

Topic Study Group No. 32: Mathematics Education in a Multilingual and Multicultural Environment

Richard Barwell, Anjum Halai, Aldo Parra, Lena Wessel
and Guida de Abreu

The Programme

All over the world, mathematics education takes place in multilingual and multicultural environments, including situations affected by historical diversity, colonialism, migration and globalisation. Research on the issues arising in such environments is growing and is of wide relevance. The aim of TSG32 at ICME-13 was to examine issues that arise in conducting research on mathematics education in such environments. The TSG saw 9 presentations in the main TSG sessions and 13 oral communications. Each main session concluded with a period of discussion of cross-cutting themes. A joint session was also organised with TSG31 (Language and communication in mathematics education).

Three themes mentioned in the original TSG description were addressed during the main sessions: the interaction between policy, practice and research; the role of theory in understanding mathematics education in multilingual and multicultural environments; and cross-disciplinary perspectives in researching mathematics education in multilingual and multicultural environments. We organise our summary of the presentations in the main sessions of TSG32 around these themes (the presentations were not, however, presented in this sequence during the TSG ses-

Co-chairs: Richard Barwell, Anjum Halai.

Team members: Aldo Parra, Lena Wessel, Guida de Abreu.

R. Barwell (✉)
University of Ottawa, Ottawa, Canada
e-mail: richard.barwell@uOttawa.ca

A. Halai
Aga Khan University, Karachi, Pakistan
e-mail: anjum.halai@aku.edu

sions). Following the list of presentations for each theme, we list some of the questions that arose in relation to the theme.

The Interaction Between Politics, Policy, Practice and Research

Papers responding to this theme addressed questions such as: How can the interaction between politics, policy, practice and research strengthen mathematics education in multilingual and multicultural environments? What challenges arise? What insights can be developed from the careful analysis of practice to inform research, policy and future practice? The following five presentations addressed this theme:

Translanguaging between Maltese and English: the case of value, cost and change in a Grade 3 classroom

Marie Therese Farrugia, University of Malta, Malta

Textbook language accessibility in English medium classes

Lisa Kasmer, Anthony Snyder and Esther Billings, Grand Valley State University, USA

How the choice of artifacts may enhance communication between different communities

Vanessa Sena Tomaz and Maria Manuela David, Universidade Federal de Minas Gerais, Brazil

The culturally rich mathematics class

Sonja Van Putten, Hanlie Botha, Batseba Mofolo-Mbokana, Jeanine Mwambakana and Gerrit Stols, University of Pretoria, South Africa

Is Grade 7 too late to start with bilingual mathematics courses? An intervention study

Lena Wessel, Susanne Prediger, Alexander Meyer and Taha Kuzu, TU Dortmund, Germany

Discussion of these presentations led to the following questions:

- How can teachers translate something to convey an idea in another language? If we wish to avoid direct translations, what kind of strategies can teachers use to convey an idea?
- How is research in on this topic different if the researcher does not speak the language(s) of the informants? Might results be different if the researcher were a member of the language community of the informants?
- In the teacher's view, what is the future of mathematics in their language? Do they want to develop the same mathematics in their own language, in a way that makes sense to the community? Or do they feel they have to change their language to accommodate western mathematics?
- How would we prepare teachers to develop both mathematics and linguistics competence?

- Some presentations appeared to identify problematic practices, but where do we draw the boundaries between what is problematic and what is not?
- How can we deal with populations of traumatised refugees who are told not to use their first languages? How much does mathematics teaching need to address these issues?
- How might emphasising mathematical vocabulary help or hinder learning? How might this differ in different cultural or like linguistic contexts?

The Role of Theory in Understanding Mathematics Education in Multilingual and Multicultural Environments

Papers responding to this theme addressed questions such as: What theories have been used and why? What do current theoretical frameworks not address? How can theory help to challenge normative assumptions? How has theory and research developed in the context of multilingual and multicultural environments contributed to understanding the learning and teaching of mathematics more generally? The following three presentations addressed this theme:

Multiple language resources in an elementary school mathematics class for learners of French in Quebec

Richard Barwell, University of Ottawa, Canada

Epistemic dimension of multilingualism: the bright side of Babel

Aldo Parra, Aalborg University, Denmark

Beyond the “language of instruction”: using formal and informal discourse practices in linguistically diverse classrooms

William Zahner, San Diego State University, USA

Discussion of these presentations led to the following questions:

- When re-appropriating theories from outside of mathematics education, are we losing the context of these theories?
- If we take theories from linguistics, how far do we go back to the original context? What does it do to take these theories?
- Where was mathematics in anything we discussed? If we lose sight of the mathematics in what we do, we will be overwhelmed by social issues, to the point where mathematics education (not just education) gets lost. Where do we set the conceptual boundaries so that we can do our work?
- The discussion on the artificial nature of the monolingual/multilingual distinction is interesting. However, what happens if we declare that all classes are multilingual? If everything is multilingual, then nothing is, because the term is vacuous. It might be more helpful to observe a distinction between multilingual and multivocal interaction? All classrooms are multivocal, but not all are multilingual.

Cross-Disciplinary Perspectives in Researching Mathematics Education in Multilingual and Multicultural Environments

This theme included questions like: What are the advantages, challenges and tensions arising from working across disciplines, including psychology, linguistics, sociology, etc.? What has research on mathematics education in multilingual and multicultural environments contributed to these disciplines? One paper responded to this theme:

Descriptive and typological linguistic methodologies in mathematics education research

Cris Edmonds-Wathen, Umeå University, Sweden

Discussion of these presentations led to the following questions:

- What are the reasons for the methodological choices we make when working across languages and cultures in mathematics education research?
- How can you work with an expert informant? How is it possible?
- If research involves mathematics, methodological issues can become more challenging depending on whether the language is codified and written, whether it has technical vocabulary encompassing math-like terminology, and so forth.
- How does someone conduct research involving a language in which they have minimal competence?

Joint Session with TSG31

The joint session of TSGs 31 and 32 provided the opportunity for participants in the two TSGs to discuss common concerns and significant distinctions in mathematics education research on language considering (or not) multi-lingual and multi-cultural dimensions. The joint session consisted of a panel and discussion focused on the theme: “Intersections and differences in work on language in monolingual and multilingual/multicultural classrooms and settings”. The panellists were Richard Barwell, Arindam Bose, Aldo Parra, Jackeline Rodrigues Mendes, Dave Wagner and Lena Wessel. The panel was chaired by Judit Moschkovich and Marcus Schütte. As a prompt for the discussion, the panellists provided a handout of some provocative statements related to the TSG foci (which we do not have the space to include in this report) and participants were invited to discuss the following questions:

- What do you see or experience as points of intersection between these two foci: mono and multilingual/multicultural?
- What do you see or experience as differences between these two foci: mono and multilingual/multicultural?
- Why do you think these two topics are treated as separate?
- How can insights from one focus contribute to the other focus and vice versa?

A productive discussion of these questions involving panel members and the audience then ensued.

Concluding Remarks

Prompted by the rich set of presentations, the discussions at the end of each session raised and addressed some important and challenging issues for research in multicultural and multilingual mathematics classrooms. Participants, for example, debated the extent to which research in this area needs to include a mathematical focus. It appeared that for some participants, mathematics classrooms were a context in which questions of social structure, marginalisation and social justice should be addressed. Others countered that such issues are not specific to mathematics and that research in mathematics education should focus on specifically mathematical questions.

A second issue concerned the role of theory and, in particular, the use of theories from outside of mathematics education. Research in this area frequently draws on theories from, among other fields, sociolinguistics, social theory or bilingual education. While participants generally recognised the value of ‘importing’ theories in this way, concerns were expressed about whether such theories were treated with the depth they would have in their ‘home’ domain. Some participants also asked whether mathematics educators should do more to develop theory on this topic using ideas from within mathematics education. One approach to address this point would be to conduct longitudinal and cross-national studies, such as the learner perspectives study.

A third general focus for discussion concerned the complexity of multicultural and multilingual classrooms, both in relation to research and practice. The diversity of presentations and, in particular, the diversity of contexts to which the presentations referred highlighted how multilingual and multicultural classrooms vary enormously. Some participants proposed developing classifications of different contexts to avoid being overly simplistic and in order to better situate individual research projects. Relatedly, participants proposed that there needs to be more collaboration with teachers to raise awareness of complexity of multilingualism and to develop strategies to use in classrooms. Finally, participants discussed the need for more convergence in research in this area, in contrast to the current rather fragmentary approach.

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