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Introduction to the papers of TWG27: The Professional Practices, Preparation and Support of Mathematics Teacher Educators

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Rationale

Thematic Working Group 27 focuses on research concerning the role of Mathematics Teacher Educators (MTEs) in fostering mathematics teacher learning, both during the pre-service and the in-service periods of teachers' careers. The need for this group emerged in CERME11, when several papers submitted to TWG18 (Mathematics teacher education and professional development), focused on teacher educators. The rationale for opening a new group for this topic stemmed also from the accumulation of research on MTEs witnessed in recent years. This growing interest is reflected in conferences (e.g., Educating the Educators), books dedicated to MTEs (e.g., Goos & Beswick, 2021), journals and special issues on MTEs' professionalization and their role in scaling up sustainable interventions (e.g., ZDM 46(2), 2014; ZDM 47(1), 2015; Int. Jr. of STEM Ed. 4(27), 2017; IJSME (1), 2021), and a host of papers focusing on this issue in leading journals such as ESM, JMB and JMTE. Our goal in creating this TWG is to support further development of this emerging field.

First steps of TWG27: The CERME12 meeting

As TWG27 is new, it met for the first time in CERME12. Twenty-three participants attended the TWG27 sessions, 16 contributions (13 papers and 3 posters) were presented and discussed. Figure 1 shows the distribution of contributions by countries, with about 57% coming from Europe, 25% from North America, 12% from South America and 6% from the Middle East.

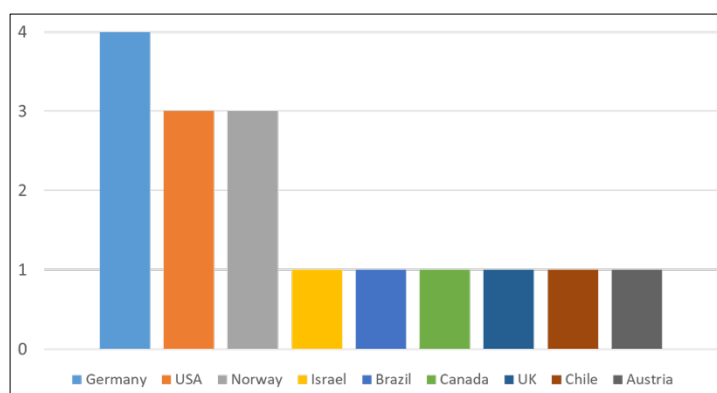


Figure 1: Distribution of contributions to TWG27 by countries

The call for papers proposed the following themes to initially form the scope and focus of the group:

1. Conceptualizing the profession of MTEs: Adapting theoretical frameworks from the teacher level to the MTE level; integrating generic and mathematical aspects within the work of MTEs;
2. Knowledge, beliefs, skills and practices of MTEs: Theoretical models and empirical studies;
3. Preparing MTEs (including formal and informal qualifications): Conceptual frameworks and empirical studies;
4. Designing professional development for MTEs; tools and resources for supporting MTEs;
5. Scaling up programs for mathematics teachers: Building institutional capacity through focusing on facilitators; institutional factors that support or hinder the effectiveness of PD facilitators;
6. The influence of current global issues on the role and practices of MTEs.

The majority of contributions related to themes 2, 3 and 4, one paper related to theme 6, and one to theme 5, while theme 1 was not directly addressed but mentioned in contributions with other foci.

A vocabulary note: MTEs are referred to in the literature by many different terms. For the purpose of coherence of the TWG27 work, we use the terms *facilitators* and *educators* to denote MTEs who support the learning of practicing teachers and prospective teachers, respectively.

Characterizing TWG27 contributions: A brief summary of different aspects

Main issues addressed

Theme 2 was the focus of many contributions, presenting studies on the knowledge, beliefs, skills and especially the practices of MTEs. Several papers focused on facilitators' practices with regard to different PD contents (e.g., conditional probability, Griese et al.; supporting at-risk students, Laschke et al.; algebraic thinking in early years, Ferreira et al.), while others centered on how PD goals are achieved (e.g., enacting norms, Schwarts et al.; modeling, Nolan; theory of change, Eriksen & Solomon). Different tools were suggested to examine MTEs' practices (e.g., scriptwriting tasks, Shure et al.; productive disciplinary engagement, Elliott & Lesseig; disruptive pedagogy, Bjerke & Nolan). Themes 3 and 4 were addressed by several contributions as well: Nieman et al. investigated how a tool, designed to provide insight into mathematics teachers' experiences within a PD course, can be used by facilitators to inquire into their facilitation practices. Rojas et al. examined the impact of "critical friendship" experiences between MTEs on their professional development, and Mayerhofer et al. introduced the idea of personas as yet another means to support MTEs. Bruns et al. investigated the effects of an extensive facilitator PD program, while Opheim et al. discussed the design of PD experiences for MTEs with varied backgrounds. Theme 5 was addressed by Seago and Knotts, who reported on asynchronous online video-based PD modules, which can be flexibly adapted to various facilitation formats, and are therefore highly scalable. Finally, Theme 6 was uniquely represented by Coles, describing MTEs' work with teachers who bring questions of global challenges into their classrooms.

Theoretical and conceptual lenses used

A range of theoretical and conceptual tools or lenses were used across the studies in this TWG. They can be categorized broadly into three groups (with some papers drawing on ideas across more than one group). In the first group are papers which drew on particular notions of teacher expertise, or

teacher learning, and used them to reflect on the role of the MTE. For example, Seago and Knotts drew on Ball and Bass's (2003) notion of Mathematics Knowledge for Teaching, as did Elliott and Lesseig (who particularly looked at Specialized Content Knowledge). Griese et al. used a model of teacher expertise in their study of facilitators, while Ferreira et al. used a model labelled Professional Learning Opportunities for Teachers, and Bruns et al. employed Prediger et al.'s (2019) three-tetrahedron model of professional development designed to investigate teacher learning. A second group drew on conceptualizations of MTEs' expertise. Shure et al. used Prediger et al.'s (2021) framework for the expertise of PD facilitators, and Laschke et al. used a model of teacher orientations which they develop into one of MTE orientations. Schwartz et al. analyzed facilitator decisions using a framework of MTEs' resources, orientations, goals and identity (Karsenty et al., 2021). There were fewer papers in this second group than in the first, perhaps reflecting the relative recency of theorizations of MTE expertise. Finally, some papers drew on theoretical frameworks that support the analysis of MTEs' actions and contexts. For example, Eriksen and Solomon used the notion of boundary objects (within Communities of Practice) to conceptualize MTEs' practices, and Elliott and Lesseig mobilized the notion of productive engagement. Rojas et al. conceptualized and analyzed the self-study of MTEs. Sharing a critical perspective, Bjerke and Nolan drew on ideas of disruptive pedagogy to study the practices of MTEs and Coles used ideas from critical mathematics education with the same aim. This diversity can be seen as reflecting how the study of MTEs often draws on ideas from the highly diverse field of the study of teachers. We view it as encouraging that conceptualizations of MTEs' practices are emerging and being shared.

Methodology employed in the studies reported

Most of the presented studies were small-scale studies, following a qualitative research paradigm, sometimes involving only single cases investigated in an in-depth manner, or self-studies (e.g., Nolan). Many of the studies used a variety of data sources to investigate MTEs' work. These included the following: interviews (Bjerke & Nolan; Eriksen & Solomon; Griese et al.; Nieman et al.; Seago & Knotts); facilitators' journal entries (Schwartz et al.); teachers' weekly online logs and teacher community walls (Seago & Knotts); written records from teachers and facilitators (Ferreira et al.); summative memos (Elliot et al.); audio and/or video data from PD sessions (Elliot et al.; Ferreira et al.; Laschke et al.; Schwartz et al.); dialogues from a scriptwriting task (Shure et al.); and video data from stimulated-recall interviews (Schwartz et al.).

As opposed to the aforementioned qualitative studies, Bruns et al. reported on a classical quasi-experimental intervention study, using quantitative methods to investigate the effects of facilitator PD on teachers' learning in the context of early mathematics education.

It can be conjectured that the focus of almost all the contributions on qualitative approaches is another indication that the field of research on MTEs is still emerging, with qualitative studies providing findings that can later be used as springboards to more diversified research approaches.

New emerging issues

Several issues emerged during the course of our group discussions. Here we summarize the most frequent ones.

- *MTEs' role in bridging between theory and practice.* We considered what conceptual lenses we might use to analyze MTEs' practices that support the link between theory and practice. One suggested idea for exploring this issue was to conduct a workshop in which participants use different lenses to examine sets of data from multiple projects.
- *The role of reflection as a learning mechanism for MTEs.* We identified several questions for future consideration, for example: How can MTEs use reflection to better attune their practices to teacher learning? How do issues of status and power influence MTEs' reflection with others such as their peers, researchers, and critical friends? What is the role of criticism or emotional reactions within MTEs' reflections?
- *Role-modeling as a practice used by MTEs.* We discussed the idea of modeling and the design of research that can address questions such as: How central is role-modeling to the practices of MTEs? To what extent do MTEs model the pedagogical practices that they support in theory? What are possible implications of a lack of coherence between the practices MTEs aim to support and the practices they use?
- *The role that TWG27 might play in moving the field forward.* As pointed out earlier, most studies reported in our group were small-scale, qualitative studies. We recognized the need to develop a more comprehensive picture of the field, for example by identifying areas of research that can benefit from larger-scale studies and an extended range of methodologies.

These issues, as well as other questions raised during the meeting, are reflected in the Call for Paper and Poster Proposals for CERME13.

In summary, the collection of TWG27 papers and posters presented in this volume reflects an effort to capture current themes within the developing research on the profession of MTEs. We look forward to the continuation of this group's activities in future ERME conferences and aspire to expand this TWG27 in terms of participants, represented countries, topics and types of studies.

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