

Discussion Group 2

The Future of Mathematics Education Research: A Discussion Group

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ABSTRACT With help of a review study by Inglis and Foster published in *Journal for Research in Mathematics Education*, Jinfa Cai summarized trends in the past 50 years of mathematics education research. Next, Arthur Bakker presented a recent survey published in *Educational Studies in Mathematics* about the future of mathematics education research. Anna Sfard compared this survey with an earlier survey for ICMI. The presentations were discussed in the whole group, after which Jill Adler highlighted a few points she considered relevant.

Keywords: Mathematics education research; ESM; JRME; Research into practice; Online teaching and assessment.

1. Theme and Description

Mathematics education research as a discipline has been celebrating several milestones. One example is that *Educational Studies in Mathematics (ESM)* and *Journal for Research in Mathematics Education (JRME)* have recently celebrated their 50th anniversaries. Fifty years is a small step for human history but a giant leap for mathematics education research journals. To mark this auspicious occasion, this Discussion Group has focused on the future of mathematics education research.

We have used an international survey — conducted before and during the pandemic — as the basis of the discussion (Bakker et al., 2021). The survey is based on one single question before the pandemic (2019): *On what themes should research in mathematics education focus in the coming decade? During the pandemic (November 2020), we asked respondents: Has the pandemic changed your view on the themes of mathematics education research for the coming decade? If so, how?* We have reported the survey results and also provided a list of research challenges that are informed by the themes and respondents' reflections on mathematics education research (Bakker et al., 2021). In particular, we discussed the impact of the pandemic on the shape of mathematics education and mathematics education research, including increased attention to issues such as online assessment and pedagogical considerations for virtual teaching.

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2. Activity Overview

Due to pandemic, the DG was organized both in person and online. On the basis of Inglis and Foster (2018), Jinfa Cai started the DG. Inglis and Foster (2018) analyzed the full text of all articles published in *ESM* and *JRME* (up to 2015). Jinfa Cai quoted the major findings from their analysis, and showed the social turn in mathematics education research. Jinfa Cai has also pointed out the decline of experimental studies in the past two decades in both mathematics education journals. The findings from Inglis and Foster (2018) served as a basis for looking into the future for mathematics education research.

Then, Arthur Bakker reported the results from an international survey (Bakker et al., 2021). The responses from 2019 were summarized in nine themes: (1) Approaches to teaching, (2) Goals of mathematics education, (3) Relation of mathematics education to other practices, (4) Teacher professional development, (5) Technology, (6) Equity, diversity, and inclusion, (7) Affect, (8) Assessment, and (9) Mathematics education research itself. In relation to the pandemic, most respondents considered the importance of their themes to be reinforced. Only few extra themes were added in the 2020 round of the survey. One question raised was whether new theories were needed due to the drastically new situation of large scale emergency remote teaching and online learning.

In 2005, Sfard published results from a survey result on Relations between Mathematics Education Research and Practice. Scholars were invited to reflect on the question of how research has been informing the practice of mathematics education over the last decade. Anna Sfard summarized the findings from the survey and discussed the survey results from Bakker et al. (2021) in terms of teaching, theories, and technology.

The DG were then divided into two groups: one in person led by Jiushi Zhou and one online led by Arthur Bakker and Jinfa Cai. The DG addressed several points, after which Jill Adler addressed the question of what ICMI can learn from the various studies and comments. One point discussed by Adler was the tension between identifying inequity or injustice on the one hand and perpetuating it on the other. For example, it is useful to know about so-called achievement gaps between various student groups to be able to improve education for lower scoring students. However, objectification of differences in terms of gaps can also have negative effects such as reinforcing existing stereotypes (Akkerman et al., 2021). For example, in Sweden Svensson et al. (2014) observed that immigrant parents believed they could never help their children as well as Swedish parents. How do we point to problematic differences in terms of for example gender, race, or ethnicity, without perpetuating the problem? We elaborate on a few directions and suggestions in the following section.

3. Future Directions and Suggestions

The results from the discussion could be summarized into the following three future directions and suggestions. The first is to increase the international collaboration.

While there is an increased international collaboration in the past a few decades, continuous effort is need. Bakker et al. (2021) reported the limitations of their survey:

The survey results are limited in two ways. The set of respondents to the survey is probably not representative of all mathematics education researchers in the world. In that regard, perhaps scholars in each country could use the same survey questions to survey representative samples within each country to understand how the scholars in that country view future research with respect to regional needs. The second limitation is related to the fact that mathematics education is a very culturally dependent field. Cultural differences in the teaching and learning of mathematics are well documented. Given the small numbers of responses from some continents, we did not break down the analysis for regional comparison. Representative samples from each country would help us see how scholars from different countries view research in mathematics education; they will add another layer of insights about mathematics education research to complement the results of the survey presented here (p. 19).

Through future international collaboration, scholars from different countries can zoom into the critical issues for future research in mathematics education. One theme where we noticed differences in focus was that of equity and justice (commonly mentioned by respondents from North and South America) and diversity and inclusion (more commonly used terms in some other continents).

The second is to improve the contribution of research to educational practice. Both ESM and JRME were founded with a charge to disseminate significant research to improve educational practice in mathematics. Impact of research on practice is a longstanding issue (Cai et al., 2017; Sfard, 2005), and there is discussion whether it is wise to think in terms of impact (Akkerman et al., 2021; Fielding, 2003). Yet participants recognized the continued effort for connecting research and education practices. The participants discussed three possible strategies to make progress of improving the relevance of research to practice: (1) Identify and understand the fundamental reasons for the divide between research and practice in different countries; (2) Identifying successful teaching practice informed by research in different countries; and (3) Examine the successful teacher-researcher partnership in various countries.

The third is to capitalize on aspects of technology for research and practice in mathematics education. Because of the pandemic, lessons have been delivered online and assessments have been conducted online as well. The participants particularly discussed the three issues mentioned in Bakker et al. (2021): (1) The importance of studying the use and influence of low-tech resources in mathematics education such as podcasts, radio, WhatsApp, or WeChat; (2) The need to systematically investigate any possible effect of administering assessments online as researchers have found a differential effect of online assessment versus paper-and-pencil assessment; and (3) The need to rethink social interactions between students and/or teachers in online settings but also study how to engage and motivate students in online settings.

4. Summary

In this changing world, the only thing does not change is change itself. As a discipline mathematics education research is maturing, we need to continuously make efforts for looking into the future: What do we need now and in the future? Akkerman et al. (2021) propose to focus on actuality and generativity. Thus, when the discussion of the future of mathematics education research continues, encouraging and supporting high-quality research that makes a difference for practitioners also continues!

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