Sociedade Brasileira de Educação Matemática

RIPEM

# Professional and academic profile of Mathematics teacher educators

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2238-0345 ISSN

10.37001/ripem.v14i4.4240 doi

Received • 15/06/2024
Approved • 19/07/2024
Published • 01/09/2024

Editor • Gilberto Januario

***Abstract:*** The aim of this paper is to identify trends regarding Mathematics teacher educators within the scope of Discussion Group 2 (GD2), based on the discussions held at and for the VIII National Forum for the Initial Education of Mathematics Teachers (VIII FPMat). The points highlighted in the summaries sent by 12 Regional Directorates of the Brazilian Society of Mathematics Education (SBEM) were taken up and expanded in GD2 at VIII FPMat, which took place at the Federal Institute of Piauí (IFPI) in 2023. The discussions were organized into two axes — the educating and professional profile and the educator's working spaces — which bring these trends together. At the end of the paper, the GD2's proposals for continuing work on the subject are presented.

***Keywords***: Teacher Educators. Initial Education of Teachers. Mathematics Degree. Pedagogy Degree.

## Perfil profesional y académico de formadores de profesores y profesoras que enseñan Matemática

***Resumen***: Este artículo tiene como objetivo identificar tendencias sobre el formador de profesores que enseñan Matemática en el ámbito del Grupo de Discusión 2 (GD2), a partir de las discusiones realizadas en y para el VIII Fórum Nacional de Formación Inicial de Profesores que Enseñan Matemática (VIII FPMat). Los puntos destacados en las síntesis enviadas por 12 Directorios Regionales de la Sociedad Brasileña de Educación Matemática (SBEM) fueron retomados y ampliados en el GD2 del VIII FPMat, ocurrido en el Instituto Federal de Piauí (IFPI), en 2023. Las discusiones fueron organizadas en dos ejes — el perfil formativo y profesional y los espacios de actuación del formador — que aglutinan esas tendencias. Al final del artículo se presentan las proposiciones de ese GD2 para la continuidad de los trabajos sobre la temática.

***Palabras clave***: Formador de Profesores. Formación Inicial de Profesores. Licenciatura en Matemática. Licenciatura en Pedagogía.

## Perfil profissional e acadêmico de formadores de professores e professoras que ensinam Matemática

***Resumo***: Este artigo tem como objetivo identificar tendências sobre o formador de professores que ensinam Matemática no âmbito do Grupo de Discussão 2 (GD2), a partir das discussões realizadas no e para o VIII Fórum Nacional de Formação Inicial de Professores que Ensinam Matemática (VIII FPMat). Os pontos destacados nas sínteses enviadas por 12 Diretorias Regionais da Sociedade Brasileira de Educação Matemática (SBEM) foram retomados e ampliados no GD2 do VIII FPMat, ocorrido no Instituto Federal do Piauí (IFPI), em 2023. As

discussões foram organizadas em dois eixos — o perfil formativo e profissional e os espaços de atuação do formador — que aglutinam essas tendências. Ao final do artigo são apresentadas as proposições desse GD2 para a continuidade dos trabalhos sobre a temática.

***Palavras-chave***: Formador de Professores. Formação Inicial de Professores. Licenciatura em Matemática. Licenciatura em Pedagogia.

## 1 Introduction

At the VIII National Forum on Initial Mathematics Teacher Education (VIII FPMat), held from November 30 to December 2, 2023, at the Federal Institute of Piauí (IFPI), Teresina Central Campus, Discussion Group 2 (GD2) proposed reflections/discussions on aspects related to Mathematics teacher educators in Basic Education[1], such as: profile and professional trajectory, educating path, knowledge needed to develop the work and its specificities, requirements of public university competition notices and action with public policies.

The aim of this paper is to identify trends about Mathematics teacher educators in the context of GD2, based on the discussions held at and for the VIII FPMat. We mapped the discussions of the Discussion Groups (DG) on the professional and academic profile of teacher educators, held at the regional teacher education forums between 2022 and 2023, whose summaries were sent by 12 Regional Directorates (RD) of the Brazilian Society of Mathematics Education (SBEM): Acre, Bahia, Ceará, Goiás, Mato Grosso, Minas Gerais, Rio Grande do Sul, Rondônia, Roraima, Santa Catarina, São Paulo and Tocantins. By highlighting convergences and peculiarities based on these texts, we identified trends that were intertwined with the records of the G2 discussions at the VIII FPMat and with theory. The results are organized into two axes: 1. the educational and professional journey and 2. the work spaces. At the end, we point out issues that can contribute to the necessary movement for research into the professor responsible for Mathematics teacher Education in Brazil.

## 2 Educators in the Brazilian context

The term *educator* can refer to "anyone who dedicates themselves professionally to education at its various levels and modalities" (Vaillant, 2003, p. 22). In this text, we focus on university professionals who work in both the Mathematics Degree (LM) and the Pedagogy Degree (LP), since FPMat aims to debate the specificities of Mathematics teacher Education. Like Coura (2018), we believe that, institutionally, in Brazil, initial teacher education takes place in higher education, so that all teachers who work in undergraduate courses can be referred to as educators.

Fiorentini (2004) argues that the typical Mathematics teacher educators have done their masters and doctorates in Mathematics, and have gone on to become university professors without any interlocution with the teaching profession, even in higher education. This consideration is still relevant today, as shown by the 2021 National Student Performance Examination (ENADE) Report for the Mathematics area (Brazil, 2022a), in its analysis of the profile of 384 LM course coordinators (341 in face-to-face education and 73 in distance education). According to the document, there is a concentration of coordinators (90.3% in face-to-face courses and 84.9% in distance learning courses) whose undergraduate degrees were in the Exact and Earth Sciences - which includes ML. The areas of postgraduate education are more diverse, but Exact and Earth Sciences remains the area in which the majority of coordinators (64.2% and 56.2%) carried out their studies, in addition to Human Sciences (17%

[1] In Bazil, Basic Education means Preschool, Elementary and Secondary Education.

and 19.2%).

The coordinator profile data produced in the ENADE (Brazil, 2022a) represents a parameter for educators who work in the educating of mathematics teachers. We therefore reinforce that the typical Mathematics teacher educator, although they may have a degree, did their postgraduate studies mostly in Mathematics, which "denotes an academic education focused on the contents of the Mathematics knowledge area, with little dialogue with aspects related to teaching and learning and teacher education" (Coura & Passos, 2017, p. 12).

In Pedagogy, a degree that educates teachers who work in Early Childhood Education and the initial years of Primary Education, according to the 2021 ENADE (Brazil, 2022b), there is a high concentration of course coordinators' initial education in the Humanities, with 79.7% for face-to-face courses and 81.9% for distance learning courses. The same is true for the area of master's and doctoral courses, where 78.4% of coordinators have the highest level of education in the Humanities, an expected result, as the LP brings together, for the most part, professionals from the broad area of *Humanities* and the area of *Education*.

Since the future pedagogue will be a single-teacher in Early Childhood Education and the initial years of Primary Education, there are curricular components of this course aimed at teaching different areas of knowledge, including Mathematics. In a study on distance learning LP courses (Lopes, Passos, Alencar & Fanizzi, 2022), it was found that there are a multitude of curricular components related to mathematics and its teaching, grouped into five categories, based on the nomenclature of these components: 1. Foundations, Methodologies, Teaching, Mathematics Education and Didactics; 2. Science and Mathematics and Mathematics and Mathematical Contents; 3. Practices and Supervised Internships; 4. Basic Education Levels; 5. Statistics, Logic/Logical Reasoning, Technologies and Economics (Noguti, 2022).

Despite the existence of these components, data on the academic education of their teachers is scarce, as is research focusing on them. A search conducted in the Brazilian Digital Library of Theses and Dissertations (BDTD), using the keywords *educator*, *pedagogy* and *mathematics* in the titles of the papers, found only four studies published in the last ten years (Jesus, 2015; Santos, 2020; Silva, 2018; Utsumi, 2016), which refer to mathematics educators in face-to-face LP courses, indicating the urgent need for scientific studies in this area.

While research on mathematics teacher educators is still recent, since only in the "second decade of the 21st century does there seem to be a growing concern to characterize the knowledge of the educator" (Contreras, Montes, Muñoz-Catalán & Joglar, 2017, p. 11), studies on LP teacher educators are rarer (Ferreira, Ribeiro & Ponte, 2023). The discussions presented here are part of this movement to conduct research on educators.

## 3 Education and professional journey

A first aspect highlighted by most of the Regional Directorates in their respective forums refers to the understanding of the nature of mathematical knowledge emphasized by teacher educators in a LM course, which is generally directly linked to the professional's educational background. The LM educator, whose educational background is focused on pure or applied mathematics, with little or no involvement in mathematics education studies, will probably prioritize what they have experienced in their courses and pathways.

On the other hand, the discussions at the DR/SP's GD considered that the educator's profile may change over the course of their teaching career. Even with a bachelor's degree in Mathematics and with rare incursions into studies on the processes of teaching and learning Mathematics in Basic Education, the educator may, during the course of their career, be driven

to delve deeper into the area of Mathematics Education.

> This professional profile of the educator may not be associated with the academic profile they have built up so far. There is and may be a need, throughout their career, to build up other knowledge and experience other experiences when these teachers become and perceive themselves as educators. (Passos & Leandro, 2023, p. 10)

In the DR/AC forum, the discussion about the educator's education profile noted the need for this professional to establish relationships between academic mathematics and school mathematics, based on a complementary approach.

> *The event provided an opportunity to reflect on the mathematics currently being taught in higher education institutions and the mathematics to be taught by teachers in Basic Education schools. Reflections that pointed to the need to closely relate these two mathematics, so that they merge and become one, considering the importance that one plays and complements the other.* [Overview of DR/AC's GD, 2023]

Possibly, the big question that stands out here is: how can we weigh up both mathematics from an integrative approach and actually develop this work with future mathematics teachers?

With regard to the nature of the mathematical knowledge approached by the educators, at the VIII FPMat, the discussions on the educational path of Mathematics teacher educators started with questions such as: what is the Mathematics to educate Mathematics teachers? Is it academic mathematics, Basic Education mathematics or both? Is it mathematics for educating teachers? To what extent is this knowledge of mathematics different for educators who work in LM compared to those who work in LP?

We understand that the Mathematics of a LM course is different from the Mathematics covered, for example, in an Engineering course and that teaching calculus in both courses corresponds to different actions, since the mathematical knowledge of Mathematics teacher education is different from that of other professionals and is therefore specialized (Carrillo-Yañez *et al.*, 2018). For the participants in the DR/GO forum, this discussion also applied to LP courses, since the curricular components related to mathematical knowledge are taught by teachers with an education in the field of Mathematics or Pedagogy, who may or may not have a background in Mathematics Education. In this sense, what to prioritize in one or two semesters of the curricular components, usually known as Fundamentals and Methodology of Mathematics Teaching, should be defined not by the teacher's wishes or educational experiences, but by what is established in the Pedagogical Course Project (PPC) as essential for the future teacher who will teach Mathematics in Early Childhood Education and in the early years of Elementary School.

We know that the mathematical knowledge explored in LP is different from that in LM, given that the object of knowledge is made up of the themes and contents of each subject and curriculum (Carrillo-Yañez, Montes, Codes, Contreras & Climent, 2019). However, we understand that it is essential for educators to know mathematics in the horizontality of its teaching in Basic Education. In addition, it is also up to the teacher educator, whether in Mathematics or Pedagogy, to have in-depth knowledge of the mathematical relationships of the knowledge covered in the segment of Basic Education with which they work, which undoubtedly goes beyond the mathematical knowledge of the future teacher, and must be broader and deeper.

According to Carrillo-Yañez *et al*. (2019), the mathematical knowledge of Mathematics

teacher educators must include the connections between different aspects of the content, linked to knowledge of mathematical structure, as well as mathematical syntax. An educator must be aware of how the different properties of concepts are interrelated, in articulation with the processes of constructing new mathematical knowledge, providing a holistic view of mathematical content.

A second aspect of this axis, mentioned by some of the Regional Directorates, refers to the need for the educator and the Mathematics teacher to master content knowledge and pedagogical content knowledge. The DR-GO regional forum discussed the knowledge that is essential for educators and Mathematics teacher.

> *Without getting into the historical dispute about which is more important, the question of mastery of mathematical content versus knowing how to teach mathematical content, it is completely acceptable that knowing mathematics is not enough for good teaching practice. You have to learn how to teach this content.* [Overview of DR/GO's GD, 2023]

Contreras et al. (2017) propose a model of the educator's own knowledge, based on the Mathematics Teachers' Specialized Knowledge (MTSK) model (Carrillo-Yañez *et al*., 2018). They comment on the difference between the educator's and the teacher's knowledge:

> For Zopf (2010) the difference is not only the depth and breadth, he also points out that the mathematical content is different; while teachers have to teach mathematics, educators have to teach knowledge to teach mathematics (in our case MTSK). On the other hand, the objectives of teaching are different. Children learn mathematics for their own use; teachers learn specialized knowledge (of mathematics and for teaching mathematics) for the purpose of teaching their students. (Contreras *et al*., 2017, p. 14)

The educator's own specialized knowledge, which is necessary to promote the specialized knowledge of future mathematics teachers, is demarcated in the literature (Almeida & Ribeiro, 2019) and one of the analytical models is that proposed by Carrillo-Yañez *et al*. (2018) and Carrillo-Yañes *et al*. (2019). For the authors, the educator's specialized knowledge includes teacher educator content knowledge and pedagogical teacher educator content knowledge.

> Following Ponte's (2012) proposal, we will understand 'teacher education content' to mean knowledge, identity and professional skills, the construction of which should be the focus of initial teacher education. We will therefore understand didactic content knowledge to mean the knowledge that will enable the educator to transform the educational content described above into the most accessible form for their students. (Carrillo-Yañez *et al*., 2019, p. 330, our translation).

The GD2 discussions on the knowledge needed by educators, held at the VIII FPMat, were in the same direction as Carrillo-Yañez *et al*. (2018) and Carrillo-Yañes *et al*. (2019), as we understand that the educator's professional knowledge must include two aspects: what will be taught and the knowledge needed to teach it.

At the VIII FPMat we highlighted another dimension of the educator's professionalism, which involves their sensitivity to recognize the necessary deconstruction of mathematical knowledge crystallized by future teachers throughout their schooling - a sensitivity that can be enhanced during their professional career. In this respect, it is the educator's task to problematize academic or school mathematics, in an environment of dialogue, in order to

*unpack* preconceived ideas related to mathematical knowledge that are already ingrained in future teachers. In this regard, Contreras et al. (2017, p. 14) comment: "Helping undergraduate students to *unpack* mathematics in a way that helps them make sense of what they will present to their students requires different work from helping students make sense of mathematics".

In this way, we recognize that, in addition to specific teaching knowledge, educators' professional knowledge involves an attitude of listening to their students, promoting an interactive environment, seeking to understand and problematize learning paths, as well as valuing the elements of the school culture in which their students will work when they graduate. Considering this movement of listening, the DR/CE, in its regional forum, pointed out that, unfortunately, there is also a lack of dialog between educators and other parties responsible for the Mathematics teacher education.

> *One challenge that is pertinent is to involve all undergraduate teachers, even those from the sectors most distant from the pedagogical discussion, such as pure and applied mathematics, in a more integrated teacher educational project, in which everyone is co-responsible for humanized education in all its dimensions, a task that is mistakenly seen as exclusive to the mathematical educator.* [Overview of DR/CE's GD, 2023, original emphasis

It is worth noting that even before mastering the mathematics to be taught in any degree course, educators need to understand their role in the human and social education of primary school teachers.

The DR-RO, in its regional forum, mentioned the human and social dimensions of educator education, emphasizing the appreciation of cultural diversity.

> *Decolonize the curriculum in Mathematics teacher education courses. This means addressing the mathematics of culturally diverse groups, promoting self-criticism in relation to social injustices, combating the invisibilization of women and ethnic minority groups in the process of recording the history of the development of mathematical knowledge.* [Synthesis of the GD of DR/RO, 2023]

We also consider axis 1 to be an aspect that was commented on in the discussions at the regional forums, as well as at the VIII FPMat, referring to the autonomy of both the educator and the Mathematics teacher in the exercise of their profession.

> *Undoubtedly, one conclusion that emerged strongly at the end of our discussions was the question of the authorship of teacher educators and those already educated working in schools. To what end? Certainly to show that the space of professional activity, whether at university or at school, is a space for creation. Turning learning processes into authorial processes can lead to the realization of authorial practices in the professional practice of future teachers.* [Synthesis of the GD of the DR/RS, 2023]

The definitions imposed by Resolution CNE/CP No. 2, of December 20, 2019 (Brasil, 2019), a reformulation to which the PPCs of bachelor's degrees have been forced to adapt in recent years, have compromised the educator's autonomy, considering that the curricular components of the courses must be strictly linked to the Base Nacional Comum Curricular (BNCC - National Common Curricular Base).

A final aspect of the educator's career path was the composition of the departments responsible for LM subjects, which generally have Mathematics educators as a minority group and therefore have little power to act, due to the low demand for teacher educator courses. The discussions also referred to the impossibility of establishing a single profile for educators, given

the continental dimension of Brazil and its diversity, which also includes LP educators. It was also argued about the potential that educators with different educational and professional profiles provide for the education of Mathematics teacher.

Finally, as the last theme of axis 1, we will deal with educator education. In general, the regional forums referred to the possibilities for Higher Education Institutions (HEIs) to offer continuing education to educators, so that they could complement their studies on the two dimensions: pedagogical aspects of teaching mathematics and school mathematical content. This is what the DR/SC proposed:

> *The biggest challenge still lies with teachers who only have specific education in mathematics, but lack didactic and methodological education in teaching. In this respect, it is important to consider the need for continuing education for the educators themselves, as one of the strategies for overcoming this weakness.* [Synthesis of the GD of the DR/SC, 2023]

Among those present at GD2 of the VIII FPMat, there was a consensus that there is no education for the educator that takes into account these two dimensions of school work in an intentional way and, in this sense, questions remained, such as: is there a need for an institutional space to educate the educator? How does this education relate to practice? We know that educators are currently educated in practice (Coura & Passos, 2017), but how are they educated?

It was also pointed out that educators form a triad between themselves, the world and their education, and that the desire to be an educator mobilizes the construction of their professional identity. In any case, the group took a stance on the need to establish initial education for educators, with a view to providing a systematized set of knowledge and practices necessary to educate teachers to be educators. The doctorate was mentioned as a first educational space for educators, in which the doctoral student could have the opportunity to reflect not only on their education as a researcher, but also on their education as an educator.

We believe that educator education can currently be seen as a *continuum*, i.e. a educational space between two extremes: that of not being educated to be an educator and that of structured education to be an educator. In the Brazilian context, according to Coura and Passos (2017), most educators were not educated to be teachers, let alone to be educators. Their professional education took place predominantly in practice, on the job. So, the following question was discussed: where can we insert ourselves and propose spaces for educator education? To some extent, this education is already minimally provided by the teaching internship in the Postgraduate Programs in Education, although it is only compulsory for Master's and PhD students who receive scholarships. The possibility of institutionally encouraging the educator's qualification at post-doctoral level, taking Mathematics teacher education as an object of study, was raised, which would meet this requirement.

In any case, the question still arises: how do we design professional development programs for educators, thinking about tools and resources to support this development? In this context, we highlight the potential of joint educator educational spaces with teachers already working in LM and LP, because if we want Mathematics teaching and teacher education to be seamless in Basic Education, we must also integrate educators in Higher Education.

## 4 Spaces of action

The first aspect associated with this axis, addressed in the summaries of five regions (AC, MG, RR, SC, SP), was the legislation pertaining to teacher education (Brasil, 2015; 2018a;

2019) and those affecting teaching work in Basic Education (Brasil, 2017; 2018b). The tendency is to question Resolution CNE/CP 02/2019 (Brasil, 2019), either because of its homogenizing education perspective or because they reduce it to

> *a thaining dimension for the exposition of fixed topics and contents, in the reduction of professional teaching practice to a technicist dimension, in the decentralization of the school as a space for the production of knowledge, in the violation of teacher autonomy, and in the mischaracterization of the formation of students as social subjects, citizens belonging to a democratic society. This disregards and disrespects the developments of the 2015 guidelines, which were built in dialogue with the teaching movement;* [Synthesis of the GD of the DR/AC, 2023].

The documents from the MG, SP and SC regional offices follow this criticism and the last one highlights the educator's role in reformulating and leading the work in undergraduate programs.

> *The question that stands out is: whether or not to comply with the official guidelines and proposals regarding a general form of organization? If so, what about the other trends in mathematics education? For example, will the teacher educators only focus on the guidelines relevant to the exclusive adoption of the BNCC? It's important to note that the BNCC and the BNC have been pushed through [under] pressure of various kinds, which contributes to educators living with insecurity when it comes to making decisions about what and how to teach undergraduate teachers.* [DR/SC GD Synthesis, 2023, our comment]

The need to reformulate undergraduate courses as a result of the curricularization of extension (Brasil, 2018a) was addressed by the SP and SC regions. The latter argues that "*the curricularization of extension and research is a public policy that, if well designed and developed, provides support for the development of actions that overcome the dichotomy between mathematical and pedagogical knowledge"* [Synthesis of the GD of the DR/SC, 2023].

Because it is essential for educators to know the school environment in all its different dimensions, in which their students, future teachers, will work (Carrillo-Yañez *et al*., 2019), the discussions of GD2 at the VIII FPMat on the curricularization of extension considered it as a space for action and a way of providing educators with knowledge about Basic Education, provoking the need to insert themselves into the school. Curricular components of bachelor's degrees that include extension practices can help educators get to know the dynamics of classroom interaction, the learning difficulties of primary school students in mathematics, the students' authorial processes in the construction of mathematical knowledge and the demands of large-scale assessments, for example. In this sense, the inclusion of extension education in undergraduate courses can help teacher educators develop pedagogical content knowledge (Shulman, 1986) which, in the model of teacher educator specialized knowledge proposed by Carrillo-Yañez *et al*. (2019), represents part of the content knowledge of teacher education.

When questioning the New High School (Brazil, 2017), the DR/RR focuses on the Mathematics teacher's work space, denoting that the discussions about the educator also consider the work of the teacher they educate.

> *The implementation of the New High School has taken place without discussing and preparing teachers and schools, which is why the difficulties with mathematics have increased. It can be seen that there is an excess of content and skills that have been defined in the official curricula and that often, in order to be fulfilled, they don't make it possible for learning to take place.* [Synthesis of the GD of the DR/RR, 2023, emphasis added]

These references to the teacher educator's role in implementing the guidelines in undergraduate courses, given the spaces in which future teachers will work, point to the need for knowledge of teacher education standards which, according to Carrillo-Yañez *et al*. (2019), make up the specialized knowledge of mathematics teacher educators. For the authors, this knowledge should include the ability to establish, justify and evaluate learning goals for future teachers, as well as a more global vision of the curriculum standards of the different educational levels in which future teachers will work.

The implications of the legislation on the curriculum structure of undergraduate courses were also discussed, from the point of view of how the educator can act, taking them into account in order to offer the best possible education to the teacher (CE, RS).

> *Discussions about the professional and academic profile of Mathematics teacher educators can only be conducted with a close eye on education curricula. Firstly, because the curricula are connected to the content in the form of subjects in which the sections of different areas and fields of knowledge are organized, they aim to educate a certain type of professional who will teach mathematics. Secondly, because these curricula also concern a teaching profession to be forged on the basis of certain behaviors, practices and actions that are considered desirable and that are tied to certain values. In this tangle of knowledge, behaviors, subjects and values, the professional academic educator not only conducts himself, but also produces himself when carrying out the curricular project for the course*. [Synthesis of the GD of the DR/RS, 2023]

The DR/SC emphasizes that, depending on the educator's professional trajectory, especially with regard to their experience as a Mathematics teacher, the workload of Practice as a Curricular Component (PCC) will be contemplated as teaching practice or as a space for producing knowledge from practice.

> *Practice as a Curricular Component (2015) — currently, Practice as a Curricular Component — has become important because it requires the educator to have inter- or multidisciplinary knowledge, which converges with that specific to mathematics. This is where the need to differentiate between possibility and reality comes in. This is minimized when the educator has or has had experience in Basic Education*. [DR/SC GD Synthesis, 2023,original emphasis]

De Souza Hobold and Schüler Menslin (2012) mention the influence of the educator's work on the education and pedagogical conception of the future teacher, for whom the influence occurs in relation to the content, the ways of working with it and the values associated with it, since the educator acts as a kind of model for learning to teach.

In GD2, this influence was also discussed. Whether in Mathematics or Pedagogy, a student who, throughout their four years on a degree course, attended classes in the monologue style, in which the educator only transmits their knowledge, will most likely repeat this teaching approach when they become a Mathematics teacher. This can even happen when they become educators and reproduce the practices of those who educated them, as Pinheiro (2008) observes.

Other aspects dealt with in the regional offices (CE, MG, RS) were valuing educators with experience in Basic Education and the need for coordination with school teachers. By emphasizing the importance of the actors involved in this process — educator and teacher — the DR/CE highlights the fact that Basic Education teachers

> *on several occasions, they act as educators for undergraduates, either as participants in research and/or extension projects, or as supervising teachers in programs such as PIBID and PRP, or in supervised internships. This approach enables a dialog between university and school, from a perspective of*

> *collaboration and continuous education, and the professional development of teacher educators and teachers.* [Synthesis of the GD of DR/CE, 2023]

Recognizing the specificities of the work in each institution - university and school - the DR/RS summary warns about how educators with different profiles can relate to the school.

> *Thinking about the school is a different practice from doing in the school. The reality of the school may be there for an internship teacher. And for a mathematician — algebraist or geometrician — working on the course's pedagogical project, in what way are intra- and interdisciplinary approaches, such as those expected by the school, possible for this professional?* [Synthesis of the GD of the DR/RS, 2023,original emphasis ]

In any case, the teacher educator's work will be enriched if he takes into account what happens in the school when planning and developing his curricular component, because what is covered in the classrooms of degree courses, directly or indirectly, relates to the movements of the school. In this sense, the university/school partnership deserves its rightful place in initial teacher education courses. Nóvoa (2017) defends the dialog between school and university as fundamental for initial teacher education, which, according to the author, needs to take place in a space he calls *between-place*, a place in which school and university actors plan and act jointly in eacher education.

Still in the context of the relationship with the school, but at the level of institutional programs, such as the Institutional Teaching Initiation Scholarship Program (PIBID) and the Pedagogical Residency (RP), the texts from the AC and SC regions point out their contribution to "[...] *teacher education, allowing future teachers to see themselves as teaching professionals*" [Synthesis of the DG of the DR/AC, 2023] and the importance of defining which educators will work in these programs: "*However, in their implementation, once again, there is a dichotomy between the mathematical and pedagogical education of the educators. The ideal would be for everyone to have this experience, accompanied by evaluations by the collective of teachers and pedagogical advisory services*" [DR/SC GD Synthesis, 2023].

This highlights the importance of the educator's role in ensuring that "[...] the university and the school establish partnerships that contribute to an education that is closer to the reality of the teaching profession. This would partially avoid the well-known 'clash with reality', often mentioned by graduates" (De Souza Hobold & Schüler Menslin, 2012, p. 797).

The text of the DR/MG also highlights the importance of these programs and internships in the process of professional induction of young teachers. Internships (compulsory and non-compulsory) are cited *"[...] as a real link between formal, academic mathematics, which is covered in higher education, and school mathematics, the working tool of teachers who teach it in Basic Education schools"* [Synthesis of the DG of the DR/AC, 2023]. The discussions within this directorate include questions about the internship and, circumstantially, the role of the educator in the role of supervising teacher.

> *What is the role of the internship? What is the role of the teacher? What is the role of the supervising teacher? What is the role of the trainee? Once these guiding points have been clarified, we should also evaluate the weight given to these components in the teacher education process, the responsibility of the supervisor in having to accompany 30 or 40 trainees distributed in different teaching units*; [Synthesis of the GD of the DR/AC, 2023].

Considering the Basic Education teacher as a teacher educator and not as a co-educator

was a point of agreement in the GD2 discussions, as their role is central to the initial education process of their future professional colleagues. In this sense, internship practices in schools, as well as institutional projects in which there is an interlocution between teachers and undergraduate students, supervised by the educator, are spaces of great relevance in teacher education.

A third point related to the educator's work, addressed in the discussions, is the dropout rate in LM courses (GO, RO, SC) and the expansion of distance learning degree programs (RO, SC) with implications for the educator's work.

By highlighting that the problem has become more acute with the pandemic, the DR/SC summary mentions the increase in dropouts and the decrease in demand for degrees, which is due to the devaluation (not only in financial terms) of the profession. The discussions in the DR/RR point to the implications of the educator's role in the dropout rate from LM courses.

> *There are still teacher educators who are unable to teach in a way that academics can learn and who focus too much on tests and exercises, making life so challenging for academics that they sometimes become discouraged. In the discussion, it became clear that, just like PEMs who work in Basic Education, teacher educators also need to know more than mathematics, but need to develop/acquire broader knowledge that favors the education of Mathematics teacher educators. One educator pointed out that teacher educators also need to have more in-depth knowledge about learning theories, about the teaching-learning process.* [Synthesis of the GD of the DR/RR, 2023, original emphasis]

The educator's role also interferes with the dropout and retention of students on courses, reinforcing its importance. “Therefore, more than just being a teacher who relates well to students, it is also necessary for them to continually learn new knowledge in their personal dynamics and articulate it with their professional development process” (De Souza Hobold & Schüler Menslin, 2012, p. 795).

The need for educators to make the teacher education space more attractive was also addressed in GD2, given that, lately, students who have graduated from high school have not been enthusiastic about a teaching career and are therefore not interested in degree courses. This is reflected in the recurring failure to fill the vacancies offered on these courses.

The few high school graduates who go on to study LM and those who, in greater numbers, go on to study LP, have generally entered higher education without certain mathematical knowledge from Basic Education. Educators need to take this into account in their work on degree courses. In the LP course, where the emphasis of the Mathematics Teaching Methodology subjects is on the mathematics of the initial years of elementary school, there are students who have not mastered even the most elementary content, such as the four basic arithmetic operations (Fanizzi, 2022). In the DR/GO, discussions about dropout in LM courses also consider the role of the educator, but cite other intervening aspects and argue in favor of a more systematic and broader solution to the problem.

> *It's not a question of who is to blame, as this ends up being tossed around, delaying the problem situation, but it is a question of identifying the problem and looking for the best solution. The fact is that the issue of evasion needs to be debated in educational institutions, so that the permanence and success of students on Mathematics teachers' courses happens.* [Synthesis of the GD of the DR/GO, 2023]

The regional offices in RR and SC expressed concern about the expansion of degree courses offered through distance learning (distance education), with regard to the educated teachers — *“Who are the professionals who will be working in the classroom from now on?”*

[DR/RO's GD Synthesis, 2023] — and the criteria for opening courses (RO).

GD2 highlighted the importance of educators knowing and using research to guide their work and sharing with undergraduate students possibilities for actions based on the results of academic studies, so that they become teacher who research their own practice. This use of research to guide teacher education can be associated with the educator's knowledge of how to organize initial education which, according to the model by Carrillo-Yañez *et al.* (2019), includes knowledge of theories and approaches to initial education and education dynamics, as well as education tasks that allow them to design powerful education scenarios.

Furthermore, at the VIII FPMat, the discussions in GD2, with regard to the spaces in which Mathematics teacher educators work, culminated in the following question: how do we educate future teachers to work with the diversity of students in Basic Education? Although the focus of the discussions was on the educator, this question refers to the concern of those present about the education that the educator provides to future Mathematics teacher. Given the impossibility of answering it at the Forum, the group highlighted the innovative and genuine practices of the "new" degrees (such as the Rural Degree, the Indigenous Degree and the Quilombola Degree), which can contribute to contemporizing the educational practices provided in LM and LP.

## 5 Final considerations

By focusing on university professionals who work in both LM and LP, we sought to identify trends about Mathematics teacher educators within GD2, based on the discussions held at and for the VIII FPMat. Using the documents produced at the regional teacher education forums and the GD2 discussions at the VIII FPMat, the trends were organized into two axes.

In axis 1, on the *formative and professional journey*, the discussions in the regional forums highlighted elements of this teacher's practice that are necessary for carrying out work that is committed to the learning of future teachers and to critical and humanized education. The regional forums focused more on the education that the educator should provide to future teachers than on the educator themselves. The discussion around what mathematics teachers need to know in order to teach prevailed, which led to debates about the knowledge needed by educators to carry out their specific task — educating Mathematics teacher. This movement is in line with research in the field of teacher education (Kelchtermans, Smith & Vanderlinde, 2017), but it needs to advance in order to demarcate the specificities of the educator's knowledge in relation to that of the teacher (Carrillo-Yañez *et al*., 2019).

The GD2 discussions at the VIII FPMat went in this direction and reveal the specificity of the educator's mathematical knowledge, just as the whole body of knowledge needed to work in teacher education is specialized. This knowledge must include elements of knowledge about teaching mathematics, the characteristics of mathematical learning and the learning patterns of mathematics, as well as covering the different professional skills that a teacher must develop as part of their education (Carrillo-Yañez *et al.*, 2019).

When it comes to the educator's profile, the discussions at the regional level show a shift in importance from the field of academic education towards their work, whether in the sense of providing a more humane approach or a dialogue with Basic Education. It is recognized that it is important for teachers who work in teacher education to have an academic background and be involved in research related to their professional task, i.e. in the field of Education and/or Mathematics Education. Experience as a mathematics teacher is indicated as a very desirable differential for educators in mathematics degrees, a reference that does not appear for the other degrees.

At the VIII FPMat, the GD2 discussions corroborated these trends, but highlighted the impossibility of establishing a single profile of academic education and professional path for educators, given the diversity of circumstances in which they work within the same course and the different contexts in which undergraduate courses are located in Brazil. In view of this, the need to institutionalize educator education as a condition for professional practice and as a field of research has gained momentum.

While discussions about the educator's profile, from the point of view of their academic education and professional work, appear more frequently in the regional texts, references to their work in degree courses are less regular, but all refer to the importance of this teacher's work in the education of Mathematics teacher They mostly focus on actions associated with initial education, especially with regard to LM.

In axis 2, on the *spaces of action*, the discussions in the regional offices highlight the educator's actions and how they impact on teacher education. They refer to the (desirable) actions of the educator, who must have certain qualities related to their academic profile, as they are responsible for teacher education in degree courses, the stage of teacher education mostly addressed in the texts. This responsibility involves implementing the legislation in force for undergraduate courses, the link between university and school and with teachers, tackling drop-out rates and taking a critical approach to the implementation of distance education in initial teacher education. They point out that educators with an academic and professional background in Education and/or Mathematics Education will have a more judicious approach to the design of education and will be closer to the demands of teaching Mathematics in Basic Education.

These trends were taken as a starting point by GD2 at the VIII FPMat, when they were expanded. They add the importance of the educator considering the gaps in the mathematical knowledge of the future teachers, whether in LM or LP, and that this action should be guided by academic research, including that conducted by the educator himself. They add their understanding of the influence of the educator's work on the student's practice, since they also offer a model for how to be an educator.

The discussions about the educator's role highlight what the literature (Murray; Malle, 2005) has been indicating, i.e. the need to contemplate first-order teaching, the object of which is mathematics in Basic Education, in this case, and second-order teaching, i.e. teaching about teaching. This reinforces the dual nature of the educator's knowledge base, which involves: the knowledge needed to teach the students of their students, future teachers, and the knowledge relating to teacher education (Dal-Forno & Reali, 2009).

The dynamics of the work brought to this text, both in the regional forums and at the VIII FPMat, show more questions than answers about Mathematics teacher educators. The consequent questions, coupled with the demand for academic studies on this teacher, observed nationally (Fiorentini, Passos & Lima, 2016) and internationally (Goos & Beswick, 2021), reinforce the need to expand research on educators. In this sense, we present questions that emerged in the process of producing this text.

- How do the different educator profiles impact on the education of Mathematics teacher, the curriculum of degree courses and the interlocution with Basic Education?
- What knowledge is needed to be an educator and what are the specifics of this knowledge? What mathematical knowledge does an educator need in order to provide teachers in formation with the mathematics they need to teach?
- What practices do educators carry out in LM and LP? How do these practices relate to

the educators' academic profile and professional practice?

- How do educators relate to teaching practices in Basic Education? What actions do they take with teachers and schools? How does this impact on their practices?
- What impact has research into mathematics education and teacher education had on educators' practices?

We therefore believe in the potential of discussions around these questions as a way forward in terms of the knowledge produced about/with educators and, especially, as a contribution to Mathematics teacher who are more aligned with the needs of teachers, schools and students. In order to answer these and other questions about educators, GD2 pointed out the importance of thinking about educator education as a field of research.

Perhaps a more immediate response to this demand is the research proposal within the scope of SBEM's GT07 Mathematics Teacher Education. Following the example of other research instituted in GT07 and carried out with the participation of its members, also counting on the contribution of members of other GTs, we believe that studies focusing on Mathematics teacher educators have great potential to contribute to demarcating them as an object of study, delimiting the knowledge produced by Brazilian research and proposing an agenda for future research.

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