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Initial Training in Mathematics Education in the Pedagogy Course: Between Discussions and Proposals in GD4 of the VIII FPMAT

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Abstract: The aim of this article is to present the discussions that emerged in the Discussion Group 4 (GD4) Initial Training in Mathematics Education in the Pedagogy Degree, during the VIII National Forum for the Initial Training of Professors who Teach Mathematics, in 2023. Some notes on studies and research on the subject are presented first, followed by the organization of the GD4 and the main topics covered, which refer to: the curriculum of the pedagogy course; the knowledge of the pedagogue; internships; the integralization of the extension; PIBID and pedagogical residency; the profile of the pedagogical trainer; and the pedagogy course in the distance modality. The group also presents its recommendations and proposals, highlighting the importance of creating this space for discussion and encouraging new research on the training of professors who teach mathematics in early childhood education.

Keywords: National Forum for the Initial Training of Professors Who Teach Mathematics. Professors who Teach Mathematics in Early Childhood Education. Teacher Education.

Formación Inicial en Educación Matemática en el Curso de Pedagogía: entre Discusiones y Propuestas en el GD4 de la VIII FPMAT

Resumen: Este artículo tiene como objetivo presentar las discusiones surgidas en el Grupo de Discusión 4 (GD4) Formación Inicial en Educación Matemática de la Licenciatura en Pedagogía, durante el VIII Foro Nacional de Formación Inicial de Profesores de Matemáticas (VIII FPMat), en el año 2023. Para ello, inicialmente se realizan algunas notas sobre estudios e investigaciones sobre el tema, seguidas de la organización del GD4 y los principales temas tratados, que se refieren a: Currículo de la carrera de Pedagogía; conocimiento del pedagogo; etapas; pago de la prórroga; Programa Institucional de Becas de Iniciación Docente y Residencia Pedagógica; perfil del formador de pedagogos; y curso de Pedagogía a distancia. También se presentan direcciones y propuestas señaladas por el Grupo, destacando la relevancia de establecer este espacio de discusión e incentivar nuevas investigaciones en torno a la formación de docentes que enseñan matemáticas en la educación infantil y los primeros años.

Palabras clave: Foro Nacional de Formación Inicial para Profesores de Matemáticas. Profesorado que Imparte Matemáticas en Educación Infantil y Primera Edad. Formación de Profesores.

Formação Inicial em Educação Matemática no Curso de Pedagogia: entre Discussões e Propostas no GD4 do VIII FPMAT

Resumo: Este artigo tem como objetivo apresentar as discussões emergidas no Grupo de Discussão 4 (GD4) Formação Inicial em Educação Matemática na Licenciatura em Pedagogia, quando da realização do VIII Fórum Nacional de Formação Inicial de Professores que Ensinam Matemática, no ano de 2023. Para tanto, são trazidos, inicialmente, alguns apontamentos sobre estudos e pesquisas sobre o tema, seguidos da organização do GD4 e dos principais temas abordados, que se referem a: currículo do curso de Pedagogia; conhecimentos do pedagogo; estágios; integralização da extensão; PIBID e Residência Pedagógica; perfil do formador do pedagogo; e curso de Pedagogia na modalidade a distância. Também são apresentados encaminhamentos e propostas apontadas pelo Grupo, destacando-se a relevância da constituição deste espaço de discussão e o incentivo à novas pesquisas referentes à formação de professoras e professores que ensinam matemática para a educação infantil e anos iniciais.

Palavras-chave: Fórum Nacional de Formação Inicial de Professores que Ensinam Matemática. Professores que Ensinam Matemática na Educação Infantil e Anos Iniciais. Formação de Professores.

1 About training future professors to teach mathematics in early childhood education: an introduction to the topic[1]

Usually, the pedagogy course is highlighted in discussions in the field of mathematics education when they refer to questions about the acquisition of mathematical knowledge. Studies such as those by Gatti and Barreto (2009), Libâneo (2013) and Curi (2005) have shown that the majority of pedagogy courses have mathematics subjects with a methodological focus, few of which are based on learning content, and even those that have subjects with this focus have "specific content without the necessary depth to contextualize ways of constructing a given concept in the disciplinary field" (Gatti, Barreto, 2009, p. 126). In addition, there is still the idea that "students have already mastered this content from secondary school, which, as we know, is not the case" (Libâneo, 2013, p. 82–83). Also, "the training courses for multipurpose teachers can be criticized for the lack of specific knowledge related to the different areas of knowledge with which the future professor will work" (Curi, 2005, p. 160). Libâneo also explains that:

> In many of today's courses, there is an almost total absence of specific content in the curriculum (Portuguese, science, mathematics, history, etc.), with only the methodology of that content, as if it were natural to separate the content from the method of teaching it. How can we train good professors without mastering the specific knowledge that will be taught to children? (Libâneo, 2021, p.760)

In this context, we need to reflect on the possibilities of acquiring specific knowledge in the initial training course and its relationship with the future teaching practice of the student of pedagogy. We are not disregarding the importance of pedagogical knowledge, since we

[1] Throughout the text, we use the words "professor" and "educator" in the masculine gender for ease of reading, but without the intention of distinguishing between genders. Thus, they refer to professor or teacher; pedagogue or educator.

understand that both correspond to two fundamental requirements for the future pedagogue, which require

> the understanding of the structure of the subject taught, the principles of its conceptual organization, the investigative path by which the objects of knowledge are constituted, and, the pedagogical knowledge of the content, that is, how themes and problems can be organized and worked on so that they can be learned by the students. (Libâneo, 2010, p. 575)

What research has found is that the time allocated to mathematics needs to be increased if we expect them to teach mathematics, i.e., that the future professor

> broaden their knowledge of mathematics as a field of knowledge and not just "see" it as a school subject that discusses the nature of mathematical knowledge, its historical construction, the use of mathematics in contemporary society, and many other topics. It is essential to include the knowledge produced in the field of mathematics education in the training process of these professors (Curi, 2005, p. 176).

Concerns about the professor who teaches mathematics in the first years of schooling are not new, and research has already been produced, as can be seen in the study presented by Fiorentini, Passos, and Lima (2016), which presents a survey of Brazilian academic research on the professor who teaches mathematics from 2001 to 2012. In this study, Abrahão and Silva (2017) identified 59 theses and dissertations on this professor, which represent about 7% of the corpus of the project. In their analysis, these authors raise five important points indicated by the results, the first of which is related to the fact that most of the professors studied chose the pedagogy course because they associate it with what they identify as a vocation and associate their future profession with the possibility of improving school education in Brazil, which implies the expectation of an initial training that prepares them for this function. However, as a second point, it is clear that students of this degree do not feel prepared to teach mathematics after graduation, which is related to the third point, where research identifies numerous problems in the initial training. These include the low number of hours spent on this area of knowledge and the difference of opinion between theory and practice. The fourth point identifies the area of numbers and operations as the main cause of learning difficulties. Finally, the fifth point recognizes the importance of participating in study groups and collaborative groups as a way to improve training for teaching mathematics and to develop teachers' autonomy and emancipation.

Also looking at studies and research, Lopes and Alves (2021) present the results of the papers presented at the XIV Meeting of Mathematics Education in Rio Grande do Sul, which took place in 2021, under the heading of Training of Professors who Teach Mathematics. With specific reference to professors of early childhood education, some results confirm what has already been highlighted here, such as the fact that, although some knowledge has been produced, there is a need for more research on training, curriculum, training processes, and their practices regarding this level of education. Also, the importance of future professors participating in projects and groups that can provide promising experiences and studies for their training and the relationship between theory and practice - in carrying out practical experiences permeated by studies: can lead to learning and a differentiated relationship with mathematics. It was clear from the papers presented at the event that there is concern about the mathematical practices of teachers in the early years, an issue that is being discussed both in mathematics education and in teacher training.

It's important to emphasize that our concern with the initial training in the pedagogy course in relation to mathematics does not disregard the general problem of training, nor the specificities of this course, its identity, as well as the subject being trained.

Brzezinski (2017, p. 123), when discussing the identity of the Brazilian pedagogue, refers to some guiding principles for their training: the solid theoretical training of the professional pedagogue, the unity of theory and practice, collective and interdisciplinary work, the concept of democratic management, research as a pedagogical principle, among others. In their opinion, these principles represent both the importance of the social significance of the teaching profession and the fundamental conditions of professional practice, as well as constitutive elements for the definition of their identity or identities.

It is this context of teacher training and pedagogy that leads us to reflect on the possible contributions of the Brazilian Society of Mathematics Education (SBEM), especially the Working Group on the Training of Teachers who Teach Mathematics (WG-07), to the discussions on this topic.

At the VI National Forum for Undergraduate Mathematics Courses, held at the Federal University of Mato Grosso do Sul (UFMS) in 2017, the initial training of professors who teach mathematics in pedagogy courses was officially included in the SBEM undergraduate forum. In the final plenary session, it was decided to change the name of the event to the National Forum for the Initial Training of Professors who Teach Mathematics. This inclusion in the Forum is an important step in the recognition by the community of mathematics educators of the relevance of discussions on the training of professors who teach mathematics in early childhood education and in the early years. If on the one hand this has led us to recognize the fragility of the courses, on the other hand it has encouraged us to do more research and to take action to overcome the challenges. This article aims to present the discussions that emerged in the Discussion Group 4 (GD4) Initial Training in Mathematics Education in the Pedagogy Degree, during the VIII National Forum for the Initial Training of Professors who Teach Mathematics (VIII FPMat), in 2023.

2 About the VIII FPMat: the organization of the discussions

The event, organized by the Working Group on the Training of Professors Who Teach Mathematics (WG-07) of the Brazilian Society of Mathematics Education, took place from 30 November to 2 December at the Federal Institute of Piauí, Teresina Central Campus. The central theme was "National Policies for the Training of Professors Who Teach Mathematics: Reflections, Challenges and Proposals", and the aim was to highlight the challenge and the political commitment to affirm the teaching of basic education as a profession with its own knowledge and practices, as well as the challenge to guarantee a public, free, inclusive, secular and socially referenced education as a fundamental principle of democracy.

The GD-4 papers aimed to discuss the possibilities and limits of the initial training of professors who teach mathematics in early childhood education and the early years of primary school, in pedagogy courses, both in face-to-face and distance learning modalities, in the light of current public policies. It also seeks to problematize how the proposed training articulates with the guidelines of the mathematics curriculum and the training needs of the students for whom it is intended.

The discussions, which took place on two of the days of the event, were based on the synthesis of the Regional Forums for the Initial Training of Professors who Teach Mathematics (Lopes & Palma, 2023). Based on the records of the forums held in the states of Acre, Bahia, Ceará, Distrito Federal, Mato Grosso, Minas Gerais, Rio Grande do Sul, Rondônia, Roraima,

Santa Catarina, São Paulo and Tocantins, this synthesis raised questions about The curriculum of the pedagogy course and mathematical education, the spaces for mathematical education in the pedagogy course, the articulation between initial and continuing education/IESIs and the basic school, mathematical education in the distance pedagogy course, the profile of the teacher trainer who works in the mathematical education subjects in the pedagogy course, and the questions and proposals listed by the regional forums.

On the first day, a round of presentations was made with participants from different Brazilian regions: Amanda Marina Andrade Medeiros- UNB; Anemari Roesler Luersen Lopes- UFSM; Antônio Mauricio Medeiros Alves- UFPEL; César Augusto do Prado Moraes- UFPI; Débora Rodrigues Caputo- UFJF; Edda Curi- Universidade Cruzeiro do Sul; Kelly Cristine Rodrigues de Moura - UFPI; Marlene Terezinha Fernandes - ULBRA; Neila Tonin Agranionih - UFPR; Priscila Bernardo Martins - University of Cruzeiro do Sul; Silmara Bezerra Paz Carvalho - SEMED- Timon (MA); Vanessa Dias Moretti - UNIFESP.

It was noted that WG-07 had done some research on pedagogy courses in Brazil, including the study "*Initial Training for Professors Who Teach Mathematics with a Focus on the Ead Pedagogy Degree - 2019",* which started with a mapping of pedagogy courses based on data from e-Mec (https://emec.mec.gov.br). A total of 4,615 courses were identified, both active and inactive, offering more than 8,000,000 places. Of these, 3724 courses were active. The initial perception led to the realization that the vast majority of vacancies made available for pedagogy courses are concentrated in distance learning courses and, in this sense, the need to discuss the training processes made available in this modality. Of the 3,724 courses on the initial list, the research actually identified 1,712 active distance pedagogy courses, since many institutions have several hubs that use the same curriculum matrix, differing in the locations where they are offered. Finally, data were obtained from courses at 238 institutions, which were examined in terms of course workload; subject name; subject workload; semester in which the subject is offered[2].

With regard to the data on face-to-face pedagogy courses, an ongoing[3] study was cited, according to which the e-Mec website lists a total of 1,838 courses offering 246,524 places/year. The largest number is in the Southeast: 764 courses and 117,263 places, followed by the Northeast: 463 courses with 26,549 seats; the South: 245 courses with 26,549 seats; the Midwest: 197 courses with 24,945 seats; and the North: 169 courses with 21,498 seats. Thus, the Southeast is responsible for about half of the courses and seats. The arithmetic mean shows that the number of places per institution is greater than 100, taking into account that the courses per institution may be offered on more than one campus and in more than one class. Also, the state with the largest number of courses is São Paulo, with a total of 426 (74,069), while Acre has the fewest, 5 (470 places).

After this first moment, there was a discussion based on the summaries of the regional forums. It was pointed out that the contributions made in relation to pedagogy courses and mathematics education are extremely important in terms of the course curriculum and the mathematics education of future teachers; the spaces for mathematics education in the pedagogy course; the link between initial and continuing education/IESIs and basic education schools;

[2] More details about the research can be found in the dossier "Initial training of professors who teach mathematics with a focus on distance learning pedagogy degrees", in Revista DoCEntes., v.7, nº17, 2022. Available at https://revistadocentes.seduc.ce.gov.br/revistadocentes/issue/view/22

[3] Data provided by Maiara Luisa Klein's (PPGE/UFSM) ongoing doctoral research "The Curriculum of On-Campus Pedagogy Courses and its Intertwining with the Training of Professors who Will Teach Mathematics", organized from the e-MEC website.

mathematics education in distance pedagogy; and the profile of the teacher trainer who works in mathematics education subjects in the pedagogy course.

On the second day, the discussions continued and, in summary, some questions were raised, not with a view to answering them, but as a possibility to guide discussions on initial training in mathematics education in the pedagogy degree:

- What kind of training proposal can be designed to link education and training?
- How do professors who teach mathematics understand and develop their pedagogical practices?
- What is the purpose of the pedagogy course?
- What knowledge do future professors need to perform adequately?
- What is the profile of the student of pedagogy in relation to mathematics? What is the relationship between mathematics in undergraduate and graduate programs?
- What proposals can be made to increase the workload and experience in mathematics in the pedagogy course?
- How should mathematics subjects be developed in the pedagogy course so that future professors learn mathematics and learn to teach mathematics?
- How has the supervised practicum in the teacher education program covered mathematical training? What progress has been made, and what are the challenges?

All these questions served as food for thought, and although they led to many questions about training in mathematics education in the pedagogy course, a few topics were selected that received more attention, especially at this meeting: the pedagogy course curriculum; the pedagogue's knowledge; internships; the integralization of extension; PIBID and the pedagogical residency; the profile of the pedagogue's trainer; and the pedagogy course in distance learning. They will be discussed below, and then some recommendations and proposals derived from the discussions will be presented.

3 Themes present in the Forum's discussions: concerns about training in the Pedagogy course

The themes covered, and briefly discussed below, are intertwined with those already researched, as mentioned above, and others that emerge from changes in the National Curriculum Guidelines for Teacher Training and Programs that are part of the National Teacher Training Policy.

3.1 The Pedagogy curriculum and mathematical training

One of the main concerns about the curriculum of the training course for professors who teach mathematics can be summed up in the provocative question posed by Curi (2020, p. 16): "What mathematics should be offered in pedagogy courses and how should it be treated, given that the number of hours allocated to this subject is still small?

The teaching of mathematics in education courses has been extensively researched in recent decades. The data show that the very small number of hours makes it impossible to have theoretical and epistemological discussions about mathematical thinking, the disarticulation between specific knowledge and pedagogical knowledge, indicating that the pedagogical

projects of Pedagogy courses are quite broad and do not guarantee the training of the basic education professor that is desired (Curi, 2005, Serrazina, 2002). Sometimes, however, it seems that progress is being made in this direction.

> Even with the advances in studies on didactic theories and interdisciplinary curricula and on the need to build mathematical concepts from an early age, the research reveals that there are still few known possibilities for effectively developing mathematical training for Pemie [Professors who Teach Mathematics at the Beginning of Schooling]. The results of the studies imply that there is a need for more researchers in postgraduate programs involved in lines of research focused on the initial training of Pemie. We therefore suggest rethinking and encouraging research that can contribute to Pemie teacher training. (Abraão & Silva, 2017, p.110)

In addition, not all courses have a defined identity, leading to a broad curricular organization with little focus on training professors who will work in early childhood education and the initial years of elementary school. The influence of public policy and legislation must also be taken into account.

> The identities of the pedagogue, although not only because of this influence, are being delineated in our country under certain determinations of the policies for the training of education professionals that materialize in legal diplomas or normative instruments such as decrees, laws, ordinances, resolutions, opinions, and which are transformed into daily educational activities. (Brzezinski, 2017,p.123)

Another factor that deserves to be considered in future research is related to the fact that Pedagogy undergraduates (as well as others) have conceptual gaps stemming from their school career in Basic Education, a situation that may have been aggravated by the COVID-19 pandemic, since face-to-face classes were interrupted and educational institutions, especially in the public school system, found it difficult to maintain activities remotely. The pandemic has also aggravated the social, economic and mental health problems that have affected, and still affect, the population and, consequently, the knowledge of education professionals.

3.2 The importance of professional knowledge for teaching mathematics in the early years of schooling

The knowledge that future educators need to be able to teach mathematics in early childhood education and in the early years was brought up again in the discussions. In this sense, the need to offer pedagogy students proposals that allow them to experience teaching mathematics was highlighted. There is a perception that a considerable number of students in the pedagogy course show no interest in teaching mathematics, which may be related to their training in basic education, when they had no possibility to approach/positive experiences with this subject. This means that the professor of the Mathematics Education section of the course must try to reverse this situation.

Moreover, the dissociation between disciplinary knowledge and pedagogical (or didactic) knowledge can be considered, as Libâneo (2015, p.630) states, "one of the most persistent problems in the organization of curricula for the professional training of professors". The author explains that professors have difficulties when it comes to mastering subject content and the knowledge and skills to teach it, and, citing various studies, explains that these are

> confirm the persistence of the dissociation between disciplinary and pedagogical knowledge in teacher training courses, while at the same time showing that this dissociation appears with very different characteristics when it comes to pedagogical degrees and degrees in specific content. In the former, where polyvalence professors are trained for the initial stage of basic education, the methodological aspect of the subjects often predominates over the content. In this case, the meaning of pedagogy is limited to general theoretical knowledge, and disciplinary knowledge is limited to the methodology of teaching the subjects, although this is disconnected from the content that generates it since, as the aforementioned research shows, future professors are not taught the content of the basic education curriculum. (Libâneo, 2015, p. 630–640)

We agree with Serrazina when he says that "there must be coherence between the training model that the trainer uses in his classes and the didactic model that he wants to transmit to future professors" (2002, p. 15). It is therefore essential for future professors to immerse themselves in spaces of problematization and investigation that will lead them to deepen their theoretical and methodological knowledge and to plan, develop, and evaluate activities/projects that involve mathematical knowledge in order to learn mathematics and reflect on the processes of learning and teaching mathematics.

The experience in the basic education classroom, triggered by supervised practicums, is an important formative moment, as discussed below.

3.3 Mathematics in supervised internships

For authors who study the internship, it is one of the most important stages of initial training, and, besides being a subject, it is an activity of the course. Pimenta and Lima (2012, p. 56), analyzing its complexity, point out that it involves studying, analyzing, problematizing, reflecting, and proposing solutions to teaching and learning situations. It requires experiencing teaching situations, learning to develop, implement, and evaluate teaching projects for different school spaces, and working together with other school actors.

> the internship prepares for collective teaching work, since teaching is not an individual matter for the professor, since the school task is the result of the collective actions of teachers and institutional practices, situated in social, historical and cultural contexts. (Pimenta; Lima, 2012, p. 56)

Almost three decades ago, Pimenta (1995) explained that

> The internship can serve the other subjects and, in this sense, it can be an articulating activity in the course. Furthermore, like all subjects, it is a theoretical activity (of knowledge and the establishment of goals) in the training of professors. It is an activity that instrumentalizes educational praxis (theoretical and practical activity) and the transformation of existing reality (Pimenta, 1995, p. 63).

Therefore, we reflect on the possibilities of learning mathematics in this space. The presence of mathematics in supervised internships represents a crucial moment in the training of any professor. However, it has been noted, and some research even suggests (Marquesin, 2012; Curi, 2005), that most of the content that trainees work on does not relate to mathematics, for a variety of reasons. Therefore, it is important to find ways for trainees to experience more mathematics teaching at this point in their initial training.

The supervised internship, understood as another space for learning to teach, involving different actors (students, school teachers, supervising teachers, parents), is an important moment in the project to train professors. The actions of planning, developing a proposal, assessing student learning and reflecting on teaching, mediated by dialogue, negotiation and interaction, make it possible to mobilize and expand professional knowledge for teaching.

In order to improve mathematics learning and teaching-learning processes, it is essential that the supervised practicum team includes a professor of mathematics education. This participation can ensure that mathematical knowledge is not only covered, but expanded, taking into account the discussions, studies, and observations that take place during the practicum. In addition, it can provoke a discussion with the school where the practicum takes place, which is also a formative moment for the teachers.

Another opportunity to experience the teaching of mathematics can be found in the Extension Program, which has recently been restructured.

3.4 Mathematics in the integralization of extension

The tripod of teaching, research and extension is the fundamental axis of the Brazilian university. However, the relationship established between the different dimensions establishes different ways of understanding the social and political function of the university.

In relation to extension, the different conceptions of university extension, its relationship with teaching and research, the financing of actions, and the relationship between the university and society are recurring themes. And since 2018, the curricularization of extension has been added to these discussions.

The mandatory restructuring of pedagogy courses with the BNC formation and the curricularization of extension (320h) was indicated by Resolution No. 7, of December 18, 2018, of the Ministry of Education (MEC), the National Education Council (CNE) and the Chamber of Higher Education (CES), which establishes the guidelines that extension activities must constitute at least 10% (ten percent) of the total student curricular workload of graduate courses, which must henceforth be part of the curricular matrix of the courses. This provision has raised many questions: by making Extension curricular, wouldn't we be making its funding in public institutions even more precarious? What will be the role of extension secretariats, deans, and deans of undergraduate education in this process? How will extension activities be monitored and evaluated? Has the resolution been widely discussed in the institutions in order to problematize the concept and/or conceptions of university counseling?

In order to analyze the relationships between the promotion of university extension and the offering/restriction of access to Brazilian higher education, Wociechoski and Catani (2023) carried out a documentary study considering the production of the texts of the PNEs from 2001 to 2010 and 2014–2024. Among the results of the research, the authors point out that there is no relationship between the curricularization of extension and access to graduate courses and that "the curricularization of extension was not built in the democratic spheres of the CONAEs of 1997 and 2010, in which, among other proposals, the expansion of enrollment rates in higher education courses was defended". (2023, p.1314)

In the assessment of the authors, Wociechoski and Catani (2023, p. 1314)

> Faced with the insufficient goal of increasing the number of vacancies in public university courses, the extension service has been overburdened with the task of democratizing the university, which tends to turn it into (yet another) bureaucratic

> device that establishes harmony between the few Brazilians who have access to higher education and those who are excluded from it.

It should be noted that the HEIs have recently begun to implement the curricularization of extension. It is in this context, of many dilemmas and contradictions, that extension activities that prioritize the mathematical education of Pedagogy students need to be conceived and developed.

Therefore, there is much to be discussed in order to think about actions that effectively contribute to training, as in the case of PIBID and the Pedagogical Residency.

3.5 PIBID and Pedagogical Residency

The Institutional Teaching Initiation Scholarship Program (PIBID) and the Pedagogical Residency (RP) have been highlighted as important spaces for learning and reflecting on the processes of teaching and learning mathematics.

The programs represent training spaces that allow academics to be inserted into the school context. They are programs that, from the beginning of the course, allow the students to be inserted into the space where they will work in the future, the school, promoting questions about the school space, the classroom, learning, and teaching. In its fifteen years of existence, PIBID has become a consolidated program accepted by field schools and higher education institutions, making it possible to articulate the initial and continuing training of professors (Ciriaco, Santos, 2020 & Fraga, 2017).

A new edition of the program was launched in 2024, and the 10/2024 CAPES notice highlights that "the program aims to promote teacher training, contributing to the strengthening of teacher training at the university level and to the improvement of the quality of Brazilian public basic education".

The results of the research (Prado, 2020; Mello *et al*., 2020; Pereira, 2020) show that the program has provided residents with relevant training experiences, highlighting the relationship between theory and practice, the relationship between school and university, the experience of teaching, and reflection on teaching and learning processes and the role of the professor. The research also highlights the challenges and contradictions of the proposal, such as the link between the activities of the Pedagogical Residency Program and the BNCC, since this link violates the autonomy of higher education institutions by distorting the pedagogical projects of the courses that train professors (Cordeiro da Silva, 2018; Faria & Pereira, 2019); the development of PR projects and the perception of students during the pandemic (Rôos, Palma, 2022); and the conceptions of theory and practice present in the proposal (Curado Silva, 2020).

It is considered that the two programs, PIBID and Pedagogical Residency, contribute to the process of initial teacher training and promote the articulation between initial and continuing training. Both in the concepts in the documents and in the implementation process, there are many contradictions, questions, and indications of the need to advance the proposals and the number of students involved. The development of subprojects that prioritize mathematical training in pedagogy courses has been repeatedly discussed in forums and events.

Another issue that has gained prominence is that of the teacher educator.

3.6 Profile of the Pedagogue Trainer

When analyzing studies on the initial training of professors who teach mathematics at the beginning of schooling, Abraão & Silva (2017, p. 109) refer to the lack of studies on the training of pedagogical trainers, indicating that "without adequate training, courses end up using traditional training practices and distancing themselves from research in mathematics education".

Among the few studies, Silva (2018) and Utsumi (2016) point out the importance of discussing who these professionals are and what knowledge they need to teach mathematics to future early childhood and elementary school professors. In his findings, Silva (2018) found that attitudes and knowledge related to teaching mathematics are needed in initial training, especially among trainers and academics, in order to better structure knowledge and skills in the training process in the pedagogy course, especially regarding early childhood education. Utsami (2016) refers to the need to consider the inseparability of content and form in the training of mathematics teachers in the graduate course in pedagogy, which implies the search for continuous mathematical training by the teacher trainers of this course based on their needs, which can contribute to democratizing the access to mathematical knowledge of students in the early years of elementary school.

But what kind of training is needed to train professors who will teach mathematics in the early years and early childhood education? Fiorentini and Oliveira (2013, p. 926) point out that in a course of study, as in the case of mathematics, the student learns not only the content but also a "way of relating to knowledge; it also internalizes a way of conceiving, treating, and evaluating it in the teaching and learning process". We agree with this idea, and, based on it, we wonder to what extent this learning to "teach" is sufficient to "teach how to be a professor"?

The teacher educator has, besides a bachelor's degree, a master's degree, and/or a doctorate, which qualifies them to be a professor in higher education, but not necessarily to teach "how to be a professor". Therefore, in relation to the profile of the teacher educator in mathematics education, it is important that he/she be a mathematics educator, i.e., a mathematics graduate with a background in teacher training for those working in the levels of education - early childhood education and the first years of primary education; or involved in research and knowledge of the reality of these teaching segments; or a pedagogue with mathematical knowledge from research developed in mathematics education or the training of professors who teach mathematics.

It's worth noting that although we are referring specifically to the training of teacher educators within the Pedagogy course, we understand that the concerns converge with those discussed in GD2-Professional and academic profile of teacher educators, at the VIII FPMat.

It seems to us, as we have seen so far, that in the face-to-face pedagogy courses we already have an accumulation of research and discussions that allow us to present the problems, the successful experiences and where we need to move forward. With regard to pedagogy courses offered via distance learning, we still have some way to go, as indicated below.

3.7 Mathematics education in the distance learning Pedagogy course

The data on distance education in Brazil, published by INEP (2023) in the Higher Education Sensus, highlights that between 2011 and 2021, the number of entrants to graduate courses in the distance education (DE) modality increased by 474%. In the same period, the number of enrolments in face-to-face courses will decrease by 23.4%.

With regard to teacher education, 1,669,911 enrolments were registered in undergraduate courses in 2022. Of these, 571,929 were enrolled in public institutions and 1,097,982 in private institutions. At the undergraduate level, 93.7% of enrolments in distance education are from private institutions, while 22.2% are from public institutions. Education courses account for almost half of all enrolments (49.2%), or just over 821,000 students (INEP, 2023).

The expansion of Distance Education (DE) courses has been observed since the enactment of the National Education Guidelines and Bases Law, No. 9394 of 1996.

The accelerated growth of distance education pedagogy courses prompted a group of Brazilian researchers to analyze the mathematics education in these courses (see above). At the time of the study, there were 1,712 active distance education courses in pedagogy. And considering that many institutions have several hubs that use the same curricular matrix, differing in the locations where they are offered, the number of pedagogy courses in the distance modality analyzed in Brazil was 238.

This study looked at the "place" that mathematics occupies in these courses (Knorst, Silva, & Fanizzi, 2022); the focus on mathematics-related subjects in the curriculum (Fraga, Borowsky, & Palma, 2022); the workload of mathematics training (Alves, Passos, & Santana, 2022); subjects that deal with mathematics teaching and education (Noguti, 2022); curricular components that include mathematics and science (Klein & Lopes, 2022); the presence of mathematics in practice and in supervised internships (Guérios, 2022); the subjects for teaching mathematics in early childhood education and in the first years (Alencar, 2022); and the presence of mathematics in subjects such as statistics, logic, technologies, and economics (Pozebon, 2022). It is clear from this research that the criticism of distance pedagogy courses does not focus on the possibilities of offering them in this modality, but rather on the organization of this course in the different institutions, with the aim of training a professor who can handle the activity of teaching and its multiple challenges.

There is still a lot of research to be done on mathematics education in pedagogy courses offered via distance learning: for example, the impact of the pandemic on whether to increase the number of places offered, how mathematics education is developed in the course, which digital platforms are used, how specific knowledge and pedagogical knowledge are linked, the link between theory and practice in the different formative moments (classes, supervised internships), and how graduates evaluate their education.

In addition, since each institution organizes the curriculum in its own way, it is essential to study the profile of the educator responsible for training in mathematics education in distance pedagogy courses.

Having presented the main points of discussion in GD4, we will now list some final considerations.

4 Some final considerations: suggested ways forward and proposals

On the basis of the issues discussed, some guidelines were proposed that could overcome some of the challenges related to the training in mathematics education in the pedagogy course:

- Encourage the participation of educators working in the pedagogy course, as well as professors, in training or in practice, in the regional forums and in the National Forum

for the Initial Training of Teachers of Mathematics, so that they can contribute to the debates and point out the challenges they face in their practice.

- Broaden the participation of the Brazilian Society of Mathematics Education and mathematics educators in forums and spaces for pedagogy, in order to find out about the specific needs of these courses and to allow insertions that create/expand spaces for discussion about mathematics education in these courses.
- Create spaces in the community of mathematics educators to share good practices in the training of professors who teach mathematics and strategies to promote the visibility of good training experiences, fostering the exchange of experiences.
- Conduct a survey of institutions and trainers working in the field of mathematics education in pedagogy.
- Create a forum (space) for debates with mathematics educators working in pedagogy.
- The need for the Brazilian Society of Mathematical Education to take a position on all the discussions presented on the process of training professors who teach mathematics in the course of pedagogy. One way forward could be to draw up a guide that could support the organization of pedagogy courses, so that we can discuss better working conditions with a view to becoming a state public policy project, including indications on: minimum workload; topics to be covered; profile of the professor who teaches mathematics subjects; promotion of the conceptual and methodological appropriation of mathematics by pedagogy students.

The importance of developing proposals that could be developed in interaction with two SBEM WGs was also highlighted: WG-01 - Mathematics in Early Childhood Education and the Early Years and WG-07 - Training of Professors who Teach Mathematics.

The importance of continuing the research carried out by WG-07 was recalled, highlighting some themes that could be addressed: research into the teacher who teaches mathematics in pedagogy; continuing research into pedagogy courses; research into distance learning pedagogy courses with an analysis of the syllabuses of Mathematics Education subjects; research into mathematics training in distance learning pedagogy courses; investigation into the mathematical knowledge needed by future professors in order to perform adequately in the early years.

Finally, the importance of this space in the National Forum for the Initial Training of Professors who Teach Mathematics was emphasized in order to continue the discussions.

References

Abrahão, A. M. C. & Silva, S. A. F. (2017) Pesquisas sobre a formação inicial do professor que ensina Matemática no princípio da escolarização. *Zetetike*, *25*(1), 94-116.

Alencar, E. S. (2022). As disciplinas para ensinar matemática na educação infantil e nos anos iniciais do ensino fundamental nos cursos de Pedagogia a distância. *Docentes*, *7*(17), 76-85.

Alves, A. M. M., Passos, C.L.B. & Santana G. F. N. (2022). Cursos de Pedagogia EAD: análise da carga horária da formação matemática dos futuros professores. *Docentes*, *7*(17), 35-43.

Brasil. Coordenação de Aperfeiçoamento de Pessoal de Nível Superior. (2018). *Portaria CAPES nº 38, de 28 de fevereiro de 2018: Institui o Programa de Residência Pedagógica*.

Brzezinski, I. (2017). Pedagogo: delineando identidade(s). *Revista UFG*, *13*(10), 120-132.

Ciríaco, K. T., & Santos, Y. K. dos. (2020). O PIBID como espaço colaborativo na formação inicial de professores que ensinam matemática. *Revista Práxis Educacional, 16*(43), 569–595.

Cordeiro da Silva, K. A. C. P. (2018). Políticas de formação de professores: construindo resistências. *Retratos da escola,12*(23),p.307-320.

Curado, K. A. P. C. (2020). Residência pedagógica: uma discussão epistemológica. *Formação Docente – Revista Brasileira De Pesquisa Sobre Formação De Professores*, *12*(25), 109–122.

Curi, E. (2005) *A matemática e os professores dos anos iniciais***.** São Paulo, SP: Musa Editora.

Curi, E. (2020) A formação do professor para ensinar Matemática nos anos iniciais do Ensino Fundamental: algumas reflexões. *Revista de Ensino de Ciências e Matemática*, *11*(7), 1–18.

Faria, J. B. & Pereira, J. E. D. (2019). Residência pedagógica: afinal, o que é isso? *Revista Educação Pública*, *28*(68), 333-356.

Fiorentini, D. & Oliveira, A.T.C.C. (2013). O lugar das matemáticas na licenciatura em matemática: que matemáticas, que práticas formativas? *Bolema, 27*(47), p. 917-938.

Fiorentini, D., Passos, C. L. B. & Lima, R. C. R. (Org.) (2016). *Mapeamento da pesquisa acadêmica brasileira sobre o professor que ensina matemática: período 2001 – 2012*. Campinas, SP: FE/UNICAMP.

FRAGA, L.P. (2017) *A organização do ensino como desencadeadora da atividade de iniciação à docência: um estudo no âmbito do PIBID – Interdisciplinar Educação Matemática*. 247 p. Tese (Doutorado em Educação). Universidade Federal de Santa Maria, Santa Maria, RS.

Fraga, L. P., Borowsky, H. G. & |Palma, R. C. D. (2022). O currículo do curso de Pedagogia EAD: um enfoque para as disciplinas relacionadas à Matemática. *Docentes*, *7*(17), 25-34.

Gatti, B.A. & Barreto, E.S.S. (2009). *Professores: aspectos de sua profissionalização, formação e valorização social*. Brasília, DF: UNESCO, 2009.

Guérios, E. C. (2022). Como a matemática é contemplada nos cursos de Pedagogia a distância no brasil: a presença da prática e do estágio supervisionado. *Docentes*, *7*(17), 63-85.

Klein, M. L. & Lopes, A. R. L. V. (2022). Componentes curriculares de matemática e ciências no curso de Pedagogia EAD: de que formação estamos falando? *Docentes*, *7*(17), 53-62.

Knorst, D., Silva, L. M. U. & Fanizzi, S. (2022). O “lugar” da Matemática nos cursos de licenciatura em Pedagogia EAD. *Docentes*, *7*(17), 13-24.

Libâneo, J. C. (2010). O ensino da Didática, das metodologias específicas e dos conteúdos específicos do Ensino Fundamental nos currículos dos cursos de Pedagogia. *Revista Brasileira de Estudos Pedagógicos***,** 91(229), p. 562 – 583.

Libâneo, J. C. (2013). Licenciatura em Pedagogia: a ausência dos conteúdos específicos do ensino fundamental. in: Gatti, B. A.; Silva Jr, C. A.; Pagotto, M. D. S.; Nicoletti, M. G. *Por uma política nacional de formação de professores*. São Paulo, SP: Editora Unesp.

Libâneo, J. C. (2015). Formação de Professores e Didática para Desenvolvimento Humano. *Educação & Realidade, 40*(2), p. 629-650.

Libâneo, J. C. (2021). Diretrizes Curriculares da Pedagogia: imprecisões teóricas e concepção estreita da formação profissional de educadores. R*evista Eletrônica de Pesquisa em Educação*, *13*(31), 743–774.

Lopes, A.R.L.V. & Alves, A.M.M. (2021). Entre Indagações e achados acerca da formação de professores que ensinam matemática: um olhar sobre os trabalhos do eixo 2 do XIV EGEM. *Educação Matemática em Revista – RS*, *22*(2), 180-190

Lopes, A.R.L.V. & Palma, R.C.D. (2023). GD4 – Formação inicial em Educação Matemática na Licenciatura em Pedagogia. In: SBEM. Sociedade Brasileira de Educação Matemática. *VIII Fórum Nacional de Formação Inicial de Professores que Ensinam Matemática (VIII FPMAT). Documento Base para os Grupos de Discussão (GDs)* (pp.79-87). Teresina, PI.

Marquesin, D. F. B. (2012). *Os espaços de formação e a constituição da profissionalidade docente: o estágio e o ensino de Matemática nos anos iniciais do Ensino Fundamental*. Tese (Tese de Doutorado em Educação Matemática). Pontifícia Universidade Católica de São Paulo. São Paulo, SP.

Mello, D. E. de *et al*. (2020). O programa residência pedagógica: experiências formativas no curso de pedagogia. *Revista online de Política e Gestão Educacional*,*24*(2), p. 518-535.

Noguti, F. C. H. (2022). Um mapeamento de disciplinas que abordam as temáticas de ensino e educação matemática nos cursos de Pedagogia EAD: o que nos mostram os currículos? *Docentes, 7*(17), 44-52.

Pereira, M. R. A. (2020). Formação inicial e profissionalização docente: contribuições do Programa de Residência Pedagógica. In: M. dos R. A. Pereira, M. Bispo,&U. C. Anacleto (Org.). Residência Pedagógica: pesquisa, formação e competências docentes. (pp. 19-40). Editora Cortez.

Pimenta, S. G. & Lima, M. S. L.(2012). *Estágio e docência* (7.ed.). São Paulo, SP: Cortez.

Pimenta, S. G. (1995). O estágio na formação de professores: unidade entre teoria e prática? *Cadernos de Pesquisa*, 94, 58-73.

Pozebon, S. (2022). Matemática nos currículos dos cursos de licenciatura em pedagogia à distância no brasil: foco nas disciplinas de estatística, lógica, tecnologias e economia. *Docentes, 7*(17), 86-94.

Prado, B. M. dos S. (2020). *Programa de residência Pedagógica/CAPES: formação diferenciada de professores em cursos de pedagogia?* 312f. Dissertação (Dissertação de Mestrado em Educação) Universidade Católica de Santos. Santos, SP.

Rôos, Deise, Palma, Rute C. D. da. (2022). Residência pedagógica em tempos de pandemia: relatos de residentes do curso de pedagogia sobre a formação matemática. *Educação Matemática Pesquisa*, v. 24, p. 506-539.

Serrazina, Lurdes (Org.). (2002) *A formação para o ensino da Matemática na educação pré-escolar e no 1º ciclo do ensino básico*. Portugal: Porto Editora.

Silva, D. K. C. (2018). *Atitudes e saberes dos formadores de professores e acadêmicos de pedagogia acerca da educação matemática na educação infantil*. 144f. Tese (Doutorado em Educação em Ciências e Matemática). Universidade Federal de Mateo Grosso. Cuiabá, MT.

Utsumi, L.M.S. (2016). *Um estudo sobre os saberes formativos do formador de professores de matemática do curso de licenciatura em pedagogia.* 376f. Tese (Doutorado em Educação). Universidade Metodista de São Paulo. São Bernardo do Campo, SP.

Wociechoski, D. P. & Catani, A. M. (2023). Curricularização da extensão e as suas relações com o acesso à educação superior nos PNEs 2001-2010 e 2014-2024: um estudo documental. *Revista Educação e Políticas em Debate*, *12*(3), 1300–1317.