

Editorial – 2020 Thematic Issue

Research Methodology in Mathematics Education: directions and perspectives

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The idea of proposing a publication on research methodology in Mathematics Education emerged from the discussions on this theme in the events in the area and in the research groups with which we have contact and in which we have participated over the past few years. The first reflection of this concern arose in 2019, within the scope of the PEA-MAT research group, with the organization of a book that dealt with important aspects related to this theme. The second is now consolidated with the publication of the twenty-three articles that make up this thematic edition.

Far from representing a consolidated theme with an immovable basis, which would make the debate meaningless, the methodology is configured as a relevant and alive topic, that is, one that remains in motion. The perspective that seemed most feasible and useful, in relation to the theme, would be to open the possibility that the reflections and research involving research methodology in Mathematics Education would be presented as a mosaic, from which the different proposals could find representation.

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In this sense, how could we understand the articulation between the texts? Could we expect the breadth of the initiative, which could encompass countless approaches, to find points of contact, overlaps, connections between written productions? The answer to these questions was foreseen in the way we saw the theme, considering the methodology as an essential element in all scientific research and understanding that the notions related to the design of a study define outlines, cutouts, procedures, data collection techniques, configurations for analysis, among other axial choices for the structure of an academic work.

The reading of the articles that make up this thematic edition shows that, even in the midst of a certain diversity in approaches, the structural meaning given to the methodology remains. This means that it is possible to perceive that the framework that guides the investigation from which each of the texts presented resulted has its bases firmly placed on adequate methodological assumptions, coming from plans that are both careful and flexible. The qualitative approach appears prominently, showing, through the typical designs of each study, its procedural and reconstructive aspect. Reflections on structural aspects of the methodology also take place, including critical propositions and analyzes.

This is the case, for example, of the article by Michèle Artigue, which promotes a questioning of research methodologies in didactics. After an introduction, placing this questioning in the history of the research field, and the methodologies within the research praxeologies, the author first deals with didactic engineering, an emblematic methodology stemming from the will of didactics to develop research methods that meet their specific needs. The author examines the relationship between didactic engineering and design-based research, including the case of cooperative didactic engineering. Then, she considers several methodological developments linked to the evolution of didactic problems and theories and technological research means, before addressing, in a final section, these methodological issues from the point of view of the relationship between research and didactic action.

Likewise, Bernardete Angelina Gatti presents some of the concepts that are observable, explicitly or underlyingly, in descriptions of research in mathematical education, which guide its development, purposes and results. The author shows that the highlighted concepts are intertwined with several possible ways and paths to collect data and analyze what is obtained in investigations regarding teaching and learning situations or training processes of different natures and levels. There is no hierarchy between them, they are not necessarily mutually exclusive and each one brings contributions to be considered within the limits of their perspectives.

Verilda Speridião Kluth aims to clarify the links of the philosophical current called "Phenomenology" with the phenomenological research methodology - the Meaning Network, which runs through phenomenological principles and the elaboration of a thinking about the science of language, presenting a way of understanding it by being inspired by Merleau-Ponty's thoughts and their application in research contexts that take testimonies as their raw material, that is, as the pre-reflective of research.

In an article that deals with the initial training of researchers, based on investigation that involves epistemological and didactic aspects, Gerson Pastre de Oliveira describes the interactions of a group of master's students who have the challenge of composing the initial elements of their dissertations, with emphasis on problematization, and who engage in a collaborative proposal as a strategy to foster the development of the texts they need to write. The research methodology in Mathematics Education is, in this work, discussed and analyzed from the perspective of scientific texts under construction.

Within the theme of this issue, some of the articles present studies related to documentary or bibliographic approaches. The article by Reinaldo Feio Lima, André Luis dos Santos Menezes and Neomar Lacerda da Silva, which assumes this characteristic, analyzes the theoretical and methodological perspectives of the scientific production of the works published

in Working Group 19 (Mathematical Education), of the National Association of Post-Graduation and Research in Education (ANPEd) in the period from 2015 to 2019.

Also, in a bibliographic perspective, the article by Ana Elisa Pillon, Leila Regina Techio, Vania Ribas Ulbricht and Márcio Vieira de Souza seeks to identify whether Digital Information and Communication Technologies have been used in the mathematics teaching-learning process in the final years of elementary school. The study was done using an “integrative literature review” from the CAPES portal and consultations with the Scopus, Web of Science and Scielo databases in the ten-year period, from 2008 to 2018.

Still in a bibliographic approach, the work of Luiz Otavio Rodrigues Mendes and Ana Lucia Pereira presents a systematic review covering the area of Teaching and Mathematical Education, based on a detailed proposal on how to carry out this type of study.

Juliana Gabriele Kiefer and Rita de Cássia Pistóia Mariani's article aims to map studies carried out from the theoretical and methodological perspective of meta-analysis in the field of Mathematics Education, available at the Brazilian Digital Library of Theses and Dissertations (BDTD), with emphasis on institutional, procedural and thematic aspects, as well as analyzing two meta-analysis investigations that address concepts of perimeter and area.

Under another methodological perspective, the article by Bruna Mayara Batista Rodrigues and João Pedro Mendes da Ponte presents the results of a research inserted in an intervention cycle of Design-Based Research (IBD) on the development of didactic knowledge of Mathematics teachers with Statistics as a structuring theme.

Another article, by João Alberto da Silva and Cristina Cavalli Bertolucci, discusses the importance of interviews with children to investigate mathematical knowledge through an essay that seeks to analyze relationships between epistemology and methodology in the exercise of this data production for research. The text discusses the characteristics of this approach, which is based on the Piagetian Clinical Method.

The text presented by Neuma Teixeira dos Santos, Roberta Modesto Braga and Adilson Oliveira do Espírito Santo describes an investigation that was based on a modeling activity, structured based on the seven knowledges indicated by Edgar Morin in the context of the theme “setting in the mangrove”. The research was carried out with a short course involving students of different degrees, as well as university and community teachers. Through the description of the observations made in the field, and considering the reports and questionnaires produced by the subjects, it was possible to perceive that all actions was linked with the principle of complex thinking and the modeling occurred freely, showing that, even that not defined a priori its stages were present throughout the process.

Antonio Peixoto de Araujo Neto and Suélen Rita Andrade Machado have institutional history as the central theme of the article they present. As a main approach, the authors use a bibliographic study to characterize five fields of research on the theme of Institutional History, namely: Institutional History via personas; Institutional History via curriculum; Institutional History via contexts; Institutional History via influences and exchanges; and Institutional History via protocols and / or documents. The analyzes presented indicated that the Institutional History field via personas was chosen by all the consulted researches, which, according to the authors, highlights the potential of Oral History.

Maria Isabel Ramalho Ortigão and Carlos Augusto Aguiar Junior present a text that analyzes the relationships between qualitative and quantitative approaches or macro and micro relationships in research in Mathematics Education developed in graduate programs in the last ten years. The discussion is based on a search for the Capes collection, in order to perceive articulations between these research spaces. Among other proposals, the article seeks to analyze and highlight the nature of the links between methodological approaches and academic productions in the researched context.

Mariana dos Santos Cezar, Samuel Rocha de Oliveira and Rodolfo Chaves bring an article that aims to reflect on how Critical Mathematics Education has been discussed in teaching processes and in the pedagogical practice of teachers in the early years of elementary school. The authors present an exploratory study carried out from the mapping of Brazilian scientific productions that approached the teaching of Mathematics in a critical perspective.

The study that Vilmar Ibanor Bertotti Junior and Janaína Poffo Possamai bring in the article they present was intended to analyze the implications of Digital Technologies of Information and Communication in remote and synchronous classes for the approach of the Teaching-Learning-Assessment methodology of Mathematics through Problem Solving.

Flavio Augusto Leite Taveira and Deise Aparecida Peralta prepared a text as a result of the investigation they undertook, whose objective is to present a proposal for analyzing the discourse present in curricular documents, based on the Discursive Ethics of Jürgen Habermas. The authors present an explanation of curriculum documents, as well as discuss the concept of Habermasian Discursive Ethics, illustrating the proposal with an analysis of excerpts from the Common National Curriculum for Teacher Education.

The article presented by Fernanda Angelo Pereira, Fabiano dos Santos Souza and Chang Kuo Rodrigues addresses a proposal for a better understanding of the notion of variability through videos with the theme "statistical education". The videos, created with a focus on concepts that involve the understanding of variability, were analyzed by teachers and students by means of a validation instrument, characterized by a questionnaire that addressed different characteristics of the productions. The collected data were analyzed using the similarity analysis method with the support of the CHIC software (Implicative and Cohesive Hierarchical Classification).

Barbara Lutaif Bianchini and Gabriel Loureiro de Lima present an article that describes a documentary investigation, consisting of a mapping, which aimed to identify the

methodological approach adopted by authors of scientific articles with the theme "teaching and learning Algebra in Higher Education", published in *Education Mathematics Research Journal* between 2010 and 2020.

Jonatha Daniel dos Santos and Heitor Queiroz de Medeiros bring an article in which they describe a qualitative research that aimed to present some theoretical and methodological paths used in a doctoral research carried out with the Tupari indigenous group, located in the State of Rondônia, Northern Region of Brazil, considering the possibility of proposing reflections on methodologies that can collaborate for research in Mathematics Education.

The text written by Bárbara Fontes and Marcelo de Carvalho Borba brings a study that composes, according to the authors, a mosaic of textual productions that address the theme "Research Methodology and digital technologies", with the objective of presenting the qualitative analysis of a video with mathematical content produced by undergraduate students in Mathematics at the Federal University of Mato Grosso do Sul in distance learning, based on an adaptation of the Documentary Method.

The article presented by Tânia Cristina Rocha Silva Gusmão deals with the Study and Task Design Cycle (STDC) as a research method directed to the study and design of mathematical tasks to guide, above all, the work of the teacher in classroom.

Closing this thematic edition, Milagros Elena Rodríguez's research is presented in rhizomes that are connected in a wonderful introspective complex: motivation, questions, justification and transmethodology; crisis of modernist methodological investigations in Mathematics Education; perspectives of transparadigmatic investigations in Transcomplex Decolonial Mathematics Education and the conclusions in the continuation of the line of research. In these conclusions, it is exposed how the transmethods enrich the complex and transdisciplinary Mathematics Education, because in the decoloniality as an indispensable

premise, categories such as eco-philosophy, diatopia, anthropolitics and anthropoetics emerge that give essences of mathematics as a scientific legacy of humanity.

That way, then, this thematic issue is constituted, which we present to the community of researchers, professors, students and all those interested in this relevant subject. Obviously, the discussions and propositions about this object will not have been exhausted, but, certainly, it will be possible to glimpse directions and perspectives in research in Mathematics Education until the moment when this compilation was constituted.