Editorial RIPEM 2017 thematic issue

Education of teachers for the teaching of mathematics in the 21st century

The *International Journal for Research in Mathematics Education* – RIPEM – devotes its 2017 thematic issue to ***Education of teachers for the teaching of mathematics in the 21st century***. This special issue targets research addressing mathematics teacher education for those who teach mathematics at any students' levels, from kindergarten to higher education, taking into consideration the characteristics, possibilities and challenges of the 21st century.

Mathematics teacher education can be conceptualized, in one hand, as an interaction process between teacher educators and (student) teachers, also including systematic interactions among teachers aiming at professional growth concerning the teaching of mathematics, and, on the other hand, as a learning environment for all people involved in this interaction process. Teacher education takes part in social, organizational and cultural contexts, being affected by them, namely by the conditions and resources at schools or by the curricular guidelines about mathematics teaching. These contexts are dynamic and have evolved significantly in the 21st century.

The overall goal of mathematics teacher education can be assumed as the necessary preparation for the practice of mathematics teaching, in case of pre-service education, or the improvement of the quality and adequacy of teachers' practice of mathematics teaching, in case of institutionalized in-service education or initiatives for promoting professional development, developed as school projects or large scale programs. In any case, it comprises the acquisition of specific knowledge and skills for teaching mathematics nowadays and the development of beliefs and attitudes favorable for mathematics teaching, including the raising of high expectations about students learning of mathematics framed by the guidelines of mathematics curriculum for the 21st century.

The quality of teacher education is an issue of crucial influence of teachers' practice of mathematics teaching at any level. Many countries have invested in reformulating their initial and continuing training programs in order, for example, to establish better connections between theory and practice, to take into account the importance of teachers' collaboration and to articulate teachers training with the current technologies at disposal.

There is a strong need for additional knowledge to inform our further understanding of the research being done nowadays in mathematics teacher education, considering initial education, in-service teacher education and professional development.

The articles included in this journal contribute to our knowledge of the state of the art of research in teacher education. The first five articles report on empirical research that is being developed by researchers and teachers in Brazil, Portugal and Spain and the last article consists in a theoretical essay that advances a proposal concerning teacher education. The

majority of the articles focus on the development of professional knowledge for teaching mathematics but some of them also stress the importance of the development of positive attitudes concerning mathematics teaching. Four of the articles are concerned with the context of initial training, and the other two are more generic and can be considered in relation with any context of teacher development.

The article "Shared Teaching Practices: Integrating Experiential Knowledge into Pre-Service Mathematics Teachers' Education" reports from a research project – Shared Teaching Practices – developed in the context of a mathematics teachers' undergraduate degree program that aims to integrate professional knowledge emerging from school practice as a formal component of pre-service undergraduate mathematics teachers' education, and shows how the prospective teachers changed their perception regarding their own professional disciplinary body of knowledge and the role of this body of knowledge in their formal pre-service education.

The article "A 'Glocal' Lesson Study: The Case of Pedagogical Practices in Mathematics" discusses the education process and the professional learning in the context of a prospective teacher education course, Pedagogical Practices in Mathematics, that aimed to problematize the teaching and learning practices in the school and developed the activities using the Lesson Study methodology. The study highlights the contributions of the education course for several aspects of teacher professional knowledge, namely the socialization and joint discussion of the planning and the execution of the class concerning chosen topics and the systematization of the lived experiences by the prospective teachers.

The article "Prospective Teachers' Statistical Thinking in Technology Enhanced Inquiry in the Context of an Integrated Approach" reports a research conducted in two curricular units of a basic education course that used education learning scenarios, taking advantage of an integrated curriculum approach and of the use of technologies, to promote the development of statistical thinking of prospective teachers. The results of this study validated the importance of the implemented scenarios for the development of students' reasoning about data representation and associations and revealed that the meaning of mean is a critical aspect for the students.

The article "Attitudes towards Mathematics in Pre-Service Teacher Training: a Comparative Study Between Spain and Portugal Focusing on Anxiety" refers to a research conducted in the context of a larger project involving several Ibero-American countries — Attitudes towards Sciences and Mathematics — and studied the association between anxiety and gender, stage of education and country of a large scale Portuguese and Spanish elementary prospective students of two higher education institutions. The results revealed differences between the two countries student's level of anxiety after initial years of teacher education, and recommend further cross-country comparative research examining the stability of those findings; and whether the pedagogies used throughout teacher training contribute for the enlargement or for the remission of anxiety towards mathematics.

The article "Mathematics Teacher's Specialized Knowledge (MTSK) in the 'Dissecting an equilateral triangle' Problem" proposes a model to analyze mathematics teachers' knowledge

from the perspective of what is peculiar to teaching mathematics, and gives an example of its application to the knowledge deployed by a secondary school teacher during a lesson working through a problem with her students. The analysis offers a summary of the advantages of the model in detailing the elements of specialized knowledge displayed by the teacher and illustrates how this knowledge enables her to plan highly productive learning opportunities for her students.

The article "Competencies as Resources for Responsible Subversive Mathematics Teachers Programs" is a theoretical essay presenting suggestions for competencies that should be cultivated by mathematics teachers, namely the competence of criative insubordination and responsible subversive pedagogical cction, which can be seen as critical in the development of teachers, both in teacher education programs and in professional development courses.
We hope that the readers can find interest in this collection of articles, and that they can inspire further research in the domain of teacher education.

The invited editors,

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