between the language of instruction and students' mother tongue or home languages. Part of this trend has identified that it is students' lack of fluency in the main language what obstructs instruction and, thereby, mathematical learning. Critique has been raised to research studying bilingualism in mathematical learning and reinforcing a cognitive deficit perspective. Other research agendas have tried to focus on the dilemmas that bi/multilingualism poses to teachers (Adler, 2001), and some others have also tried to explore the broader network of social, cultural and political practices in schools and mathematics classrooms that contribute to the construction of bi/multilingualism as problematic.

In particular, the focus on the mathematical underachievement of minority groups in many societies has raised awareness on the necessity of expanding research views on this matter. Multiple examples of this type of research can be found in, for example, the work of the group on multiculturalism and mathematics education in the last four CERME conferences (see for the proceedings of conferences at <http://ermeweb.free.fr/>).

In this volume we have collected a series of four papers around this issue, representing both research done mainly in Sweden and Denmark, as well as international research particularly from Australia, thanks to collaborative research enterprises. The papers address the issue of multiculturalism and multilingualism from perspectives that highlight the complexity of the challenges. All papers go beyond deficiency discourses of minority students.

The involvement of Kay Owens, Charles Sturt University (Australia), with Swedish colleagues in researching mathematics education for Sámi people in Sweden, led her to propose to the editors of *NOMAD* the idea of having a special number of the journal dedicated to culture, ethnomathematics and mathematics education in the Nordic region. Her proposal resonated well with our own idea for a thematic issue. Building on her long personal experience and research work in different cultures, Kay Owens, in the article *Culturality in mathematics education: A comparative study*, extracts and discusses six key issues that are important to consider when dealing with mathematics education in multicultural and multilingual settings.

In the article *Bilingual students' mother tongue. A resource for teaching and learning mathematics*, Eva Norén presents some of the main results of a project promoting the teaching of mathematics in the mother tongue of the students and not only in Swedish. The project run in five multicultural schools in the Stockholm area and involved a number of bilingual teachers and students. Bilingual mathematics teachers seemed to promote mathematical learning and engagement in the classroom by using two languages in mathematical discourses. Pupils and teachers communicated mathematically in different ways, and the interplay between mathematics and language often became obvious. Bilingual students participating in the project expressed that they were able to learn more than what they normally did in a Swedish-only mathematics classroom, and they felt secure with the ways of using languages and learning mathematics. Participating in the project contributed to the students' confidence in their mathematics learning competence.

Troels Lange's article *Homework and minority students in difficulty with learning mathematics. The influence of public discourse*, raises the issue of the connection between minority children's experiences in school

mathematics and the public images about how minority parents provide parental support for their children's schooling, particularly in the case of doing homework. He contrasts an immigrant 10 years old girl's perception of her home support and her mathematics teacher's rather different perception. He shows how the girl tries to align her perception of her home support with middle class Danish family values, and how the public discourse about immigrants apparently frames the teacher's perception of the resources that are available or not available to the girl. The analysis provided in this article is an example of how mathematics teaching and learning are embedded in a wider socio-political field. For the case of minority students, the analysis suggests that sometimes resources could be available that schools do not see because students are constructed as disadvantaged.

The article *School mathematical discourse in a learning landscape. Understanding mathematics education in multicultural settings* is a collaborative venture between Helle Alrø, Ole Skovsmose and Paola Valero who have been researching mathematics learning in multicultural settings in Denmark for the last 5 years, and Tamsin Meaney, Uenuku Fairhall and Tony Trinick, who have been researching mathematics education in multilingual settings in New Zealand. By bringing their conceptual tools together they discuss the potential of combining two particular notions: the learning landscape and school mathematical discourse. They aim at formulating concepts and methodological tools to challenge the simplification of issues in regard to mathematics learning in multicultural settings, when adopting restricted perspectives on issues of bilingualism. In the paper they propose how these two notions relate and offer a framework for the analysis of the complexity of mathematics education practices in these settings. They present two cases from their empirical material and analyze it with the proposed model. They conclude by pointing to the potentialities and limitations of such framework.

## New structure of the editorship

From January 2009 Johan Häggström (NCM) enters the chief editorial team. Johan has been for many years the managing editor of NOMAD and now he will also be serving as a chief editor together with Morten Blomhøj and Paola Valero. This is the first step in a process of changing the structure of the editorship for NOMAD from shifting among the Nordic countries in periods of four years to an editorship that represents more than one country at the time.

During 2008 we have had the help of Anita Lindkvist Pedersen as an editorial assistant. Unfortunately due to lack of founding she can

not continue working with us. We would like to thank her for having been the contact between editors, authors and reviewers, and for administering the review process.

### Thanks to authors and reviewers

Finally, we would like to thank all the authors that have submitted papers and book reviews to NOMAD in 2008. We have experienced an increasing number of submissions and, for the first time in the history of NOMAD, we have papers queuing for publication. Accordingly 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 them in 2008. We sincerely thank their engagement with the journal. Below the list of reviewers for the papers processed in 2008.

Andreas Ryve	Lil Engström
Antti Viholainen	Lisser Rye Ejersbo
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Bettina Dahl Søndergaard	Marit Johnsen Høines
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Kaarina Merenluoto	Troels Lange
Kay Owens	Trygve Breteig
Kjersti Wæge	Uffe Jankvist
Kristin Bjarnadóttir	Ulla Runesson
Lena Lindenskov	

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