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### **ABSTRACT**

The present text aimed to analyze the process of teacher professionalization from the perspective of the specific training of the teacher discussing the role of Didactics in the formation of Mathematics. It is considered that the knowledge working in the degree in Mathematics is necessary knowledge for the teaching practice and is directly linked to the action of teaching. As an example, the themes of didactics, teacher professionalization, teaching methodologies, and professional development can be cited. It sought to deepen the investigation of the knowledge necessary for teachers for their

professional practice. The bibliographic research was based on investigations carried out by Shulman (1986; 1987; 1996), Mizukami (2005-2006), Marcelo Garcia (1999; 2009), Tardif (2002), Hill & Ball (2004), Libâneo (2002, 2006), Candau (2008), (2009), Oliveira-Formosinho (2009), Libâneo e Pimenta (2011), Ponte (1999; 2014; 2020), Gatti (2009a; 2009b; 2010; 2019), Giraldo (2018), among others. The work reveals that the didactic and pedagogical knowledge present in the initial and continuing education of teachers needs to contribute to a reflective stance on their practice, in addition to the experimentation of different teaching strategies. With this, it is expected that the teacher can develop a more conscious, reflective, and effective teaching performance. The training helps the professional teaching knowledge that supports and guides the practice of the teacher in the classroom (PONTE, 2020). Training and professional development processes are fueled by professional knowledge that, at the same time, mobilizes and promotes other knowledge. The results indicate that teacher professionalization, encompassing initial and continuing education, can contribute to professional development and the construction of the identity of teachers, categories that must interact in a continuum permeated with being, living, and teaching, key elements for the exercise of teaching. Still, as a complementary perspective, it is emphasized that the investigative attitude should be the axis of training for the construction of a solid and flexible knowledge base, having as specificity, the learning of teaching and the construction of professional development strategies.

**Keywords:** Initial training, Professionalization, Didactics, Mathematics education.

### **1 INTRODUCTION**

The pedagogical practice of future teachers should be based on elements and practices that give rise to the opportunity to concretize theories learned at the university, analyze their dimensions, know conceptions, adjust their assumptions to the current reality, question others, and build their didactic knowledge about the practice experienced. This text aims to present a theoretical and methodological

contribution that nourishes the reflections on Teacher Training and Professionalization today in the face of a reflective attitude about their practice.

The experiences of teachers, training spaces, learning communities, and varied field experiences mobilize general questions that drive our reflection and writing supported by an extensive knowledge base that promotes reflection and search for understanding of the training (initial and continued) of teachers. They also lead to the commitment to the continuity of the development of the professional behavior of teachers *vis a vis* systematic reflections of theoretical and methodological contributions and personal inquiries.

In this essay, we start from the assumption that teacher education takes place throughout life and that, therefore, theoretical studies should permeate the pedagogical activities in the undergraduate courses and, the classroom practices of Basic Education can enrich the teaching work. To this end, we will present, initially, the historical origins and the theoretical foundations that underlie the modalities of teacher training developed in the region of inquiry of Mathematics Education.

For the development of this study, we listed the following research questions: How does the process of teacher professionalization occur from the perspective of specific teacher education? What is the role of Didactics in Mathematics training? These questions mobilized the reflection that we will present based on studies by Shulman (1986; 1987; 1996), Mizukami (2005-2006), Marcelo Garcia (1999; 2009), Tardif (2002), Hill & Ball (2004), Libâneo (2002), Candau (2008), Fiorentini + Lorenzato (2009), Oliveira-Formosinho (2009), Ponte (1999; 2014; 2020), Gatti (2009a; 2009b; 2010; 2019), Giraldo (2018).

As a result, it is concluded that the training helps the professional teaching knowledge that bases and guides the teaching practices; therefore should contemplate the supervised pedagogical practice, in which the teacher in training can try different teaching strategies and evaluate them in the light of didactic references adopted, making adjustments and adaptations in real contexts, as a rule, permeated by issues such as social inequalities and diversity - which makes the work even more challenging, especially if we consider that the working conditions do not follow the challenges and demands placed on the professional exercise.

In the subsequent sections, we will make a presentation of the research related to the initial and continuing education of teachers that will unfold for an understanding of Professionalization and Teacher Professional Development.

## 2 HISTORICAL ROOTS AND THEORETICAL FOUNDATIONS IN THE REGION OF INQUIRY OF MATHEMATICS EDUCATION

Mathematics Education has been structured as a field of teaching and research for only a few decades. When considering Mathematics Education in the field of teaching, Mathematics is thought of as a curricular component in a more comprehensive way than simply the transmission of content, since it covers formative processes of children, adolescents, young people, and adults in the school institution. In this perspective, it demands links with Pedagogy, Sociology, Anthropology, History, and other areas of knowledge.

Mathematics Education emerged in the late 1980s, emerging as a new disciplinary and professional field. The emergence of this new strand has, in Brazil, as reference milestones the execution of the National Meeting of Mathematics Education - I ENEM, which took place in 1987, at PUC in São Paulo, and, in 1988, the II ENEM took place, in the city of Maringá in Paraná, in a meeting between teachers who founded the Brazilian Society of Mathematics Education (SBEM)

Thus, Mathematics Education in Brazil as a professional field has its origins in early twentieth century. In this period, the teaching of mathematics was not yet seen as different from the existing practice, since its proposals for improvements were not very explicit. Therefore, it was from this that the need for attention arose on the part of the mathematicians of this period to conquer the desired space in school education.

At that time, MS was not yet clearly configured. It was not usual to look at the teaching of mathematics with perspectives different from those directed directly to the tasks and procedures of classroom practice and the production of manuals or didactic subsidies. It is possible, however, to identify, in this period, some efforts and movements that would prepare the ground for the later emergence of MS as a professional field not only of action but also of systematic production of knowledge (FIORENTINI & LORENZATO, 2009, p.17).

In 1920 an educational movement called Escola Nova emerged, whose reflections contributed to Brazilian Mathematics Education. According to the scholasticist conceptions, the student was the center of the learning process and no longer a passive receiver. This movement enabled the creation of new methodologies of teaching and learning school mathematics, thus emerging the first mathematical educators who created materials for didactic-pedagogical purposes of the discipline, from which stood out Everardo Backheuser and Euclides Roxo.

From the mid-1940s to the 1950s, other mathematicians such as Júlio César de Mello e Souza, later known as Malba Tahan, Cecil Thiré, Ary Quintella, Munhoz Maheder, Irene Albuquerque, and Manoel Jairo Bezerra, emerged. According to Fiorentini + Lorenzato (2009), these mathematicians or teachers of Mathematics, instead of investigating the experience of students and teachers in schools or

the process of teaching and learning, prioritized summarizing textbooks for students and indicating knowledge necessary for teaching practice and for the curriculum emphasizing the specific contents.

Until 1950 the studies carried out were directed to the primary school emphasizing very initial contents of Mathematics and concerns regarding psychological studies and teaching-learning of the child. After this decade congresses were held in Brazil focusing on the process of teaching mathematics also, at that time, regional centers of studies in education were founded, which provoked the interest of teachers in the area of mathematics in researching more about teaching and learning in Brazil, as well as began to involve with actions of an international mobilization of reformulation and modernization of the school curriculum, called the Movement of Modern Mathematics.

The movement cited can be characterized as an intense change in the teaching of mathematics since teachers and other professionals in the educational area, from the basic levels to the universities, was dissatisfied with the teaching model that had been practiced.

During the military regime, education began to be valued, and its focus was justified by the purpose of qualifying the workforce. At that time, (in the 1970s), compulsory professionalization in high school was instituted, and the extension of period of compulsory schooling from four to eight years. Such changes, especially those resulting from the expansion of compulsory schooling, promoted the expansion of universities in the early 1970s, and the expansion of teacher training in science and mathematics, a time when there was the emergence of graduate courses in the area of Education, Mathematics, and Psychology whose central concern was with the expansion of the teaching staff.

Subsequently, it was noticed that other stages and modalities of teaching defined interests for studies related to the curriculum, teaching, and learning processes in mathematics, distinguishing itself from the previous phase.

In the period from 1975 to 1984, a multinational program was instituted that served classes of students from all over Latin America, organized by Ubiratan D'Ambrósio. The purpose of the program was to qualify specialist teachers for the teaching of science and mathematics, with the purpose that they lead courses and programs aimed at improving teaching. The studies implemented showed more objective concerns regarding pedagogical practice. This period represented the phase of the emergence of Mathematics Education as a professional field of specialists in didactics and the methodology of mathematics teaching.

From 1980 onwards Mathematics Education is questioned within its conception, and new lines of research emerge from which one can cite: Ethnomathematics, the History of Mathematics Teaching, Mathematical Modeling, Problem Solving, and the History of Mathematics, among others. This period was also marked by the participation of professors, with enormous experience in the classroom, in research groups, and events aimed at improving teaching in the areas of science and mathematics. They

collaborated in the context of systematized reflection through the approach to situations experienced in the context of the classroom (FIORENTINI & LORENZATO, 2009).

Even with the great debates regarding Mathematics Education in Brazil, its implementation occurred only in 1987-1988, coinciding with the foundation of the Brazilian Society of Mathematics Education – SBEM, established as a civil society of a scientific and cultural nature, composing groups of researchers from all levels of the Brazilian educational system.

In this way, Mathematics Education becomes concerned with improving the way mathematics is taught in schools, intending to make it more relevant and attractive to students. This includes using technology and other tools to help make learning mathematics more interactive and engaging.

Researchers in the Mathematics Education inquiry region use a variety of research methods, including case studies, experiments, quantitative and qualitative data analysis, and theoretical work, to investigate issues related to the teaching and learning of mathematics.

## 2.1 THE INITIAL TRAINING OF MATHEMATICS TEACHERS: KNOWLEDGE ON SCREEN

The initial training of teachers in Mathematics should happen to promote the construction of knowledge, as well as stimulate the construction of pedagogical practices from a critical-reflective perspective. As postulated by Libâneo (2002, 2006), Libâneo and Pimenta (2011).

The initial training in Mathematics should contribute to the future teachers building knowledge related to mathematical knowledge, teaching knowledge, teaching strategies, their professionalism, teaching practice, and professional development, going beyond learning limited to the intrinsic contents of the area of operation as well as to the mere training of techniques (BARGUIL; MARAES, 2015).

The discussions around the Mathematics course as a locus of teacher training reveal a collection of issues that have been emerging and, at the same time, have favored the configuration of a large part of the agenda of teacher training policies in the country. Discussing the formative arrangements of the courses from the epistemological and curricular perspective demands recognizing that how mathematics training is presented today, about its limitations and possibilities, is a consequence of a complex network of meanings about the demands attributed to these courses and about their institutional identity as responses to historical challenges of the Brazilian educational context (FRANCO, 2012).

Initial training should not be limited to the specific knowledge of the future teacher's area of activity. According to Tardif (2002), it elucidates that the teaching practice encompasses different knowledge and that it maintains different links with them. It establishes that teaching knowledge is "[...] as a plural knowledge, formed by the amalgam, more or less coherent, of knowledge coming from

professional training and disciplinary, curricular and experiential knowledge" (TARDIF, 2002, p. 36), and this knowledge comes from various origins and that teachers establish different relationships with them.

Thus, the aforementioned author discusses the knowledge, classifying it into the **knowledge of professional** training concerning the set of knowledge passed on by teacher training institutions; **disciplinary knowledge**, which is the knowledge related to the various fields of knowledge currently constituted in our society; **curricular knowledge**, which is presented, in the form of school programs, objectives, contents, methods that the teacher must work; and finally, experiential knowledge, the knowledge coming from the experience being legitimized by it. (TARDIF, 2002).

This author points out the importance of the construction of knowledge to support the training of teachers and, consequently, their practices in the classroom-based, surely, by their professional knowledge. Professional teaching knowledge directly guides the practice of the teacher in the classroom because it is a practical action, "although it is based on knowledge of a theoretical nature (...) and also of a social and experiential nature (...)" (BRIDGE, 2012, p. 85). In this perspective, the discussion about the professional knowledge of teachers has mobilized several studies, through which relevant categories and dimensions have been pointed out. Elements such as knowledge of the curricular content, didactics, values, and attitudes necessary for the teaching profession and aspects of professional culture have often been associated with the process of professional development of teachers (PONTE and OLIVEIRA, 2002; CANAVARRO, 2003; BRIDGE, 2012; PONTE et al., 2014). In this movement of research and practices related to teacher education, a set of studies that are dedicated to investigating the possibilities of learning and professional knowledge evidenced by classroom studies stands out, an approach that has prioritized the professional development of teachers at different levels of education and educational contexts (STIGLER and HIEBERT, 2016). Classroom studies constitute a Teachers need to be trained in a critical, dialogical, and reflective way to enable them to promote pedagogical practices that meet the needs of students. They need to know the contents of their area of training, to know how to mediate the teaching and learning processes, constituting an indispensable condition for the act of learning to occur.

## 2.2 THE CONTINUING EDUCATION OF TEACHERS AND THE DEBATE AROUND THE PROFESSIONAL KNOWLEDGE AND PEDAGOGICAL PRACTICE OF MATHEMATICS

Mathematics and other areas of knowledge allow the teacher a field of improvement of his active and vast work, necessary for his professional development. Having a starting point, availability, and defined objectives, teachers, in addition to respecting their students, need to respect the teaching of mathematics evidencing its concepts and its role in society (PONTE, 2014).

According to Ribeiro and Kawalek (2017), the teaching of mathematics is considered something rigorous and tiring, which results in the demotivation of students, however, the use of didactic methodologies can transform the teaching of mathematics into something profitable and pleasurable. The teachers do not adapt and pass content without guiding in which moment of life these students will apply the content learned, the students are limited to reproducing. Teaching should establish links with daily life and its needs. Ponte (2014) says that to learn the teaching profession, particularly as a mathematics educator, the teacher should not be limited to systematized knowledge on the contrary, there needs to be an articulation between pedagogy and humanization for this teaching. Mathematics is a science present in all realities and contexts of everyday life; therefore, it helps or should contribute to the understanding of society.

Professional development takes place from a set of formal and informal processes. Professional practice is allied to training, exploratory, reflective, and investigative experiences contribute to the development of identity and didactic-pedagogical knowledge for the teaching profession. The practice must also align with the theory so that, when situations emerge seek solutions in scientific knowledge, thus expanding the possibilities for facing some problem that occurs.

Bromme (1994) presents the empirical results of his research supporting in them the hypothesis that the professional knowledge of teachers needs to be decomposed into the aspects related to classroom practice to better understand its characteristics and identify its two well-differentiated types: formal knowledge, conceived as more propositional, declarative, theoretical or scientific, and practical knowledge, perceived as more personal, situated, tacit, relational or linked to know-how. Professional knowledge is therefore a very particular mixture of the areas of knowledge (especially knowledge of the subject, philosophy, and pedagogical knowledge), and this mixture is structured by the practical experience of teachers with their classrooms.

The professional knowledge of the Mathematics teacher is distributed by three major domains: i) the knowledge of the educational context - whose field of action originates from the social, educational, organizational, and cultural realities in which the teacher is inserted; ii) pedagogical knowledge – that which privileges the various perspectives of the teacher about the teaching and learning processes, with implications for the general organization of the classroom; and iii) the knowledge of Mathematics – responsible for highlighting the nature of the different ways in which the teacher relates to this disciplinary field.

Therefore, it is essential to immerse teachers who teach mathematics in mathematical didactics because, with this, both students and teachers will know how to deal with future problems. For the teaching and learning of mathematics to be profitable, the teacher needs to have didactic training in the area, so that he can thus develop human qualities and professional skills, to enable awakening in

the student a relationship of respect, which will depend on how much the teacher will be trained and prepared. And for this, teachers need a solid base of mathematical or non-mathematical knowledge. Ponte (2014), states that it is necessary to define the most relevant content according to the level of training.

Initial and continuing education take a position focused on school mathematics, which often limits the process of professional development. To Lima (2018), the teacher must assume the commitment to teaching, seek alternatives for continuing education, reaffirm the importance of the teacher's protagonism, and bring necessary contributions to contemporary reality.

There must be a public policy aimed at valuing this profession and for better working conditions that enable effective teacher professional development.

According to Ponte (2014), the professionals responsible for the training of new professionals need to favor learning appropriately and naturally. It is noteworthy that the studies of Ponte (1999; 2014; 2020) have contributed to fostering the enormous international interest in using classroom study as a model of professional development. With the Lesson Study there has been less focus on the application of mathematical instruction methods and, therefore, the promotion of other more dialogued strategies that allow greater interaction between teacher and students.

The researches related to the themes of training and development of teachers highlight interesting results about the significant advances that have occurred in initial training, such as collective and collaborative work, changes and updates of the curriculum, technological integration, and exchange of information, experiences, and ideas. The search for student engagement and commitment, the practice developed through supervised internships, extracurricular activities, and the experiences lived in the disciplines are also relevant aspects. On the other hand, there are challenges, especially those related to the conceptions of learning and the processes involved in it.

Another successful strategy in the studies of references on teacher education, as well as the construction and promotion of pedagogical knowledge of content are the cases of teaching, which constitute, in this process, instances in which the specificities of teaching can be considered. The teaching cases are important because, as Shulman (1996, p. 208) pointed out: "We do not learn from experience; We learn by thinking about our experience... [...]. A case is a recalled, recounted, reexperienced, and reflected version of a direct experience."

The teaching cases could contribute to the exercise of remembering, retelling, reliving, and reflecting. As defined by Shulman (1996, p. 208), teaching case "is the process of learning by experience", also warned about the relevance of its use for aspects of a new and globalized society that brings in its core new challenges and with them new requirements and new competencies to be consolidated. These new challenges will require the teacher to be prepared enough to solve them.

### 2.3 RESEARCH ON TEACHER EDUCATION AND TEACHER PROFESSIONAL DEVELOPMENT

According to Marcelo Garcia (2009), the conception of professional development with the evolution of research has been resignifying.

For a greater understanding of teacher professional development, the contribution of studies aimed at identifying and systematizing domains of professional knowledge (ELBAZ, 1983; Brommème, 1994; BRIDGE, 1999; SHULMAN, 1986; 1987; 1996), consider the knowledge of oneself, the knowledge of the educational context, the knowledge of the subject of the discipline, the pedagogical knowledge, the curricular knowledge, the knowledge about the organization and management of the class or the didactic knowledge. Concomitantly, research on the integration of experiential knowledge and theoretical knowledge has shown that practical knowledge has a contextualized nature and is modeled by the values and intentions of the teacher (CLANDININ, 1989; ELBAZ, 1983), and can also be characterized as knowledge in action and very marked by the practice of reflection (SCHÖN, 1992; 1983).

Day (1999) states that this whole process of professional development is linked to personal and professional experiential experiences, public policies, and the context in which it is inserted. The formal or informal, individual or group actions to acquire and improve the teaching practice, according to the researcher, promote professional development and expand its meaning, contemplating the entire teaching trajectory, being interconnected to continuing education.

Marcelo Garcia (2009) understands that in the current context, social transformations require teachers to master knowledge because it is he who is responsible for creating the possibilities for the construction of students' knowledge. In this sense, professional development ceases to be something restricted and individualistic to collective with clear and specific objectives, centered on seeking the improvement of the entire school institution, focused on teaching-learning processes, curriculum, especially in the learning of students, aimed at all people directly or indirectly linked to the construction of student's knowledge, the entire school community.

Continuing education at work, learning absorbed throughout life, training courses, and exchange of experiences and ideas with colleagues are factors that contribute to teacher development, enabling the construction of professional identity. For Marcelo Garcia (1999), these formative activities contribute to the improvement of the teaching-learning processes of teachers. The school environment is one of the stages of the formative process, according to the studies of Marcelo Garcia (2009) the construction of teaching knowledge provides a significant improvement in the quality of teaching of teachers and the learning of students, it becomes evident the difference between a professional who seeks evolution and continuity in their methods and studies, and a professional who

does not seek to update their practices and knowledge, this difference affects the students, being them directly the most harmful, then the image of the school becomes negative.

According to Marcelo Garcia (2009), it is necessary to invest in insertion and professional development instead of increasing the duration of initial training courses. In initial training it is important to take into account that academics do not arrive without knowledge, after all, they have already been inside a regular classroom, and have ideals formed about education, although in some cases it is superficial knowledge. This is because many teachers have their particular prejudices and beliefs when they start their professional careers, some studies seek to understand how changes and developments occur, how this learning is constructed, the influence of these beliefs and prejudices on pedagogical practices, and the resistance to change. Investigations suggest that beliefs influence changes in practices, and the evolution of these beliefs contributes to teaching, this change happens slowly and gradually because many professionals are resistant to updating convictions and assuming misconceptions.

Marcelo Garcia (1999) says that continuing education is a collective or individual activity to improve the development of individual work intentionally. On-the-job training also occurs collectively or individually in the workplace. There is an improvement, that is, the updating of content knowledge and methods. Professional development is a way to enable continuity for initial training considering personal experiences, formal and school knowledge over long periods, and formative processes.

In his study on teacher education in Brazil, Gatti (2010) concluded that,

[...] The training of professional teachers for basic education has to start from their field of practice, add to this the necessary knowledge selected as valuable, in its fundamentals and with the necessary didactic mediations, especially because it is training for educational work with children and adolescents. (GATTI, 2010, p. 1375)

This data makes it possible to think about the professional competence that should be built in formative processes that dialogue with the different realities of teachers inserted in varied and diverse school contexts. There are also fundamental elements to analyze aspects to be emphasized in the professional development of teachers, among them, the ethical and social commitment to the realities in which teaching and its conceptions have their consequences fostered by experiences stand out.

Another aspect to highlight refers to the professional identity that is built from the evolution of experiences in constant transformation throughout life and according to the context in which it is inserted both in training and in acting. The social changes over the years have brought new profiles of students, and new challenges to teachers for teaching. In this movement, the globalized society brought to the classrooms new problems for the teacher, which imposes an attentive and sensitive look to exercise their profession, affecting teachers in a demotivating way and triggering psychological problems in the face of complex demands that do not match the conditions of work and even training.

Educators are required to adapt to the current societal scenario for the development of skills and capacity for innovation.

However, despite the problem described, it is possible to think about training from a critical and reflective perspective. One of the formative processes contributing to professional development is the understanding of teaching practice as a place of production of subjectivities and styles of being a teacher, in a dialectical movement of construction/reconstruction, it is recontextualized by teachers in the intersection of different cultures and repertoires of life permeated by different paradigms of teacher education.

Oliveira-Formosinho (2009) recalls that allied to effort and availability it is necessary to create opportunities for the teacher to learn and teach. Its three perspectives for teacher development can be presented as follows: in the first, the development of the teacher is given by the knowledge and competencies considering the importance of selecting essential contents for the teacher's performance; in the second, the development of the teacher occurs associated with an ecological change involving the place, the conditions and the time of work; in the third, the development of the teacher, understood as personal understanding, involving personal and professional development.

According to Marcelo Garcia (2009) professional development should occur according to the interests and needs of teachers, always aiming at the best use and learning of students, even if there are difficulties. Day (1999) states that teachers are directly responsible for the transmission and acquisition of knowledge, they are in the front line of education.

Mizukami (2005-2006) brings a relevant contribution by presenting some aspects related to characteristics and roles of teacher educators that should be considered by public educational policies, among them:

a) the importance of a solid and flexible knowledge base, essential for the trainer to perform his functions, providing opportunities for situations and experiences that lead the future teacher to 'learn to teach' in different ways for different types of clientele and contexts; b) the need to build professional development strategies that are not invasive and that allow the objectification of beliefs, values, personal theories; c) the importance of building learning communities involving school teachers and university trainers to provide professional development processes more appropriate to the teaching profession and d) the consideration of the 'investigative attitude' as the axis of the trainer's training: conceptualized training of the trainer (COCHRAN-SMITH, 2003) as a continuous and systematic process of research, in which participants question their assumptions and those of their peers and build local and public knowledge appropriate to changing contexts. (MIZUKAMI, 2005-2006, p. 1)

From the discussion presented, it is identified that the researcher focused her proposition on the formation of the trainer, but the aspects defended by Mizukami (2005-2006) also allow us to conclude that the development of the investigative attitude should be the axis of training (initial and continued), having a solid and flexible knowledge base centered on the learning of teaching, the valorization of

professional development strategies and the construction of healthy learning communities core aspects in public educational policies directed to formative processes.

Mizukami (2005-2006) contributes to our understanding of teaching as an experience, endowed with meaning, which the teacher builds and reconstructs, continuously, as he resorts to his knowledge incorporated throughout the trajectory of life, according to the demand of the historical and social context where he is inserted and of his formative and professional paths.

### 3 BY WAY OF CONCLUSION

This text presents personal analyses of the researchers and mentees, authors of this essay, who although they do not seek to theorize more deeply the learning processes of teaching, bring foundational elements for the understanding of contexts that involve formative experiences, the fruit of research that we are developing at the moment.

In the teaching exercise, according to Shulman (1996), the diverse learnings are signified/resignified, because these are constituted by the articulation of different knowledge that interrelates, coming from different sources.

Assuming that the domains of theory and practice are intertwined in the different moments of professional training and throughout the teaching career, the use of **teaching cases** (MIZUKAMI, 2005-2006) and the **class studies** – Lesson Study - (PONTE, 2020) can provide the development of reflective processes at different times of teacher education, the analysis of manifest conceptions and the understanding of specific learning in the face of concrete teaching and learning situations.

Teaching requires the construction of a unique way of teaching based on specific and general understandings of specific knowledge, related methodologies, students and their learning styles, context, and educational purposes.

The objective of this study is to favor elements of a change in the practice of teachers, especially in mathematics, since the knowledge listed here proposes possibilities, within the concrete experience of teachers in the current context, to contribute to the construction of a new identity for teachers in general and, particularly, of Mathematics.

Mathematics education is complex and crossed by beliefs, affectivity, cognition, self-regulation, and learning. During the period of his initial training, the teacher who teaches mathematics has contact with the scientific knowledge and methodologies through which he will expand his knowledge of mathematics to be taught. It was verified, from the bibliographic survey, a constant increase in research related to teacher training and mathematics education.

Discussing initial and continuing education, didactics, teacher professionalization, and mathematics education bring to light aspects that need to permeate both the theoretical field of teacher

education, enabling critical reflection on the pedagogical practices adopted, as well as the adequacy of the educational objectives proposed in the respective formations. Therefore, aspects that involve a constant analysis of teacher practice and professional development.

Thinking about the development of teachers implies conceiving both the initial training and the exercise of teaching and, equally, the formative contexts in processes that involve the learning built by the different knowledge and knowledge endorsed in a personal/professional path, having the experience as an important element in this movement.

The confluence of the dialogues, of the authors listed in this text, between professional development, teacher learning, and the exercise in teaching contributed to confirming the perspective of teacher professional development focused on the conception that both initial training and the exercise of teaching occur in formative contexts on a continuum, involving the learning built by the different knowledge and knowledge endorsed in a personal, institutional and professional path crossed by experience.

The dialogues between professional development, teacher learning, and teaching are located in the field of studies on teacher education. A study conducted by Gatti, Barreto, and André in 2011 pointed out that the problems related to teaching in basic education have been studied by different groups of researchers and with diverse assumptions.

Teaching cases and classroom studies are relevant perspectives because they constitute approaches to the professional development of teachers centered on teaching practice.

Finally, it is highlighted that it is possible to find subsidies from the problems already investigated about teaching that contributes to the construction of the teacher's identity and the knowledge necessary for teachers (or future teachers) to work in the profession and to face the challenges that are presented in school practice, daily, in the classrooms.

The training helps the professional teaching knowledge - a repertoire of knowledge necessary for the professional exercise that bases and guides the teaching practices - because the processes of training and professional development are fed by professional knowledge that, at the same time, mobilizes and promote other knowledge. In addition, teacher training should also contemplate supervised pedagogical practice, in which the teacher in training can experiment with different teaching strategies and evaluate them in the light of adopted didactic references, making adjustments and adaptations in real contexts.

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