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Editorial

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Knowledge to Teach and *Knowledge for Teaching*: New Theoretical-Methodological Contributions to the Research on Teaching and Mathematics Teacher Training

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This issue of *Pedagogical Research* collects eight texts that share a common objective: to analyze, through history, the mathematics harnessed in teaching and in teacher training. The texts discuss the relationships between the disciplinary field of mathematics and the field of education.

The studies included here highlight the importance of historical analyses as a form of knowledge for educators who teach mathematics. Among many research projects on mathematics teacher training, a common characteristic is the discussion about the nature of the mathematics harnessed in teaching and in teacher training. What type of mathematics should be used to train teachers so that they are able to perform better teaching work with their students? The studies contained in this issue of *Pedagogical Research* aim at answering that question based on historical analyses, which are connected to investigations on the processes and dynamics of the production of new knowledge, of new types of mathematics focused on teaching and teacher training. This is the objective of the text written by Professor Rosilda Morais, who highlights the role played by experts in education and the production of *mathematics to teach* and *mathematics for teaching*.

Following the same line of thought as Morais, Professor Wagner Valente introduces theoretical-methodological elements for studying *mathematics to teach* and *mathematics for teaching*. According to him, the study of the historical relationships between the two forms of mathematics provides confirmation of changes in mathematics teachers' professional knowledge.

The study by Professor David da Costa harnesses the concepts of *knowledge to teach* and *knowledge for teaching* and analyzes guidelines on pedagogical practice published in journal articles in the late 19th century. In his analysis, Professor David da Costa shows the complexity of the relationships established between the two forms of knowledge by taking into consideration the pedagogical trend that prevailed at each historical moment.

Also based on theoretical-methodological tools that investigate the production of knowledge for mathematics teaching and teacher training, Barbara Novaes, Danilene Berticelli and Neuza Pinto discuss pedagogical manuals published between the 1930s and the 1970s. In the manuals, the three authors emphasize the guidelines for using teaching/learning materials. Their study systematized professional knowledge related to *fractions*.

Professor Encarna jiménez's study contains an investigation into the discipline of Methodology of Mathematics, which was established in Spain in the 1930s in order to train teachers to work with the early grades of primary school. Her analysis takes knowledge to teach and knowledge for teaching into consideration.

Portuguese Professor José Matos conducted a study on a theme that is similar to Spanish Professor Jiménez's: he analyzes the discipline of Methodology of Mathematical Sciences in the early decades of the 20th century. Based on accounts given by teachers who taught the discipline and on the didactic procedures they adopted, the author describes the construction process of professional knowledge in secondary school mathematics teachers in Portugal.

The international movement *New Math*, which started in the 1960s, is discussed in a study by Professors Denise França and Edilene dos Santos. They discussed the use of teaching materials in the process of systematization of knowledge *to teach* and *for teaching* the new mathematics.

Finally, Professor Iran Mendes's study shows the rich possibilities of using the History of Mathematics as a teaching element in basic school. With a focus on the disciplinary field of mathematics, the author takes on the challenge of discussing the didactic and formative aspects of mathematics, by approaching the History of Mathematics, and treating the curricular themes of the discipline with rigor.

In recent decades, research on the knowledge that must be part of teacher training has grown exponentially. There is strong evidence that Lee Shulman's work has been a landmark for studies since the 1980s. Based on it, typologies of knowledge that is

part of the training of future teachers have been developed. The studies presented in this issue of *Pedagogical Research* collect research work related to this growing movement of analyzing teacher training knowledge. More specifically, the studies discuss teachers' mathematical training through historical investigations.

The articles contained in this edition share a common theoretical-methodological base, which emphasizes the existence of knowledge of two distinct natures: knowledge to teach and knowledge for teaching. Such knowledge justifies the theoretical elaboration of two types of knowledge regarding mathematics teacher training: *mathematics to teach* and *mathematics for teaching*. *Mathematics to teach* constitutes a teacher's object of work, whereas *mathematics for teaching* should be seen as a teacher's working tool. These two categories have proved to be important for historical studies, leading researchers to analyze the constitution of the mathematics harnessed in teaching and in teacher training. With them, it has been possible to better characterize professional teaching knowledge, the knowledge shared by educators who teach mathematics: a relationship between mathematics to teach and mathematics for teaching. In this case, professional knowledge refers to training connected to teaching, that is, the mathematics in teacher training connected to the mathematics that is harnessed in classrooms. The articles in this issue show how these distinct types of knowledge are interconnected in specific historical periods.

I hope you enjoy it!

Wagner Rodrigues Valente
Guest Editor