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TWG13: Early years mathematics

Introduction to the papers of TWG13: Early years mathematics

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Introduction

The working group on Early Years Mathematics was established at CERME 6. The aim of this working group has always been to share scholarly research concerning mathematics for children aged 3-8. In this age group, the transitions within preschool, and from preschool to the early grades of primary school are important areas of attention. The working group on early years mathematics has also considered that in different countries preschool education has different objectives and children in different countries begin primary school at different ages (e.g., in Sweden there is one preschool curriculum for children aged 1-6 followed by primary school, and in UK there are different curricula for with nursery, preschool and primary school: 0-2, 3-4 and 5-8 years). These differences have always stimulated fruitful discussions and CERME 10 was no exception.

The 15 papers were each allocated 30 minutes of attention during the TWG 13-sessions; 12 minutes for presentation, 8 minutes where a different participant prepared a response or query, and 10 minutes for open discussion. The five posters were allocated 15 minutes each for a brief presentation and open discussion. One 30-minute slot was reserved for group work where participants from different countries were grouped and discussed quite openly topics of common interest (such as, e.g., the role of aesthetics in mathematics and the use of manipulatives in mathematics), and another 30-minute slot was reserved for discussing the plenary by Lieven Verschaffel on children's number sense. It was very fortunate to have him as a participant in TWG13..The final 90-minute session on Saturday was used to collaboratively prepare the report for Sunday, which together with what was presented and discussed in the other sessions, formed the basis for this introduction.

One of the Friday sessions included a 60-minute presentation and discussion of the Early Years Mathematics chapter draft for the soon to be published ERME book, where one of the editors of the book (Kenneth Ruthven) was present. Participants had been asked to read and send their questions and comments to the chapter in advance of the conference, and these inputs, as well as comments during the session, contributed important input to the ongoing discussion in the group.

The number of participants in TWG13 has been quite stable over the past five conferences, and each time the group has benefitted from a quite broad attendance when it comes to the area of Europe. Twenty-nine participants from 11 different countries attended the working group in Dublin (see the table below).

Country	Number of papers	Number of posters	Number of Participants
Belgium			1
Denmark			1
Germany	1	1	3
Greece	2		2
Israel	1		1
Norway	3	2	8
Poland	1	0	1
Portugal	0	1	1
Sweden	3	1	4
Spain	2	0	4
UK	2	0	4
TOTAL	15	5	29

General summary of presentations

Seventeen of the 20 papers and posters concerned preschool children aged 3-6 years, preschool/kindergarten teachers' professional knowledge and competence development or teaching materials for activities in preschool. The remaining three contributions focused on children aged 6-7 years, which in most countries means Grade 1 in school. Compared to previous years, there was an increased attention given to preschool compared to early schooling.

Broad attention was given to the roles of preschool teachers' competencies in promoting early years mathematics learning. Vanegas, Gimenez and Samuel studied school mathematics narratives in early childhood teacher education, focusing on how the future preschool teachers recognized the potential of two professionally designed geometrical tasks to promote mathematical processes. Palmér and Björklund considered how preschool teachers characterize their own mathematics teaching in terms of design and content, while Hundeland, Erfjord and Carlsen analysed preschool teachers' orchestration of researcher-designed mathematical activities. They used this analysis to discuss what can be learned about teachers' knowledge by adopting the Knowledge Quartet by Rowland and colleagues for kindergarten level. Tirosh, Tsamir, Levenson and Barkai studied preschool teachers' variations when implementing a patterning task, where they investigated the impact of the various implementations on children's success in extending repeating patterns. Gifford, Griffiths and Back presented a theoretical paper concerning the use of manipulatives with young children, while Skoumpourdi presented a framework for designing inquiry-based activities for early childhood mathematics. Silva, Costa and Domingos offered an interdisciplinary approach to linking science and mathematics in early mathematics. A new issue presented and discussed during our WG was

mathematics for special needs children during the early years. Gasca, Clemente and Colella outlined and discussed the design of mathematical instructional activities to foster achievements in mathematics for children with Trisomy 21 (Down's Syndrome). Peter-Koop and Lüken considered the role of inclusive compared to exclusive settings for the learning of mathematics for children with special needs.

In total, eight papers and posters focused on the learning and development of mathematics for preschool children. The paper by Tzekaki and Papadopoulou was based on a teaching intervention for developing generalisation in early childhood. Björklund's paper considered the importance of adults challenging two year old toddlers' evolving concepts of numbers in their play. Her paper stimulated a discussion as to whether 3 years of age should be the lower limit of attention for our group as it was in the past. Sundström and Levenson reported on an exploratory study of young children's aesthetic development in the context of mathematical explanation, while Pettersen and Volden presented a poster considering the use of maps in kindergartens and children's development of spatial orientation and navigations. Bjørnebye reported from a multi-case embodied design study on early learning of numbers, while the paper by Schöner and Benz studied preschoolers' perception and use of structures in sets, adopting eye-tracking as a tool. Breive studied preschool children's argumentation as part of an inquiry approach in reflection symmetry and Rinvold investigated children's learning of numerocity. Both Breive and Rinvold adopted Radford's theory of knowledge objectification to kindergarten settings.

Regarding the first year of primary school, Maj-Tatsis and Swoboda reported on an intervention study on first grade school children's ability in noticing and using regularities in three-dimensional geometrical objects while using playing blocks. Van Bommel and Palmer focused on 6 years old children's representation of the semi-concrete and semi-abstract, as connections between concrete (objects) and abstract (signs) representations. Finally, Thoules presented a self-study action research study on the role of gestures in supporting mathematical communication for first grade students with language delays.

Main characteristics and issues in focus

The group had ongoing discussions about the importance of fostering children's early development of mathematics for later success. As such, the group experienced presentations and discussions of several intervention and exploratory studies, teacher development and ways of fostering children's mathematics learning. The role of play and the term "playful learning" was given great attention. This proposed term takes into account that distinguishing between play and learning at this age-level makes little sense. The argument offered was that an activity designed, planned and guided by the teacher may indeed promote learning among children, but can be considered as play by the children.

As usual, the group presented a mixture of small scale studies (case study design), large scale studies and several pilot studies for larger studies. These different studies contributed valuable insights. We also experienced a broad range of theory in discussions of papers and posters, including the theory of objectification, variation theory, socio-cultural theories, the use of Clements and Sarama's framework, the core knowledge system, as well as development of conceptual frameworks. The theoretical discussions of the group were supported by Lieven Verschaffel's perspective and contributions, generating fruitful discussions of theory use and development.

The most prominent “news” for our group came from presentations discussing the following issues: ways in which special needs children can engage with mathematics, toddlers and mathematics, and young children’s appreciation for the aesthetical dimensions of mathematics. The group was also introduced for the first time to the possibility of using eye tracking as a tool in early years mathematics research. We encourage researchers to continue with their important work regarding early years mathematics and hope to see new insights in the next CERME meeting.