Research Article

Characterization of Knowledge Production About Teachers Teaching Mathematics in Pedagogy Courses (2009-2019)*

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ABSTRACT

The purpose of this article is to characterize the production of knowledge about training and the work of teacher educators, who teach mathematics in Pedagogy courses. For that, we raised theses and dissertations defended in Graduate Programs in the last decade, a procedure that is part of the first stage of an investigation, funded by the São Paulo Research Foundation (FAPESP), under development at the Federal University of São Carlos - UFSCar. The theoretical framework encompasses discussions about the presence of Mathematics in the initial training of teachers in the early years, fields of knowledge that the specialized literature considers relevant to the approach, as well as teaching in Higher Education, since the broader study focuses on the possibility of answering: Who teaches Mathematics in Pedagogy courses in the State of São Paulo? We understand that understanding what previous studies / researches say helps in the process of constituting the theoretical-methodological framework in the constructs that make up the arguments for the validity of a research project that aims to find answers to the question posed. In methodological terms, the objective was to map master's and / doctoral works defended in the period from 2009 to 2019 based on an "State of the Art" experience. Qualitatively, the results undertaken in previous investigations make it possible to improve the research in progress, which we aim to contribute to the production of knowledge in Mathematics Education and teacher training when we look specifically at the teaching practices of Mathematics in Higher Education at the time of insertion of researchers in the production of empirical data.

KEYWORDS

Teacher training. Pedagogy. Mathematical education. Teaching in higher education.

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Caracterização da Produção do Conhecimento Sobre Professores que Ensinam Matemática em Cursos de Pedagogia (2009-2019)

RESUMO

Caracterizar a produção do conhecimento sobre formação e o trabalho de professores formadores, que ensinam Matemática em cursos de Pedagogia, é o objetivo deste artigo. Para tanto, levantamos teses e dissertações defendidas em Programas de Pós-Graduação na última década, procedimento que faz parte da primeira etapa de uma investigação, financiada pela Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), em desenvolvimento na Universidade Federal de São Carlos – UFSCar. O referencial teórico abarca discussões sobre a presença da Matemática na formação inicial de professores dos anos iniciais, campos do conhecimento que a literatura especializada julga pertinente à abordagem, bem como à docência no Ensino Superior, uma vez que o estudo mais alargado se centra na possibilidade de responder: Quem ensina Matemática em cursos de Pedagogia do Estado de São Paulo? Entendemos que compreender o que dizem estudos/pesquisas realizados anteriormente auxilia no processo de constituição do referencial teórico-metodológico nos constructos que compõe fundamentos argumentativos da validade de um projeto de investigação que visa encontrar respostas à indagação posta. Em termos metodológicos, objetivou-se mapear trabalhos de mestrado e/doutorado defendidos no período de 2009 a 2019 com base em uma experiência do tipo "Estado da Arte". Qualitativamente, os resultados empreendidos nas investigações anteriores possibilitam aprimorar a pesquisa em curso, a qual perspectivamos contribuir com a produção do conhecimento em Educação Matemática e formação de professores ao olharmos, especificamente, para as práticas de ensino de Matemática no Ensino Superior quando do momento de inserção dos pesquisadores na produção de dados empíricos.

PALAVRAS-CHAVE

Formação de professores. Pedagogia. Educação matemática. Docência no ensino superior.

Caracterización de la Producción de Conocimiento Sobre Profesores que Enseñan Matemáticas en Cursos de Pedagogía (2009-2019)

RESUMEN

El propósito de este artículo es caracterizar la producción de conocimiento sobre la formación y el trabajo de los formadores de docentes, que enseñan matemáticas en los cursos de pedagogía. Para eso, planteamos tesis y disertaciones defendidas en programas de posgrado en la última década, un procedimiento que forma parte de la primera etapa de una investigación, financiada por la Fundación de Apoyo a la Investigación del Estado de São Paulo (FAPESP), en desarrollo en la Universidad Federal de São Carlos - UFSCar. El marco teórico abarca discusiones sobre la presencia de las Matemáticas en la formación inicial de los docentes en los primeros años, los campos de conocimiento que la literatura especializada considera relevantes para el enfoque, así como la enseñanza en la Educación Superior, ya que el estudio más amplio se centra en la posibilidad de responder: ¿Quién imparte cursos de Matemática en Pedagogía en el Estado de São Paulo? Entendemos que comprender lo que dicen estudios / investigaciones previas ayuda en el proceso de constituir el marco teórico-metodológico en los constructos que constituyen los fundamentos argumentativos de la validez de un proyecto de investigación que tiene como objetivo encontrar respuestas a la pregunta planteada. En términos metodológicos, el objetivo era mapear los trabajos de maestría y / o doctorado defendidos en el período de 2009 a 2019 sobre la base de una experiencia de "estado del arte". Cualitativamente, los resultados obtenidos en investigaciones previas permiten mejorar la investigación en curso, cuyo objetivo es contribuir a la producción de conocimiento en la educación matemática y la formación del profesorado cuando observamos específicamente las prácticas de enseñanza de las matemáticas en la educación superior en el momento de inserción de investigadores en la producción de datos empíricos.

PALABRAS CLAVE

Formación de profesores. Pedagogía. Educación matemática. Docencia en educación superior.

Introduction

The training of teachers has been, in recent decades, the subject of studies of several researchers. In the works, particularly, that demarcate the construction of knowledge and the investigative tendency in Mathematical Education seems to exist the consensus that we live a historical problem in the constitution of practices that promote the acquisition of knowledge, knowledge and/or skills necessary for teaching and that when the subject involves the first years of schooling, the difficulties of the teachers are aggravated, especially. According to Valente (2019, p. 52, author's highlights):

> The debate on the training of teachers who teach mathematics leads us to reflections on the knowledge that should be present in the training of teachers. Which mathematics should the future teacher train? Or, to put it another way: which mathematics represents the specific knowledge of this teaching professional? Or, further: what mathematics should be appropriate for a professional teaching knowledge in basic school? Such questions are on the agenda, it seems, a long time ago.

Taking the author's questions as a problem that has affected us directly and indirectly, either by the formative action that refers to the degree course in Pedagogy of which we are members (as an academic and as a teacher trainer), or by the experience of approaching research in Mathematics Education, which materializes in the research project "**Who teaches Mathematics in Pedagogy Courses? The profile of the teacher trainer of public institutions in the State of São Paulo**", under financing from *Fundação de Amparo à Pesquisa do Estado de São Paulo* - FAPESP (Process: 2019/ 10135-7) in force since August/2019.

We frequently observe in the results of studies already carried out in this field (GOMES, 2002; CURI, 2004; ORTEGA, 2011), that there are "harsh" criticisms to the Pedagogy course and to the professionals' egresses of this degree when they enter the career and start teaching different subjects, among which is Mathematics. However, there still seems to be little production of knowledge when the subject refers to the profile of the teacher responsible for this discipline, as well as the characteristics of their education, the constitution of their professionalism, for example.

The foundations that support the structuring of the study in check are based on the belief that there are other aspects that can also compose the scenario of challenges that the teaching and teaching of Mathematics in the first years of schooling announce, one of them highlighted in the article is the profile of the trainer of teachers who will teach mathematical content in Basic Education. This theme we intend to raise in this paper, initially, with the characterization of the production of scientific knowledge of the area from the mapping of theses and dissertations, which we had the possibility to explore from the realization of the first stage of field research that will be presented in the next sections.

The Research Problem

With the end of investigations already carried out previously, in the scope of the actions of the "Study and Research Group on the Beginning of Teaching and Teaching of Mathematics[1]" - GEPIDEM/CNPq - it is possible to affirm the existence of indications that demarcate the possible influence of the formative practices that the degree presents to the future teacher, This is because, in thesis, this teacher of Higher Education is responsible for giving future teachers the opportunity to have access to basic knowledge and knowledge of teaching in the initial years.

Works such as Soares (2014), Zortêa (2015), Muniz (2016), Mariano (2016), Cremoneze (2017), Almeida (2018), Neves (2018) and Santos (2018) are examples of research that strengthen the belief that we need to look at the profile of those who work on aspects of Mathematics teaching in the training of teachers in the initial years, Since in the final results of these studies, it was recurrent the observation that the practices of Higher Education can distance and/or bring the pedagogue closer to the area of Exact Sciences depending on his expectations and experiences with the discipline in the graduation.

Therefore, in the FAPESP research scenario, we take as a research question: What is the formative trajectory of the professionals who teach the subjects related to Mathematical Education in the Pedagogy courses of public universities of the State of São Paulo?

To this end, we aim to operationalize a field work that involves identifying and knowing, in more detail, the profiles of teachers who teach "Foundations and Methodologies of Mathematics Teaching", respectively the processes of teaching and learning in the early school years.

The formation of teachers is a rich and promising field to be explored, this is not a new data, since there are more and more aspects that touch directly on processes of reformulation of the curricular grids of the graduations what moves, without a doubt, in the conception of a teacher who wants to graduate or, as in this study, in the ideology of formative practices related to Mathematics that concern "what" a pedagogue needs to know/understand to teach in the first years.

Lima (2007), when studying the polyvalent teacher[2] and the teaching knowledge to the exercise in the public school, highlights the existence of an amalgam of factors that interfere in the identity of this professional. For the author, he "[...] is an essential professional of the Brazilian educational system, since he works daily and directly at the base of the pyramid with children in public schools" (LIMA, 2007, p. 5). In this understanding, the figure of the

[1] This group was linked to the Federal University of Mato Grosso do Sul - UFMS, Campus Naviraí - from February 2013 to January 2019.

[2] The term "polyvalent teacher" is adopted in this work as the terminology used for the pedagogical teacher, to that professional who has to deal with different disciplines.

pedagogue in the school environment becomes of fundamental importance to citizenship, this requires the valorization of his career, better working conditions, as well as a formation that contemplates the current requirements of doing pedagogic in the educational system. This, without a doubt, goes through the conception of formation present in the graduation courses and, in the specific case of this proposal, from the formation to the teaching of Mathematics to teach in the schools.

Thus, we understand, in agreement with both the specialized literature on the subject and the current curricula, which is the object of discussion and, therefore, teaching in the initial years the knowledge of "Numbers and operations", "Quantities and measures", "Space and form", "Statistics and Probability" and, since 2017 with the Common National Curriculum Base - BNCC - (BRAZIL, 2017), the inclusion of elements of "Algebra", of algebraic thinking in particular.

The development of these needs to be linked, beyond the specific knowledge of the mathematical properties implicit/explicit in the exploration, systematization and materialization of concepts, to pedagogical knowledge and curricular knowledge (SHULMAN, 1986), because it will not help the teacher to understand the content if he doesn't know how to teach, the possibilities of organization of pedagogical work, as well as the specificities of its teaching in classes of the initial years, which will require the teacher of higher education not only knowledge of the area, but also professional experience of acting in these school levels, because the experience will presuppose, in the defense that we have, knowledge of the cause-effect relationships when the theoretical-methodological approach with Mathematics Education in childhood. Therefore, being a teacher trainer in Pedagogy courses, within this component of the curriculum, we think it is necessary to have knowledge of the reality that permeates the school and the classroom, which it has exercised to teaching and, based on this, can redirect to practices and try to break through the barriers constituted by students who often come to graduation for fear of Mathematics, with negative marks of the process experienced as students of basic education.

The challenge is to break the negative view of this area. Evidently, to achieve this formative objective, the theoretical and practical directions exercised by the teacher trainer will have a "weight" of great value that can, depending on the teacher, contribute to overcoming difficulties or enhance the feeling of "powerlessness" in the process of teaching and learning concepts by future teachers.

Gatti and Nunes (2008, p. 22), in an analysis of the Pedagogy courses in Brazil, specifically those that address the group "Knowledge related to specific professional training" conclude that.

> The subjects of this group bring menus that register concern with the justifications on why to teach, which, in a certain way, would contribute to prevent these subjects from becoming mere prescriptions. However, only in a very incipient way do they register what and how to teach. A large number of menus register generic phrases that do not allow specific contents to be identified. There are institutions that propose the study of the teaching contents associated to the methodologies but, even

> so, in a panoramic and not very deep way. So, even in this set of 28% of subjects that can be classified as focused on specific professional training, what the menus suggest is that this is still done in a very insufficient way.

The picture highlighted by Gatti and Nunes (2008), although already has more than a decade, still presents itself contemporary in the scenario of the elaboration of the Pedagogical Projects of Courses (PPC's) of the graduations in Pedagogy. In this way, it becomes necessary, when one wants to analyze this aspect, to observe situations beyond what is on paper, considering that in practice, as the authors highlight, there will be much more or so little of what is stated on the menus. Therefore, to look at what the teacher's action is based on, both for the elaboration of menus, teaching plans and classroom actions, is information pertinent to the configuration of a study proposal that aims at characterizing the profile of who is "behind the documents", that is, the teacher of Higher Education.

For this reason, we are also looking here: Who are the trainers? What kind of practices do they declare to constitute with their students? What conceptions permeate the teaching and learning of Mathematics foreseen in their teaching plans? What knowledge and contents are needed for the approach in the initial years in your visions? Finally, what formative trajectories have these teachers had with Mathematics Education and how can they interfere in the way they see the formation in Pedagogy courses?

Higher education in Brazil has grown considerably, with an increase in the number of places available for this segment of education in both the public and private sectors in recent years. The education/training model in public universities, in particular, is based on a paradigm that aims at the indissociability of teaching, research and extension and, in this context, Cunha (1996), invites us to reflect on how difficult it is for teachers to move through these three dimensions in order to guarantee the necessary quality within institutions. Another issue raised as a problem by the author is the fact that Brazilian legislation does not provide for a university teaching degree, but only states that this degree should be in the form of postgraduate scricto senso, however, it does not explain how this degree should be, highlighting that it generates a mistaken interpretation that research knowledge is automatically transformed into teaching knowledge. Although research knowledge is fundamental, given that in this field of teaching there is no disengagement from research, there is a whole range of knowledge for teaching that are different, leading many to choose a career in universities as the place where research is done, forgetting to reflect that it is among their duties to be a teacher (CUNHA, 2009).

Regarding the teaching of Mathematics in Pedagogy courses, we find a problem that also bumps into the performance of Basic Education teachers, the real "dread" that pedagogues have of it, as well as the negative feelings generated during their schooling process. Xavier (2015), in his master's thesis, brings in an explicit way this issue, placing in his reflection that the role of the teacher of Mathematics in Higher Education, especially in the courses of Pedagogy, is to break this barrier, minimizing the fears of students and focusing on pedagogical practices that can form and facilitate the future teaching action of their students. For us, this situation is also directly linked to the formation of the teacher who teaches Mathematics in the initial formation of teachers.

After these reflections, we believe it is indispensable to take a more careful look at the degree courses in Pedagogy, specifically observing the formation of the professional who teaches the subjects in the field of Mathematics Education, evidencing their formative trajectory, which conceptions they have elected to be primordial in the menus and teaching plans, thus trying to understand and discuss ways that can lead to the improvement of this field so essential, but still feared by future teachers.

Staking - Methodological Design

The production of scientific knowledge, in Human Sciences, requires an approach that allows it to make considerations that go beyond the obvious, the consequence, the observable in a practical way, the findings evident to the eye. It is necessary to try to understand what is in the "between the lines" of the data. Therefore, qualitative research in education (LÜDKE; ANDRÉ, 1986), of a descriptive-analytical nature, is an approach that allows us to weave more detailed considerations of certain subjects.

Qualitative research in the field of education has a significant importance, since it is based on this view that it is possible to make an in-depth reflection on the context of the reality to be studied, its specificities, its variables and the external influences that permeate each and every environment, thus being able to, make an analysis that enables discussions that lead to the diagnosis of problems, that is, qualitative research in education aims to understand the process of quality of the situation and not only the final results, but the reasons why they were reached, thus facilitating interventions to improve the practices to be developed (ZANETTE, 2017).

In this work, we chose as an instrument of data production the mapping in which the "State of the Art" perspective was used, since such an approach implies "[...] the challenge of mapping and discussing a certain academic production in different fields of knowledge, trying to answer that aspects and dimensions have been highlighted and privileged in different times and places [...]" (FERREIRA, 2002, p. 257), which we aim to do by making contact with studies, their production conditions, as well as their central results.

Seeking to respond to the objectives of the mapping, we elected three research descriptors [keywords], being them: "Formation of Trainers", "Teaching in Higher Education" and "Professional Identity". The option for these descriptors refers to the correlation between the terms "formation", "teaching" and "identity" of the teacher, since the research work that we are carrying out is located in this triad of studies precisely because it focuses the teacher trajectory in the formation of the teaching in Higher Education. Therefore, these keywords made it possible to filter investigations that helped us to expand the theoretical-methodological reference.

The survey was conducted at the *Biblioteca Digital Brasileira de Teses e Dissertações - BDTD* - (http://bdtd.ibict.br/vufind/), Brazilian Digital Library of Theses and Dissertations and at the Catalogue of Theses and Dissertations of the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES* - (https://catalogodeteses.capes.gov.br/catalogo-teses/#!/) - Coordination of Improvement of Higher Level Personnel. In this process, we have adopted the "Human Sciences" filter and researched programs in the areas of "Teaching", "Education" and "Teaching of Sciences and Mathematics".

Table 1 illustrates the results found, in quantitative terms, at the time of insertion of each descriptor in their respective bases, as well as the centrality of production, in the sense of the collection indexed in these platforms.

Table 1. List of Theses/Dissertations and the correlation with the search descriptors in BDTD and CAPES.

Descriptors	Quantity of publication per year											
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	**Total Descriptor**
Training of Formers	265	378	391	379	433	488	567	453	544	794	-	**4.692**
Teaching in Higher Education	675	360	425	200	414	475	525	617	516	701	-	**4.908**
Professional Identity	262	361	367	375	442	513	580	567	544	589	-	**4.600**
Grand total	**14.200 researchers**											

Source: The authors (2019).

As verified, in the mapping carried out, when searching for works of the three descriptors, in the two databases, we reached the number of 14,200 searches defended in the decade from 2009 to 2019. Of this total, 33.042% (4,692) correspond to the descriptor "Formation of Trainers"; 34.564% (4,908) to "Teaching in Higher Education"; and 32.394% (4,600) refers to the percentage number of theses and dissertations on "Professional Identity".

An important factor to be observed is that a large part of the research is concentrated in the South and Southeast regions, more predominantly in the Southern region of the country, specifically works defended in graduate programs of Universities of the State of Rio Grande do Sul, such as the Federal University of Rio Grande do Sul (UFGRS), Federal University of Santa Maria (UFSM) and State University of Rio Grande do Sul (UERGS).

Despite the significant number of researches found when searching based on the descriptors, we have in this work a specific questioning about who is the professor who teaches Mathematics in the Pedagogy courses and, for that, from the direct contact and the previous reading of the localized texts, when tuning, few works help us to think about this research problem, since a significant part of the production of knowledge in the area is focused on Basic Education in general, this falls, without a doubt, on the need of more in-depth investments for studies in the field of Higher Education.

Thus, in synthesis, from the general quantity of studies (14,200), in the filter from the reading, initially of the summaries of theses and dissertations, and, later, of the works in their entirety, we find five directly linked to the theme that we are working on in the project in question, being these, therefore, the ones that will be presented in the next items.

Thesis and Dissertation Mapping: What Does the Production of the Last Decade (2009-2019) Say?

What do the surveys on "Training of Trainers" say?

In view of the significant number of studies found, when this descriptor was inserted into the BDTD and CAPES platforms, among the 4,692 (100%), 4 (0.085%) are directly linked to the descriptor "Training of Trainers". The process of verification of these occurred based, initially, on the reading of all the abstracts of theses and dissertations found in the first search, later, when the foci of investigation were identified, we read the whole of each thesis and dissertation with the objective of expanding the theoretical-methodological repertoire of the research proposal developed, as well as to situate ourselves before the production of knowledge of the field.

From this action, we located 2 theses and 2 dissertations defended between the period of the search: Manfredo (2013), Reis (2014), Utsumi (2016) and Castro (2018). Chart 1 presents their specificities:

Chart 1. Surveys that discuss the theme "Training of Trainers" in the period 2009 to 2019.

Title	Author	Advisor:	Institution	Level	Year
Knowledge of teacher trainers and the practice of training for teaching and mathematics in the initial years of schooling	Elizabeth Cardoso Gerhardt Manfredo	Professor Doctor Tadeu Oliver Gonçalves	Universidade Federal do Pará – UFPA	Thesis	2013
Being a teacher in Higher Education: social representations of teaching practices by trainers of the Pedagogy course	Rennata Paolla Jacintho Peres Reis	Professor Doctor Monica Rabello de Castro	Universidade Estácio de Sá – UNESA	Dissertation	2014
A study on the formative knowledge of the math teacher trainer of the degree course in Pedagogy	Luciana Miyuki Utsumi	Professor Doctor Norinês Panicacci Bahia	Universidade Metodista de São Paulo – UMESP	Thesis	2016
Teacher training in mathematics for the early years of elementary school: the role of the Pedagogy course	Maria Odilma de Oliveira Castro	Professor Doctor Sandramara Matias Chaves	Universidade Federal de Goiás – UFG	Dissertation	2018

Source: The authors (2019).

Manfredo's (2013) doctoral research aimed at investigating the construction and expression of the knowledge of teacher trainers throughout their experiences, and their repercussion on training practices for teaching in Mathematics Education in the initial years of elementary school to students of the degree in Pedagogy. To this end, the direction of the theoretical and methodological corpus of research in check assumes, as Manfredo (2013, p. 16) states, the following path:

> With such perspective, I deal initially with the university professor inserted in the problem of the formation and his role in the professional qualification of the professor to act in the initial years of schooling. Then, I deal with theoretical references, dialoguing with authors' positions regarding knowledge, knowledge, identity and teacher training. In view of this material, I take a position on the knowledge and the way it is constituted throughout the formation of the teacher, especially the teacher trainer.

Manfredo (2013), defends the thesis that the teacher develops his knowledge according to his personal and professional experiences, demonstrating that a good teaching practice in Higher Education, to which everything indicated, can be linked the experiences that he obtained during his trajectory. Regarding the teaching of Mathematics, the author invites us to reflect on the lack of a conceptual and pedagogical formation for the teaching of the subject in some undergraduate courses, which she considers a mistake that occurs in the context of the initial formation of teachers for this field, both in the undergraduate course in Mathematics and in Pedagogy, given that it compromises, without a doubt, the formation for teaching in Basic Education. On this issue, Manfredo (2013, p. 46) states:

> This lack of training for teaching in terms of quality of professional training contrasts with the evident recognition and mention of Oliveira (2007) of the fact that the success of student learning depends fundamentally on the posture and attitudes of the teacher, given his responsibility in the selection of content, organization and evaluation of the activities proposed and developed, which are determinant in the process of teaching and learning.

The study had, as a source of data production, interviews with five university professors who taught subjects related to Mathematics, showing the formative trajectory of each one, that is, what paths they traveled to reach teaching, analyzing their biographical narratives of formation and experience trajectories in the teaching career. In view of the results, the author draws some conclusions that teaching for all was not the first option, but the formative paths led them to the classroom and that the remuneration of a university professor is in fact a motivating element to enter Higher Education as a professional field. "The perception that teaching would be a break in the branch or something passing, or even complementary to another professional occupation" (MANFREDO, 2013, p. 96).

As for the choice for teaching in the area of Mathematics, the author shows that all those researched reveal the presence of a teacher who marked their trajectory as students. This, rightly, implies that we reflect that this can be an interesting aspect in the sense of the attractiveness of teaching by the bias of the possibility of constituting a collective identity, mediated by peers, the good feelings arising from the relationship teacher and student, but is also present, in this influence, a side that needs to be problematized: the possible lack of autonomy when the positive and/or negative influence of our teachers is not overcome, since, although we can rely on "good practices" of teachers that we have throughout the trajectory, however, each teacher is formed in a unique way, because the experiences of each are different.

Another important conclusion of Manfredo's work (2013) is that the knowledge constituted in each trajectory of personal and professional formation defines ways of thinking and acting in the formative practice because it brings elements or constituted knowledge that facilitate, clarify or inform the formative teacher, enabling him to have greater security and success in his practice. In conclusion, Manfredo (2013, pp. 183-184) makes the following statement:

> Through this analysis it was possible to observe in the process of pedagogical reasoning a formative practice in which constituted knowledge is mobilized along each formative journey, at the taste of the socializing experiences of each participant. This knowledge converges in the process of conducting the classes and allow, on the one hand, to offer a pedagogical model of apprehension of mathematical contents, necessary for the teacher in initial formation. On the other hand, they allow this undergraduate student to develop scientific and reflective attitudes regarding teaching and learning (in confronting and problematizing didactic resources, curricula, psycho-pedagogical aspects, history, etc.) in general, configuring a reflection on teaching, and particularly on mathematics, and thus be able to see himself as a teacher in training and not only as a student.

The researcher shows that we are a product of our training and that in the graduation course it is necessary that the future teacher has the notion that he will be in front of a classroom, as well as that he needs to overcome his difficulties in relation to the subject of

Mathematics, problematizing the contents, in the perspective that his experiences can contribute to his professional practice, so that his future students do not have a fragmented training.

The second research was carried out by Reis (2014) who, in his dissertation, analyzed the social representations about the learning of teachers in Pedagogy courses and also the knowledge they have acquired throughout their training, from the perspective of understanding which ones they use in their pedagogical practice in the classroom, having as a field of research a private university and a public one. For this purpose, the scope of data production was based on the collaboration of 11 teachers, 6 from the public institution and 5 from the private one, who used semi-structured interviews to collect data from the research subjects.

As the work advances, already in the theoretical references presented, the author brings a debate that teaching is much discussed in the literature in the scope of Early Childhood Education, initial years and final years of Elementary School when compared with university teaching, since, the skills and abilities of the teacher of Higher Education seem to walk more into the theoretical field of research on teaching than in fact in the practical knowledge "of" and "about" the school. In this context, being a professor at the University, according to the author, often implies having a theoretical mastery in the deepening of the subjects to be taught. "Little has been demanded of higher education teachers in terms of pedagogical knowledge. Each day the demands for university teachers to have master's and doctor's degrees are increasing [...]" (REIS, 2014, p.10). In continuing this critical assessment, Reis (2014) also points out that we need to question whether training, in the stricto-sensu mode, implies improvements to the teaching quality of the teacher who will work directly with the training of future teachers.

A proposed discussion, as an alternative to the problem of the dissertation, is that the institutions not only have a teaching staff with excellent qualifications, but that they also have a didactic-pedagogical qualification. To this end, the offer of continuing education actions to Higher Education teachers, in the perspective of improving their practices, is something relevant throughout the teaching in the teaching of this category of education professionals, because the central objective of graduate programs is to train researchers and not teacher trainers, which leaves the discussions of teaching practice, in the Higher Education area, in second place.

Reis (2014), concludes that the professors who have been researched have discourses that are very aligned with the criticisms they make of teaching in Higher Education and that what differentiates them is the fact that in public institutions, university professors from public and private universities are charged for academic productions and in the private institution they are pressured by management so that the university is recognized and attracts more students. According to Reis (2014, p. 134):

> [...] the greatest difference perceived between teachers in public and private institutions refers to the fact that teachers in public institutions see research as an ally in the educational process. For them, the research helps, brings the theoretical discourse closer to the practices carried out in the classroom. For teachers of private institutions, research is something more distant (we believe that because research is not an obligation in the private institution) and bringing it closer to practices is a challenge, because it is not directly part of the reality in which this teacher is inserted, which makes it easier to bring his classroom practice closer to his previous teaching experiences.

The conception and the forms of representation of pedagogical practice, object of study in this research, are differentiated within the institutions and felt by the subjects of formation in a sudden way, when compared (public x private).

In summary, the teachers point out that the great impediment to not carrying out practices that can improve teaching and the pedagogical relationship are the ways in which the institutions define the dynamics of work, not allowing teachers to have autonomy, as explained by Reis (2014, p. 135):

> The professors interviewed stated, at various moments, that the great villain so that the reality in higher education does not change, from a theoretical training and disconnected from practice, to a training where there is a coherent relationship between this universe, is the institution itself. It is mentioned as the great impediment for the teacher to change his teaching models, to change the reality of higher education, since, for them, it would not accept anything outside of what is established or anything that requires a greater investment in time or money. Allied to this aspect is the working student who, due to lack of time and dedication to studies, discourages the teacher from searching for new models of teaching, new practices that can help this more coherent formation between theory, research and practice.

Utsumi (2016), in his doctoral thesis, conducted a study aimed at the training of mathematics teachers in the early years of elementary school, seeking to understand their training in Pedagogy courses. In order to fulfill this objective, he aimed to discuss what knowledge is needed by the trainers so that they can provide the graduates with a satisfactory education so that they can practice teaching.

The initial hypothesis raised by the author is that the formation of teachers that consolidates pedagogical practices "[...] through the effective guarantee of skills, competencies and attitudes required for the initial formation of teachers of Mathematics in the initial years of Basic Education [...]" (UTSUMI, 2016 p. 42), could help in the confrontation of the failure of students in this stage of Basic Education.

In view of this, the discussion that Mathematics Education in the initial years has been a much discussed topic at the academy level and that this is evidenced by the coining of terms such as, for example, mathematical literacy, numerical literacy. However, although the subject is widely discussed, mathematics in the classroom remains something difficult for both students and teachers. According to Utsumi (2016, p. 48):

> However, it is noticeable that students, even those fully literate in everyday language, do not possess the basic skills for the understanding of Mathematics They are often unable to conclude with accuracy the four fundamental operations: addition, subtraction, multiplication and division. Nor can they interpret them in the problem situations on which their teaching is based today.

The author argues that it is necessary for the trainers to provide students with a solid theoretical training in order to develop a critical consciousness in relation to Mathematics.

In methodological terms, both public and private Higher Education institutions that offer the degree course in Pedagogy, public and private Basic Education schools that offer the initial years of Elementary Education have been used as a field of research. The subjects of the research were teachers of higher education both of the degree course in Pedagogy and of Mathematics, students of the degree course in Pedagogy, as well as teachers who already act as in the initial years, using as data collection instrument questionnaires and interviews.

In concluding the investigation, Utsumi (2016) highlights that the initial training of teachers does not provide students with the conditions to reflect on the contents they will have to teach, because it does not even manage to fill the gaps that already exist. As for the trainers, an excessive concern with the methodology was contacted and not in the domain of the contents. The study also revealed that the teacher who teaches the subjects of Mathematics, in the course of Pedagogy, must have not only the mastery of the contents, but also provide the students with a reflective formation. For Utsumi (2016, p. 159):

> Its formative practices must be anchored in proposals that articulate the multiple dimensions of the formation of the mathematics teacher, with special attention to specific contents, since the researches have verified a desolating and worrying scenario in relation to this issue.

In short, he argues that the teacher trainers also need to overcome the gaps, because in their initial training they also had an emphasis on methodologies, but as professionals in education, they are also in continuous training, they can contribute to a successful pedagogical practice in the future.

Castro (2018), the fourth and last work identified as important to the constitution of our theoretical reference, investigated the training in Mathematics in Pedagogy courses in two Universities of the State of Goiás (GO), proposing a discussion that the mathematical training of future pedagogues must occur in a solid way, because a large part of the graduates who opt for this degree, to what the data from other studies show, have a gap as to the conceptual mastery of the levels of mathematical proficiency of contents considered elementary. For the author, this should be demystified throughout the course, after all, the first impressions that children will have regarding Mathematics will be presented by this professional (CASTRO, 2018).

In the description of the data, it is presented that one of the Universities offers two subjects directed to the teaching of Mathematics, both being directed to the initial years of Basic Education, while in the second institution only one subject is part of the roll of formation in this field, being this also with emphasis in the initial years.

When interviewing the students, Castro (2018) concluded that they feel the need for more dynamism and practical classes in Mathematics that encompass specific knowledge of content, so that they can be more secure when practicing teaching. The researcher emphasizes that although they are critical to their education, the students from both Universities want to be teachers and, therefore, are concerned about their education in Mathematics.

In relation to the teacher trainers, the production of data took place based on a semi-structured interview to understand how mathematical formation was thought in the Pedagogy courses researched. In view of his analyses, Castro (2018, p. 98) highlights:

> In this sense, the evaluation of the training of students in the course of Pedagogy in the subjects of mathematics, aims to know the quality of this training, understanding and the difficulties of the students and thus establish strategies to reach the level of "second nature" in the expression of Gramsci (1979), i.e., to expand knowledge with access to information mainly with regard to the training of teachers for the teaching of mathematics in the early years of elementary school since this knowledge and studies of mathematics involves a plurality of knowledge.

Faced with the problem of this study, the central conclusion demonstrates/s signals that it is necessary to carry out research related to teacher training that aims to understand processes of teaching and learning mathematics in the initial years.

What Do The Research On "Teaching In Higher Education" Say?

As Table 1. illustrates, in the descriptor "Teaching in Higher Education", initially the surveys counted a total of 4,908 (100%).

The general quantity of these works brings the idea that this term/subject, apparently, is widely discussed in literature and in graduate programs, however, with a more detailed look at the correlation between "teaching in higher education", "pedagogy course" and "mathematics discipline", the number decreases expressively, so much so that in the last decade we find 1 (0.020%) which will be highlighted below.

In chart 2, we have the identification of the Master's dissertation located in the period limited to mapping, we know that the production "of" and "about" "Mathematics in Pedagogy courses" is significant, this both in number of theses and dissertation defended in recent years and in articles and chapters of books of collections to which we have access on a regular basis, however, it should be noted that by adopting the descriptor in question, in this work, we were careful to try to give prominence to research that would fulfill the objective of evidencing the practices, actions and/or constitutive elements of the training of teacher trainers.

In this sense, the following work deals with the perceptions of students about "teaching in Higher Education" in Mathematics Education in the degree in Pedagogy, which differs from other studies that try to demarcate impressions of students (future teachers) about their training, without problematize who is the teacher who teaches in these courses.

Chart 2. Researches that discuss the theme "Teaching in Higher Education" from 2009 to 2019.

Title	Author	Advisor	Institution	Level	Year
Learning to teach Mathematics: a proposal for Pedagogy courses	Suely Cristina De Souza Fernandes Crahim	Ana Maria Severiano da Silva	Universidade Severino Sombra	Dissertation	2013

Source: The authors (2019).

In his dissertation, Crahim (2013) discusses the formation of the pedagogue for the teaching of Mathematics in the early years of elementary school. For this purpose, he aimed to investigate the formation of the pedagogue for the teaching of Mathematics in the initial years of elementary school. The research field was a private University; the author criticizes the statement that to teach Mathematics in Pedagogy courses you have to be the teacher trainer with a degree in Mathematics.

Proposing that the teacher who trains future pedagogues must provide dynamic and quality teaching in both specific and pedagogical content, Crahim (2013, p. 22) states:

> We emphasize the need for the teacher to provide his students with moments of research, experiences, searches. He must be willing to listen, to dialogue, to opportune in his classes moments of debate, of freedom to speak and to expose his ideas, of understanding the will of his students. To do so, you must like to teach and like the student. It is necessary to like to learn and to encourage learning. It is necessary to feel pleasure in observing your students in their discovery by their own knowledge.

From the conception of the exposed formation, the author interviewed students and professors of the University as a form of data production. One of the questions that caused her most strangeness is that both students and teachers agreed, for the most part, that the professor responsible for the area of Mathematics in the degree in Pedagogy should be licensed in this subject, however, the author argues that the professor should provide the student with knowledge and frankness when teaching, proposing classes that help the future educator, and that this only a teaching path is able to provide, as advocates Crahim (2013, p. 55) in the excerpt below:

> Research on teacher training and profession points to a review of the understanding of teachers' pedagogical practice. It is considered that the teacher, in his trajectory, builds and reconstructs his knowledge according to the necessity of its use, his experiences, his formative and professional paths.

Finally, at the end of his research, he highlights the importance of the professional trajectory of the teacher, because his professional experiences can help in certain moments he gave his class, thus making the students feel more secure than what is being taught.

What Do The Surveys On "Professional Identity" Say?

To the general quantity of the works filtered with this descriptor, being 4,600 (100%), no researches were found, in the stipulated period, that had direct correlation with the study that we are developing, these would be the ones that, by chance, would deal with "Professional Identity" and "Teaching in Mathematics Education in the Pedagogy Course", which, by the filter of the reading of the summaries of the theses and dissertations verified, did not fulfill the requirement.

Thus, we did not bring to the incorporation of this section because they were works that portrayed professional identity in other areas such as, for example, the role of the internship in the construction of the teaching identity; the collaboration and identity of teachers, the professional identity of the trainer in higher education in general, without an articulation with the formation of teachers in the Pedagogy degree, among others.

Final Considerations: Where Do The Studies Guide Us?

The researchers analyzed and listed in this work give us ways to think and analyze some inferences regarding the teaching of Mathematics in the initial years of elementary school, as well as the initial formation of teachers who work in this stage of teaching. In addition, the experience of mapping the production of knowledge in the area in the last decade has given us the opportunity to know and detail theses and dissertations that highlight the work of the teacher trainer in the field of Mathematics Education, his knowledge, knowledge and experiences, since, without a doubt, it has contributed greatly to problematize the object of study and also to identify characteristics of the profile of those who teach Mathematics in the degree in Pedagogy, based on the literature of the subject.

As we have seen, throughout this article we have sought to characterize aspects of the work of the trainer. We have mobilized a theoretical-methodological reference that was constituted from mapping the production of knowledge, through theses and dissertations, located from 2009 to 2019 in the perspective of understanding the studies on "" Education for Trainers", "Teaching in Higher Education" and "Professional Identity". Regarding the descriptor "Formation of teachers," we find the works of Manfredo (2013), Reis (2014), Utsumi (2016) and Castro (2018), which have delineated themselves more for general studies of the field, with low correlation with the education of the trainer who teaches Mathematics. About "Teaching in Higher Education", Crahim (2013) was the only text related to the focus of our study. This, no doubt, seems to signal the fact that they become relevant production in this area, given the low proportionality of the research. The research on "Professional Identity" did not allow connections with the work we are doing.

In the theses and dissertations presented here, it is possible to notice that the results of these investigations demonstrate that the courses of Pedagogy, in what concerns the mathematical formation and the formation for teaching, the central focus of the formative

actions falls with emphasis on teaching methodologies, that is, they focus on "how to teach" and not "what", in specific terms of the elementary mathematical contents to be introduced with the child of the initial years, which corroborates, even if more than a decade has passed, with the data of the doctorate research of Edda Curi (2004).

Another important factor is that, according to Resolution CNE/CP No. 1 of May 15, 2006, which institutes the National Curricular Guidelines for the Graduation Course in Pedagogy, the initial formation of the pedagogue must contemplate aspects, in the different dimensions, of the field of Early Childhood Education and the first four years of Elementary School, which is not observed, when the subject is Mathematics Education, at least in the theses and dissertations highlighted here. In other words, what we mean is that the menus of the subjects responsible for the pedagogues' mathematical formation seem to have no space-time to discuss the aspects of mathematical language in acting with the small child (nursery, maternal and kindergarten). By way of problematization, although this is not the focus of our research, we investigate: Where is the Mathematics of Early Childhood Education in the initial formation of the pedagogue?

To what the data of the research presented shows, most of the teachers acting in the pedagogical license were not pedagogues, perhaps this justifies, in thesis, the non-appearance of the discussions "of" and "about" Mathematical Education in childhood. The formative trajectory of the teacher educators indicates, due to the work we brought to the dialogue, that they are not related to the process of teaching and learning mathematics in childhood.

Referring to the study we are developing, the differential lies in the fact that we are concerned with looking at the formation of the trainer, as he constituted his trajectory to be in this place, so that we can contribute to the theoretical field of Mathematical Education in the initial formation of teachers, we understand that what we have built up to now helps us to develop the future stages of the research project in course, which originated this production.

In summary, studying processes that involve the formation, performance and conception of trainers to characterize "those who teach Mathematics in the degree of Pedagogy" represents, to the scientific initiation scholar, a first contact with the field of academic research, which can be a path to new ventures such as master's and/or doctorate. Studying a theme directly linked to the formation in Pedagogy, in the case of this study of Mathematics, allows one to have a vision on how this field of knowledge relates to the initial years, as well as the access to specialized literature that may help in the future teaching practice of the first author (academic of Pedagogy at UFSCar), to understand that, many times, the trainers do their best with the workload they have in the disciplines and also how challenging it is to *LearnMathematics* in formative processes of the teacher/pedagogue.

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