

Thematic Working Group on Mathematics Teacher Knowledge, Beliefs and Identity, TWG20

ERME column regularly presented by Frode Rønning and Andreas Stylianides

In this issue presented by the group leaders Francesca Martignone, Miguel Montes, Miguel Ribeiro, Federica Ferretti, Veronika Hubeňáková, Nadia Kennedy and Jimmy Karlsson

CERME Thematic Working Groups

We continue the initiative of introducing the CERME Thematic Working Groups, which we began in the September 2017 issue, focusing on ways in which European research in the field of mathematics education may be interesting or relevant for people working in pure and applied mathematics. Our aim is to disseminate developments in mathematics education research discussed at CERMEs and enrich the ERME community with new participants, who may benefit from hearing about research methods and findings and contribute to future CERMEs.

In this issue, we introduce the CERME Thematic Working Group on Mathematics Teacher Knowledge, Beliefs and Identity, TWG20.

Introduction

The purpose of this report is to briefly present CERME's Thematic Working Group (TWG) 20 on Mathematics Teacher Knowledge, Beliefs and Identity. At CERME13 (Hungary, 2023) this TWG was led by the authors, inheriting the legacy of more than thirty scholars in the field who have led the group since it started in 2013. We start by briefly outlining the history of CERME TWG20, then present the main topics and ideas addressed in the Group and conclude with some reflections on the future of the Group drawing on the synthesis that has emerged from previous conferences.

TWG20 history

From 1998 to the present, each CERME conference has included one or more TWGs that deal with teacher education and practice. A group at CERME1, named "From a Study of Teaching Practices to Issues in Teacher Education," focused on a large span of issues, from teacher practices to teacher education. Over the years there has been an increasing interest in the latter, leading to a sizable increase in the number of researchers attending this TWG. Due to this interest and considering the different foci of research within teacher education, three new groups have been

constituted since CERME9 (2013), building on the original TWG: TWG18 "Mathematics teacher education and professional development"; TWG19 "Mathematics teacher and classroom practices"; and TWG20 "Mathematics teacher knowledge, beliefs, and identity." TWG20 is one of the most popular in CERME: since CERME9, 142 research papers have been presented by members of this group, including researchers from Europe and all other continents; at CERME13 for example, the TWG20 participants came from 16 different countries.

TWG20 topics

Teacher knowledge, beliefs and identity, their relationships, and their impact on professional practice and teacher education are the topics of attention by the TWG20 group. Since Shulman's work [8] and up to more recent research in mathematics education (e.g., [1, 2]), two major domains of content knowledge have been identified and studied: mathematical knowledge and pedagogical content knowledge. Professional knowledge, both mathematical and pedagogical, can have a powerful impact on the quality of mathematics instruction [3]. A key role is also provided by teachers' beliefs about teaching and learning mathematics [6]. In recent decades, there has been a growing interest in mathematics teachers' beliefs [5] and their relationship to teachers' knowledge. These issues are linked to studies on teacher identity. The latter reflects the way in which the teacher feels part of and in possession of agency within the community of teachers, as well as equipped to contribute to its development [9]. Many studies in mathematics education have adopted the conception of identity as based on the narratives that teachers "tell" about themselves as professionals: narratives provide a practical means to make identity accessible and investigable [4, 7].

Over the years, TWG20 participants have discussed and debated various issues related to teacher knowledge, beliefs and identity, ranging from theoretical to methodological perspectives and approaches, while keeping in mind the role and impact of such research on mathematics teacher education, with the goal of improving students' mathematical thinking. While at the beginning

of the TWG the focus was mainly on models concerning teacher knowledge, recent CERMEs have seen an increase in contributions concerning the role and impact of such knowledge on mathematics teachers' beliefs and their effect on practice. As such, the relationship between teachers' knowledge, beliefs, and identity is increasingly considered.

TWG20 future

Over the last years, TWG20 discussions have focused mainly on two ideas. First, there is a concern with how context, and therefore, cultural issues, impact on teachers' knowledge, beliefs and identity. Second, the discussions have revolved around the fact that research often implicitly suggests that teachers should have strong specialized knowledge (mathematical and pedagogical), with a coherent belief system, based on a well-developed professional identity. As a consequence, discussions have moved to an inquiry into how much one should and can demand of both pre-service and in-service teachers in order for them to develop the skills and dispositions of teaching for mathematical understanding. These two core ideas have led, in the medium term, to a discussion about what standards are necessary to ensure the mathematical quality of the instruction that teachers provide. To meet this challenge, research focusing on tasks for teacher education is one of the cornerstones of the group's developing agenda, as it provides an opportunity for participants to discuss reachable teacher standards (both in pre-service and in-service teacher education). Also, research on tasks is useful in identifying issues that should be addressed in order to further deepen and clarify the field's understanding of the role of mathematics teachers' knowledge, beliefs, and professional identity for effective mathematics teaching. A topic that has not yet been explored in depth, but which could be the subject of future discussions within the group, is the knowledge and beliefs of mathematics teachers in tertiary education. The research shared in TWG20 on tertiary education has focused mainly on university teachers involved in courses for future mathematics teachers, but, given the nature of mathematics taught in tertiary courses, such as engineering and other science programs, it could be an interesting and fruitful field of study.

References

- [1] D. L. Ball, M. H. Thames and G. Phelps, [Content knowledge for teaching: What makes it special?](#) *J. Teach. Educ.* **59**, 389–407 (2008)
 - [2] J. Carrillo-Yañez, N. Climent, M. Montes, L. C. Contreras, E. Flores-Medrano, D. Escudero-Ávila, D. Vasco, N. Rojas, P. Flores, Á. Aguilar-González, M. Ribeiro and M. C. Muñoz-Catalán, [The mathematics teacher's specialised knowledge \(MTSK\) model.](#) *Res. in Math. Educ.* **20**, 236–253 (2018)
 - [3] H. C. Hill, M. L. Blunk, C. Y. Charalambous, J. M. Lewis, G. C. Phelps, L. Sleep and D. L. Ball, [Mathematical knowledge for teaching and the mathematical quality of instruction: An exploratory study.](#) *Cogn. Instr.* **26**, 430–511 (2008)
 - [4] R. Kaasila, [Using narrative inquiry for investigating the becoming of a mathematics teacher.](#) *ZDM* **39**, 205–213 (2007)
 - [5] R. A. Philipp, Mathematics teachers' beliefs and affect. In *Second handbook of research on mathematics teaching and learning*, pp. 257–315, Information Age, Charlotte, NC (2007)
 - [6] J. P. Ponte, Teachers' beliefs and conceptions as a fundamental topic in teacher education. In *European Research in Mathematics Education I.III*, pp. 43–50, Forschungsinstitut für Mathematikdidaktik, Osnabrück (1999)
 - [7] A. Sfard and A. Prusak, [Telling identities: In search of an analytic tool for investigating learning as a culturally shaped activity.](#) *Educ. Res.* **34**, 14–22 (2005)
 - [8] L. S. Shulman, [Those who understand: Knowledge growth in teaching.](#) *Educ. Res.* **15**, 4–14 (1986)
 - [9] E. Wenger, *Communities of practice: Learning, meaning, and identity.* Cambridge University Press, Cambridge (1998)
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- Francesca Martignone is an associate professor of mathematics education at the University of Eastern Piedmont. Her research interests include teacher knowledge, teacher education, and assessment. She was the former leader of CERME TWG20.
francesca.martignone@uniupo.it
- Miguel Montes is a senior lecturer of mathematics education at the University of Huelva, focusing on teacher education and problem posing and solving. He currently leads CERME TWG20.
miguel.montes@ddcc.uhu.es
- Miguel Ribeiro is an associate professor of mathematics education at the State University of Campinas. He researches teachers' knowledge, professional development, and education tasks. He was a leader of CERME TWG20.
cmribas78@gmail.com
- Federica Ferretti is an associate professor of mathematics education at the University of Ferrara. She focuses on assessment, large-scale assessments, and teacher development. She coordinates the Ferrara University Center for Teacher Education.
federica.ferretti@unife.it
- Veronika Hubeňáková is an assistant professor at Pavol Jozef Šafárik University in Košice, Slovakia. Her research includes teacher knowledge and future teacher preparation. She co-leads the Slovak National Center for Digital Transformation of Education and also CERME TWG20.
veronika.hubenakova@upjs.sk
- Nadia Stoyanova Kennedy is a professor of mathematics education at the New York City College of Technology of the City University of New York (CUNY). Her research centers on the philosophy of mathematics

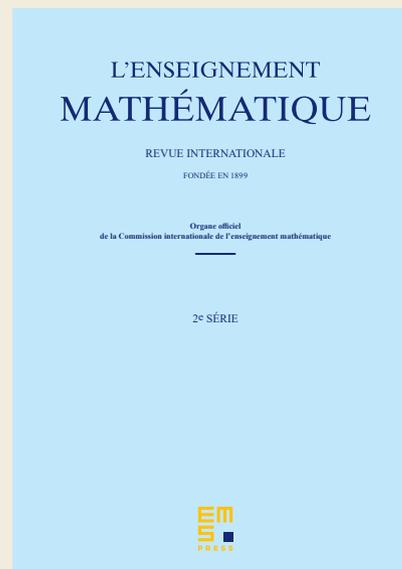
education, dialogic teaching, and teacher professional identity, with a focus on critical approaches. She is a former co-leader of CERME TWG20.

nkennedy@citytech.cuny.edu

Jimmy Karlsson is a PhD candidate in mathematics education at Karlstad University. He studies students' mathematical knowledge development, focusing on cognitive activation and classroom practices.

jimmy.karlsson@kau.se

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