THEMATIC SECTION:
MATHEMATICS EDUCATION

Personal Archives of Teachers and History of Mathematics Teaching Professional Knowledge

Wagner Rodrigues Valente[I]

[I]Universidade Federal de São Paulo (UNIFESP), São Paulo/SP – Brazil

ABSTRACT – Personal Archives of Teachers and History of Mathematics Teaching Professional Knowledge. This article aims to emphasise the importance of the personal archives of mathematics teachers for the analysis of the dynamics and processes for the elaboration of teaching professional knowledge. For this, it uses the concept of scientific field that comes from the studies of Pierre Bourdieu. It also takes as theoretical references the work of researchers Rita Hofstetter and Bernard Schneuwly, who address the construction of reference knowledge for teaching and, also, the studies of Peter Burke on the history of knowledge. By historically analysing the trajectory of discussions about mathematics in teacher education, the study concludes that the documentation contained in personal collections of mathematics teachers enables the analysis of the clashes that have occurred over time between disciplinary fields and the professional field of teaching, in terms of the production of the professional knowledge of the mathematics teacher.
Keywords: **Professional knowledge. Mathematics. Teacher Education. Personal Archives.**

RESUMO – Arquivos Pessoais de Professores e História do Saber Profissional da Docência em Matemática. Este artigo tem por objetivo ressaltar a importância dos arquivos pessoais de professores de matemática para análise das dinâmicas e processos de elaboração do saber profissional docente. Para tal, utiliza o conceito de campo científico vindo dos estudos de Pierre Bourdieu. Para além disso, toma como referentes teóricos os trabalhos dos pesquisadores Rita Hofstetter e Bernard Schneuwly que abordam a construção de saberes de referência para a docência e, também, os estudos de Peter Burke sobre história de um saber. Analisando historicamente a trajetória das discussões sobre a matemática na formação de professores, o estudo conclui que a documentação contida em acervos pessoais de professores de matemática possibilita a análise dos embates que ocorreram, ao longo do tempo, entre campos disciplinares e o campo profissional da docência, em termos de produção do saber profissional do professor de matemática.
Palavras-chave: **Saber Profissional. Matemática. Formação de Professores. Arquivos Pessoais.**

Initial Considerations

Teacher education has as one of its main themes the knowledge that should be involved in the formative process. This article analyses, from a historical perspective, the example of mathematics teacher education. Starting from the creation of mathematics courses in Brazil, the text addresses the different ways of thinking about the teacher's mathematics education. Initially, showing that mathematics, as a disciplinary field, was seen as sufficient knowledge for teaching praxis; then, the study addresses international and national research, which points to criticism of the mathematical disciplinary field, in relation to teacher education. This fosters studies on mathematics that, unlike the disciplinary field, should be treated as the teacher's professional knowledge. Finally, the text analyses the contribution of the teaching professional field and the importance of the personal files of mathematics teachers as documents for the research on the trajectory of mathematics as the teacher's professional knowledge.

What Mathematics Should Form the Future Teacher?

The university education of mathematics teachers began with the creation of the Faculties of Philosophy at the University of São Paulo, as of 1934. Decree No. 6.283 of January 25, 1934, in its first paragraph, provided:

> Paragraph 1 - The license for secondary teaching will be granted by the University only to the candidate who, having graduated in any of the sections in which he/she specialised in the Faculty of Philosophy, Sciences and Letters, has completed the pedagogical qualification course at the Institute of Education.

The decree marked the birth of what became known as *3+1*, a model of teacher education given by three years of mathematics courses and related disciplines, added to one year of disciplines in the list of education sciences; those taught by the Institute of Education. According to the decree, the mathematical disciplines would be added to those pedagogical ones, constituting the knowledge of the mathematics teacher education.

The birth of the mathematics course – a subsection of the Faculty of Philosophy, Sciences and Letters – had as idealisers in its organisational structure the presence of the Italian mathematicians Luigi Fantappiè and Giacomo Albanese, who came to work in Brazil integrating the intellectual cadres to create the University of São Paulo (Silva, 2000). These teachers formed the first generation of Brazilian mathematicians, such as Benedito Castrucci, Fernando Furquim de Almeida, and Omar Catunda.

The mathematics course was constituted based on little or no importance at all to mathematics teacher education, despite the original

intention to seek articulations between the mathematical disciplinary field and the education sciences, under the terms of the *3+1* model.

> [...] the pedagogical formation of the future mathematics teacher was not valued by the Italian professors, who even advised students not to carry out a year of studies to become mathematics teachers (teaching degree) after completing their bachelor's degree (research degree). According to Castrucci, he did not take this additional year of studies because Fantappiè suggested: 'study Mathematics, leave aside those didactic things, because didactics has only one good rule: to know the subject, if you know the subject, the rest is: you are an artist, and if you are a bad artist, you will be bad forever, if you are a good artist, you will be a good teacher. The rest puts it all aside' (Castrucci apud Freitas, 1992, p. 50)

What Mathematics should form the future teacher? The question does not seem to apply to mathematics teacher education until the 1980s, practically. And if it could have been formulated at that time, its institutional response would have been obvious. So, what mathematics should form the future teacher? The mathematics! This answer is well to the taste of the guidelines of USP mathematicians, pioneers of the mathematics course.

The foundation of the mathematics course of USP, in 1934, developed institutional references for teacher university education within the scope of a performance focused on the mathematical disciplinary field. Mathematical seminars and unprecedented scientific productions by foreigners who were constituted as the first faculty would dictate the dynamics of formation of a very small number of future mathematics professors[1].

Regarding teaching qualification, in terms of a profession that requires its own knowledge, the disciplinary course, with the mathematical branches taught, was seen as sufficient. Fantappiè's positions were emblematic: one should not waste time with "[...] those didactic things." Thus, the origin of the university education of mathematics teachers evokes the mathematical disciplinary field as self-sufficient, generator of its own pedagogy, of its own mode of teaching. Even if put into law (decree), the sciences of education, in terms of their disciplinary branches, would have nothing to say to the prospective mathematics teachers. They were educated to turn their backs on the pedagogical disciplines. Qualifying the teacher meant qualifying the researcher, and the mathematical disciplinary field would, in fact, prove to be the only reference for the constitution of knowledge for this qualification.

What Mathematics as a Professional Knowledge Should Form the Future Teacher?

From the point of view of the university education of the mathematics teacher, the *3+1* model will last long. In a broad-spectrum re-

search, Gatti (2010) showed that most teaching degree courses in mathematics had curricula with a much higher mathematics workload, "[...] mirroring more the idea of a research than a teaching degree" (p. 1373).

On the other hand, issues related to the teaching profession, to the knowledge necessary for the profession, internationally, from the 1980s, had an impulse with the studies developed by Lee Shulman.

> By criticising the dichotomous emphasis present in teacher education/selection around two traditional axes (specific knowledge and pedagogical knowledge), Shulman (1986) introduces a third axis (knowledge of content for teaching), which comprises: knowledge about the subject to teach; didactic knowledge of the subject; and curricular knowledge of the subject. The third axis is thus configured in the main axis of the formation of teaching knowledge, as it intentionally interconnects mathematical knowledge and didactic-pedagogical knowledge, also including the educational/formative sense underlying school practice that happens when teaching and learning these contents. (Fiorentini, 2004, p. 14).

In these new times, we then change the question posed: *What mathematics should form the future teacher?* The new research became interested in answering another question: *What mathematics as professional knowledge should form the future teacher?* The issue directly involves concerns about teaching activity. The appropriation of disciplinary fields by themselves is no longer at stake. It is necessary to have a direct intention to qualify for teaching, not for the disciplinary fields involved in this qualification.

From Shulman, there have been many studies dedicated to the construction of typologies related to teacher education knowledge. Such typologies intend to characterise the teacher's professional knowledge (Hofstetter; Schneuwly, 2017).

On the other hand, in recent times, the researcher Bernadete Gatti presented a synthesis of the state of knowledge about initial teacher education in undergraduate courses, in which she discussed convergent aspects in research. In the list, teacher education how-how was highlighted. The first aspect was the little penetration of research conclusions in the institutionalisation of teacher education courses, which, according to the author, contributes to sustaining the idea that the school subject knowledge is enough for teacher education. Gatti (2014) warned of how difficult it is to decide what a teacher should know to teach when there is no specific debate about undergraduate courses:

> To conceive the teaching degree as a full undergraduate course, with particular, specific characteristics, in a collective environment in which to qualify a teacher 'is less [important]', an environment in which there are epistemological difficulties to choose what it is necessary for teachers to know to start their work in basic education – knowledge of the school subjects, pedagogical and cul-

> tural knowledge – ended up generating arrangements that show the appreciation of the school-subject form indiscriminately. What is necessary for a teacher to act in basic education is not less or lighter, but can be different, in some aspects, from what is necessary to form a stricto sensu specialist (Gatti, 2014, p. 37).

In this way, tensions there are tensions between different scientific fields, to use Bourdieu's (2001) conceptualisation, in which a field "[...] emphasises the role of structures that guide scientific practices whose effectiveness is exercised on a microsociological scale [...]" (p. 67). Thus, on the one hand, there is the university curricular organisation, the curriculum of teacher education, of mathematics teachers, placing an emphasis on the mathematical field through its different disciplines. On the other hand, the field of educational research is present, pointing out the fragility of the teacher's professional education in view only of the references of the specific (mathematical) disciplinary field.

Studies such as those by Gatti (2014) have shown that educational research, the education sciences, are powerless in the process of institutionalising the results of their investigations in relation to teacher education. There are obstacles to the knowledge developed in the educational field so as not to allow them to compose the knowledge required in the training of prospective teachers, establishing new disciplines.

In a way, current times show a certain accommodation of this tension between the mathematical disciplinary field and education sciences. This accommodation has resulted in the growth of so-called continuing education. If we consider that there is great inertia in the process of institutionalisation of new disciplines for teacher education, investments end up, in a way, leaving aside the initial education, giving an important place to continuing education. This fact was corroborated by the researcher Marli André, who noted that in the 1990s much of the research had initial education as its centre of interest. However, in the 2000s, André's study observed a change in the focus of research for teachers, which began including their opinions, knowledge and practices. André (2011) also warned about the radical drop in research focused on initial education, stating that "[...] this fact causes a lot of concern because there is still a lot to know about how to prepare teachers to face the challenges of education in the 21st century" (André, 2011, p. 31).

The previous analyses have been made from the point of view of a relatively short time span: a few decades. This, of course, has to do with the considered urgency for changes in the teacher's professional training, seeking improvements in teaching. The widening of the time interval, considering historical studies, brought possibilities of analysis of the knowledge of teaching on other bases. From a historical perspective, the research turned to a different new question, which can be expressed by: *How has been developed a mathematics as a teacher's professional knowledge?* We assume that every trade, every profession produces knowledge (Tardif; Raymond, 2000). Over time, such knowledge undergoes a systematisation process, consolidating itself as knowledge.

Knowledge changes, transformations, processes, and dynamics of its constitution require long analysis time, a broader scale of observation, historical studies.

How Has the Professional Knowledge of the Prospective Mathematics Teacher Been Developed?

Unlike works that problematised mathematics for teacher education for their performance in teaching in current times, our research approaches historically the problematisation of the knowledge involved in this education, the mathematics involved in the initial education of mathematics teachers. In this way, we promote a change in the questions previously posed about mathematics in teacher education, or about how mathematics should be characterised as professional knowledge. From the historical perspective, we seek to analyse which mathematics was considered suitable knowledge for the exercise of the teaching activity over time. In other words: How has been developed a mathematics as a teacher's professional knowledge? In terms of the documentation that the past left us, to answer the question we are located within the scope of teaching. The documentation is the empiricism analysed in the research. Thus, from traces of the past of teachers' practices, which we found in student assessment tests, textbooks, pedagogical journals, notebooks, etc., we adopted the perspective of considering mathematics as teaching profession knowledge that is constituted and changes over time. This has been guiding the development of research toward questioning which transformations occurred in mathematics taken as professional knowledge for the exercise of teaching in each historical epoch.

Before proceeding, we should note that a theoretical problem that has emerged regarding the theme we call *the history of the professional knowledge of the mathematics teacher* concerns the possible anachronism that involves the use of the expression *professional knowledge*, since our studies cover a long period. Concerns about professionalisation, especially with the characterisation of professional knowledge, are quite recent, dating from the mid-1980s, as shown in previous lines, from the studies of Lee Shulman. However, the insertion of research in the teaching professionalisation movement tries to accompany the "[...] emergence of a culture of professionalisation" (Barbier, 2006, p. 69). To this end, the turn of the last forty years is an important milestone for the treatment of the types of knowledge involved in teacher education. Thus, despite a certain inappropriateness in the use of the expression *professional knowledge* for the knowledge involved in teaching, in teacher education, what seems important in our studies is the finding that teaching, even without being professionally characterised, had mobilised several types of knowledge since immemorial times. And those types of knowledge are present as invariants of social relations that specify the so-called *school form* (Hofstetter; Schneuwly, 2017, p. 119). Thus, the presence of the various knowledges in the teaching activity is

a historical fact. Going back to more distant times, when the relationship of those who teach and those who are taught becomes school, since the creation of the school as an institution, the knowledge is its intermediary (Vincent; Lahire; Thin, 2001).

As said, the study of the processes and dynamics of the development and changes of the professional knowledge of the mathematics teacher led us to enter the field of teaching through historical documentation. In this way, the personal files of mathematics teachers gain unparalleled importance. Such documentation allows us to analyse the clashes between the mathematical disciplinary field, the field of education sciences and the professional field of teaching practice. Among lesson plans, textbooks, students' notebooks, teachers' notebooks, pedagogical handbooks, pedagogical journals guidelines and a variety of documents that a given teacher accumulated and kept throughout his professional career, it becomes possible to face the theoretical challenge of answering the question already posed by Burke (2017): How has dispersed information become consolidated knowledge throughout history?

APER and APOS as Sources for the History of the Professional Knowledge of the Mathematics Teacher

At least since the year 2000, it has been possible to gather documents of mathematics teachers for research purposes of past teaching activities. In different ways, teachers themselves and, most of the times, the families of teachers already deceased, have entrusted documents to researchers. From a mass of papers that would most likely disappear, such as class drafts, students' and teachers' notebooks, originals of various versions of didactic works, professional documents, textbooks, etc. researchers have been able to sanitise, preserve, and inventory a series of materials that have been very important for research on the history of mathematics education, specifically the history of the professional knowledge of the mathematics teacher.

The development of the history of specific knowledge, as already mentioned, involves the challenge of answering the question: How has dispersed information become consolidated knowledge throughout history? (Burke, 2017). In this case, the dispersed information is found among the documents of the personal collections of mathematics teachers. The analysis of this varied documentation will allow, in a given historical time, to systematise the professional knowledge, the professional knowledge of mathematics teaching, beyond the perspective given by the mathematical disciplinary field and by the sciences of education. The documents of the teachers' personal collections allow a greater approximation to the pedagogical practices carried out and to the types of knowledge mobilised to execute them. In summary, together with the mathematical disciplinary field and the education sciences, there is the analysis of the dynamics and processes of the professional field of teaching to produce new knowledge destined to the work of the mathematics teacher.

For this text, the documentary collections of teacher Euclides Roxo (1890-1950) – APER (Arquivo Pessoal Euclides Roxo/Personal Archive Euclides Roxo) and the documents of the collection of teacher Osvaldo Sangiorgi (1921-2017) – APOS (Arquivo Pessoal Osvaldo Sangiorgi/Personal Archive Osvaldo Sangiorgi) will be considered as examples of the importance of personal collections as sources for the history of the professional knowledge of the mathematics teacher.

Personal Archive Euclides Roxo – APER

The APER was constituted from teacher Roxo's son's (Stélio Roxo), donation, in 2000. It has documents from 1909 through 1955. The acquis is composed of a total of 624 documents[2].

The production of the APER documents should be analysed considering international and national contexts of mathematics teaching. Regarding the international context, in 1908, in Rome, at an international mathematics congress, mathematicians were interested in discussing issues related to teaching. To this end, an international commission for the study of mathematics teaching was created. Once the commission was constituted, a central committee was elected, led by the mathematician Félix Klein (ICES, 1908, p. 446).

A relatively long time elapsed between international discussions on mathematics teaching and curricular changes in Brazil. This may be justified because there were no places of representation constituted of educators, nor associations of mathematicians, nor specific offices to deal with educational issues at the national level.

From the late 1920s onwards, debates intensified between different positions on how to treat mathematics teaching. Tensions appeared between mathematics, such as the disciplinary field, and mathematics teaching. In fact, it would constitute anachronism, at that time, to call "*mathematical disciplinary field*" the place occupied by teachers who taught mathematics courses in Brazilian high school. They were mostly engineers. It was only from the end of the 1930s, in view of the creation of the philosophy colleges, that the country started having teachers who majored in mathematics in Brazil (Valente, 2020).

The intense debates about mathematics teaching, at that time, led us, in Brazil, to Euclides Roxo, who was himself an engineer. Roxo was director of Colégio Pedro II, in Rio de Janeiro, a model institution for secondary education in Brazil, all shaped in accordance with French high schools. His position as a director gave him the status of a minister of education when there was no such ministry. Teacher Roxo promoted changes in high school mathematics in Brazil in the fading of the so-called Old Republic, between the Proclamation of the Republic (1889), and what became known as the Revolution of 1930. The interlocutor of international proposals, Roxo was also a member of the ABE – Brazilian Association of Education (founded in 1924), maintaining a close dialogue with the main figures and leaders of primary and teacher

education. He also taught classes at the Instituto de Educação do Rio de Janeiro, qualifying teachers for primary education. For those characteristics, Roxo stopped being a typical high school mathematics teacher to get close to the mathematical disciplinary field. A typical teacher, in general, had little or no didactic-pedagogical training, as previously analysed. Due to his professional history, Roxo fought a long battle to include new knowledge in teacher education, beyond those strictly mathematical (Valente, 2004).

Euclides Roxo's endeavour was to transform the curriculum for mathematics teaching in Brazilian high school, seeking to assert what seems to have been the dearest point to this movement that had Félix Klein at the forehead: bringing to elementary school the Differential and Integral Calculus through the initiation to the study of functions. As an integrating concept of Arithmetic, Geometry and Algebra, Roxo searched -mainly in American textbooks- for a new organisation for teaching and writing works that would integrate those mathematical branches which, until then, has been taught separately. The school subject Mathematics was institutionalised in Brazil through this teacher's actions, merging the different branches.

All those innovations led by Roxo placed him at the centre of debates and tensions in which we had a few high school teachers with insertion in the field of education sciences, on the one hand, and engineers, unfamiliar with educational discussions but attached to mathematics on the other. This triggered, from the first decades of the twentieth century, a public debate on mathematics and mathematics teaching. This debate was more focused on the field of mathematics teaching, the professional field. In the spotlight was the mathematics that should be taught. The disputes focused on teaching programs, guidelines for pedagogical work, math textbooks, etc. Who would have the authority to give the basis to what should be taught in mathematics and how would this discipline be taught? Brazil of the 1920s – agrarian, with a mostly illiterate population and few and isolated colleges – was beginning its industrialisation, taking advantage of the opportunities arising in the First World War, and craved for modernisation. Roxo used the argument of authority evoking teaching in more advanced countries at his will. He took Félix Klein as a major reference and added what he considered proposals from US pedagogical practices to enable the project of merging arithmetic with geometry and algebra in the construction of the school subject Mathematics.

All those transformations related to knowledge developed in the 1930s, knowledge that the mathematics teacher should have to exercise his craft, are opposed to those disciplinary types of knowledge that made up the *3+1* model, precisely at the time of the creation of the mathematics course, where the three years brought together the disciplines of the mathematical field (among them Analytical and Projective Geometry; Mathematical Analysis; and Vector Calculus). If on the one hand, the mathematical research spread through its differentiated branches, the mathematics teacher professional knowledge was a fu-

sion of them, in an elaboration of the professional field of teaching in dialogue with the international teaching trends.

The analysis of the APER documents, materials such as letters between Euclides Roxo and political leaders; letters Roxo exchanged with teachers and sending his books for appreciation; documents proving his actions in preparing the first national curriculum for mathematics teaching, formalised by the Reform Francisco Campos; newspaper clippings related to debates about the new knowledge that should be part of the teaching work, aiming at the fusion of the old mathematical disciplines into a single line called *mathematics*, and so many other documents allow the systematisation of the professional knowledge of the teacher who taught mathematics between 1930 and 1950.

Personal Archive Osvaldo Sangiorgi – APOS

Gathering about 1,600 folders of documentation of Professor Osvaldo Sangiorgi, the personal collection of this teacher was donated by his daughters. The set of documentation includes photos, books, letters, intellectual production, among many other papers[3]. When analysed, all this documentation needed to be entangled in the national and international context to which Sangiorgi constituted an emblematic figure for mathematics teaching.

These were times of redemocratisation. On the international scene, the end of World War II left the inheritance of victory over the fascist-oriented totalitarian regimes. With this, the opposition forces united to overthrow the Getúlio Vargas regime in 1945. For the new times, the construction project of Brasilia became the icon of political-economic modernity. Brasília the project, São Paulo – the city and the state – the reality.

The city of São Paulo had about 239,820 inhabitants in 1900; half a century later, it jumped to 2,662,786. São Paulo became the largest Brazilian metropolis and, at the same time, the largest Latin American industrial centre, generating alone more than 50% of all industrial production in the country (Sevcenko, 2000, p. 104).

On the other hand, the level of growth of the state of São Paulo in the 1950s can be evaluated from the average income per inhabitant. In this period, it was twice the national average. From the 1940s to the 1950s, the State altered its socioeconomic profile, revealed in the change in employment from primary to secondary and tertiary activities. This resulted in immense urbanisation, translated into an increase of the order of 160% of the population that came to reside in urban areas. (São Paulo, 1962, p. 17-19). In the educational field, particularly in high school, the number of enrolments almost doubled in a decade, in a total of 360,000 students in 1960 (São Paulo, 1962, p. 36).

In the state of São Paulo, until the 1940s, the network of state gymnasiums was made up of 37 establishments in the countryside and three in the capital; in 1950, there were already 143 gymnasiums in the coun-

tryside and 12 in the capital; in 1958, the numbers reached 294 schools in the countryside and 65 in the capital (Sposito *apud* Bontempi Jr., 2006, p. 140).

Following this trajectory of enormous growth in the number of gymnasiums and the school population at this level of education, more and more textbooks were produced. Companhia Editora Nacional, founded in the 1920s by Monteiro Lobato, was at the forefront of this escalation, bringing together a group of authors who practically hegemonised the production of didactic mathematics texts. Among the great authors were Jacomo Stávale , Ary Quintella, and Osvaldo Sangiorgi.

In São Paulo, in the 1950s, coffee farming was replaced by industrialisation. It was the foundation of São Paulo's prosperity, with its headquarters in the capital, already in an advanced process of integration with the neighbouring municipalities, in a complex multidirectional expansive process that originated the so-called *Greater São Paulo*. In parallel, a new emerging social layer became part of the local elite, basically made up of industrial entrepreneurs linked to more or less recent immigration families (Sevcenko, 2000, p. 104).

This elite's children had the privilege of being tutored by the best teachers their economic condition could afford. Thus, private classes and preparatory courses were an important source of income for those professionals.

Osvaldo Sangiorgi was an example of those excellent teachers, disputed for big money by the wealthy families of São Paulo to give private lessons to their children. In those times, a good teacher, recognised and propagandised by the achievements of his students, enjoyed the social *status* of a liberal professional.

Teachers from traditional schools interspersed their daily regular classes with private classes. The publishers, it seems, accompanied this movement, and summoned those teachers to write textbooks. This seems to have happened with Sangiorgi in the 1940s and 1950s.

Osvaldo Sangiorgi was born on May 9, 1921. His qualification included a degree in mathematical sciences, in 1941, as stated in his diploma, awarded by the Faculty of Philosophy, Sciences and Letters, Education Section, of the University of São Paulo.

Osvaldo Sangiorgi started his professional life at the *Padre Anchieta Women's Institute of Education*, a Normal School in the Brás neighbourhood, in São Paulo. Sangiorgi organised his mathematics course with Ary Quintella's books. From his memories, he affirmed that he began to write textbooks because he was welcomed by the publishing house Cia. Editora Nacional. Sangiorgi also reiterated that at that time – years 1940-50 – this publisher *looked for* good teachers, proposing that they write textbooks (Sangiorgi, 2004).

Certainly, from his didactic-pedagogical experience with the mathematical education of Normal School students (normalistas), Sangiorgi was motivated to prepare one of his first publications by Cia. Editora Nacional: the book *Matemática e Estatística*, written for the insti-

tutes of education and normal schools. The text had, in the first edition of April 1955, 10.030 copies, according to the *Mapa das Edições* of the publisher, which belongs today, to the historical collection of the institution (Valente, 2008).

This first editorial success was followed by a collection of works for the gymnasium: *Matemática – curso ginasial* (Mathematics – gymnasium course). In the three years following the release of the issue for the 1st grade of middle school (gymnasium), Sangiorgi's collection was widely accepted. The circulation continued increasing, and in 1957, 100 thousand copies of the first book had been issued. From then on, this circulation per year kept stable, until 1963, when, according to the files of Cia. Editora Nacional, the 134th edition of the book was published (Valente, 2008).

Considering that the school population of all secondary education in the state of São Paulo, from the 1950s to 1960, as seen above, doubled to 360,000 students, we can realise the significance of the numbers reached by the collection *Matemática – curso ginasial*, by Osvaldo Sangiorgi (Valente, 2008).

The unprecedented growth in the number of gymnasiums in the state and capital of São Paulo, combined with a greater degree of flexibility for the states of the federation to organise their own secondary education, and the accelerated development of the São Paulo editorial park in the production of textbooks characterised the educational environment in the late 1950s.

At this point, Osvaldo Sangiorgi was already recognised as the highest reference for mathematics teaching. Sangiorgi, as a great author of textbooks, carried with him the mathematical, didactic, and experience authority of a great articulator of joint actions between Cia. Editora Nacional and the Department of Education in the promotion of meetings and courses for teachers. And, in those courses, the reference were his didactic works.

Between June and August 1960, Sangiorgi left for the United States to participate in an improvement course, with a scholarship from the *Pan American Union* and *National Science Foundation*, an internship at the University of Kansas.

Back in Brazil, Sangiorgi soon fostered articulations between teachers, the media, and the Department of Education of the state of São Paulo, to modify mathematics programmes, as he had seen in the United States. The newspaper *Folha de São Paulo*, on October 11, 1960, reported: "São Paulo teachers aim to reform the programmes and methods of mathematics teaching". The text informed that in its general restructuring plan, the Department of Education created a working group to study mathematics teaching, coordinated by teacher Osvaldo Sangiorgi (Nakashima, 2007).

After this report, loads of news about the changes that mathematics was undergoing became a topic in print media. The newspapers of São Paulo, above all, followed every step and initiative of Osvaldo San-

giorgi around the changes in mathematics teaching towards the so-called modern mathematics. They reported courses for teachers, with furlough, by the Department of Education; invitations for foreign lecturers; creation of GEEM – Mathematics Teaching Studies Group, under the coordination of Osvaldo Sangiorgi; Mathematics Teaching and Modern Mathematics Congresses; interviews and testimonies of Sangiorgi, among other news about modern mathematics teaching (Nakashima, 2007).

The launch of a collection of textbooks was the apex of the whole scenario built for the entry of modern mathematics into Brazilian education. The collection for gymnasiums was released in the middle of 1963, to be used in the school year of 1964. In that year, Cia. Editora Nacional issued more than 240,000 copies of volume 1, of the work *Matemática – curso moderno* (Mathematics - modern course), by Osvaldo Sangiorgi (Valente, 2008).

In those times of enormous growth of the school population along with the publishing of textbooks, the mathematics teachers' professional knowledge had in those works a fundamental reference for their practice. The teachers' work guides in the school routine will be the maths textbooks. In the second half of the 20th century, Osvaldo Sangiorgi was a figure that, traveling through the most different fields – education departments, publishers, print, and even television media (TV Cultura), GEEM, among many others – promoted and disseminated his didactic works, becoming a real *best-seller* (Valente, 2008). Such productions, initially, were the result of systematisations of his teaching experiences in the use of other mathematics didactic works. Later, already in times of modern mathematics, new knowledge is added to teaching, taking into account books and courses from the United States.

The APOS documents allow the analysis of the changes in the mathematics teachers' professional knowledge and the transformations that occurred from the 1950s to the 1980s. Sangiorgi's work developing new mathematics teaching programmes in times of the MMM (modern mathematics movement) served as what much later became the official curriculum documentation for mathematics teaching. The professional field of mathematics teaching in gymnasiums allowed Sangiorgi to systematise new knowledge that made him an icon of mathematics teaching in Brazil, through the success of his textbooks.

Final Considerations

The interest in characterising the professional knowledge of the mathematics teacher is a relatively recent subject in research. As we have seen, this topic gains expression from Shulman's investigations. Previously, with the creation of the mathematics course, teacher education knowledge was institutionalised, with the privilege of the mathematical disciplinary field. A new era was established with the more incisive presence of the sciences of education, which promoted types of knowledge for teacher education. On the other hand, the relationships

between those fields – mathematics and education – debate to the present day about what mathematics should qualify the teaching professional.

In the study of the mathematics teacher's professional knowledge, from a historical perspective, it is admitted that such knowledge has been developed through the professional field of mathematics teaching for a long time. In the clashes with the disciplinary fields, the professional field elaborates knowledge that constitutes objects and tools for the work of the mathematics teacher. The analysis of this production is dispersed, not systematised. Through students' and teachers' notebooks, textbooks, and a whole range of materials present in the daily life of schools it will be possible to transform such dispersed information into consolidated knowledge that teachers used professionally. In this case, documents from former teachers, especially the ones who were protagonists in the professional field of teaching, constitute precious sources for study. Thus, organising this documentation through the creation of teachers' personal files is fundamental.

Received on March 10, 2021
Approved on May 19, 2021

Notes

1 Silva (2000, p. 10) informs that the passing rate in the Mathematics Course of the first class of graduates was 14%. In 1937, three students graduated, two of them women: Yolanda Mounteux and Maria Izabel Arruda de Camargo. They were the first Brazilians to graduate in mathematics in São Paulo.

2 The summary inventory of the APER can be found at: <https://repositorio.ufsc.br/handle/123456789/173456>.

3 The summary inventory of the APOS can be found at: <https://repositorio.ufsc.br/handle/123456789/173403>.

References

ANDRÉ, Marli Elisa Dalmaso. Pesquisas sobre Formação de Professores: tensões e perspectivas do campo. In: FONTOURA, Helena Amaral; SILVA, Marco (Org.). Formação de Professores, Culturas: desafios à Pós-graduação em Educação em suas múltiplas dimensões. E-book online. In: ENCONTRO DE PESQUISA EM EDUCAÇÃO DA REGIÃO SUDESTE, 10., 2011, Rio de Janeiro. **Anais...** Rio de Janeiro: Anped Sudeste. Disponível em: <http://www.fe.ufrj.br/anpedinha2011/sobre.html>. P. 24-36. Acesso em: 6 mar. 2017.

BARBIER, Jean-Marie. Les Voies Nouvelles de la Professionnalisation. In: LENOIR, Yves; BOUILLIER-OUDOT, Marie-Hélène (Org.). **Savoirs Professionnnels et Curriculum de Formation**. Canada: Les Presses de L'Université Laval, 2006.

BONTEMPI JR., Bruno. Em Defesa de 'Legítimos Interesses' – o ensino secundário no discurso educacional de *O Estado de São Paulo* (1946-1957). **Revista Brasileira de História da Educação**, Campinas, n. 12, p. 122-159, 2006.

BOURDIEU, Pierre. **Science de la Science et Réflexivité**. Paris: Éditions Raisons d'Agir, 2001.

BURKE, Peter. **¿Qué es la Historia del Conocimiento? Como la información dispersa se ha convertido en saber consolidado a lo largo de la historia**. Buenos Aires, Argentina: Siglo Veintiuno, 2017.

CIEM. Rapport Préliminaire sur l'organisation de la Commission et le Plan General de Ses Travaux. In: **L'Enseignement Mathématique**. Paris/Genève, v. 10, 1908.

FIORENTINI, Dario et al. A Formação Matemática e Didático-Pedagógica nas Disciplinas da Licenciatura em Matemática. In: ENCONTRO PAULISTA DE EDUCAÇÃO MATEMÁTICA, 7., 2004, São Paulo. **Anais...** São Paulo: s/e, 2004. P. 1-10.

FREITAS, Sonia Maria. **Reminiscências**: contribuição à memória da FFCL-USP (1934-1954). 1992. 174 f. Dissertação (Mestrado em História Social) – Faculdade de Filosofia, Letras e Ciências Humanas, Universidade de São Paulo, São Paulo, 1992.

GATTI, Bernadete. Formação de Professores no Brasil: características e problemas. **Educação & Sociedade**, Campinas, v. 31, n. 113, p. 1355-1379, out./dez. 2010. Disponível em: <https://www.scielo.br/pdf/es/v31n113/16>. Acesso em: 28 fev. 2021.

GATTI, Bernadete. A. Formação inicial de professores para a educação básica: pesquisas e políticas educacionais. **Est. Aval. Educ**., São Paulo, v. 25, n. 57, p. 24-54, jan./abr. 2014.

HOFSTETTER, Rita; SCHNEUWLY, Bernard. Saberes: um tema central para as profissões do ensino e da formação. IN: HOFSTETTER, Rita; VALENTE, Wagner Rodrigues (Orgs.). **Saberes em (trans)formação: tema central da formação de professores**. São Paulo: L F Editorial, 2017.

NAKASHIMA, Mário. **O Papel da Imprensa no Movimento da Matemática Moderna**. 2007. 164 f. Dissertação (Mestrado em Educação Matemática) – Programa de Estudos Pós-Graduados em Educação Matemática, Pontifícia Universidade Católica de São Paulo, São Paulo, 2007.

SANGIORGI, Osvaldo. Entrevista concedida aos professores Célia Maria Carolino Pires e Wagner Rodrigues Valente no dia 25 de março de 2004.

SÃO PAULO (Estado). **II Plano de Ação do Governo**, 1963-1966. São Paulo: Imprensa Oficial do Estado, 1962.

SEVCENKO, Nicolau. **Pindorama Revisitada** – cultura e sociedade em tempos de virada. São Paulo: Peirópolis, 2000.

SILVA, Circe Mary Silva da. A Faculdade de Filosofia, Ciências e Letras da USP e a Formação de Professores de Matemática. In: REUNIÃO ANUAL DA ANPED, 23., 2000, Caxambu/MG. **Anais...** Caxambu: ANPEd, 2000. Disponível em: <http://23reuniao.anped.org.br/textos/1925p_poster.PDF>. Acesso: 28 fev. 2021.

TARDIF, Maurice; RAYMOND, Danielle. Saberes, Tempo e Aprendizagem do Trabalho no Magistério. **Educação & Sociedade**, XXI, 73, 2000.

VALENTE, Wagner Rodrigues (Org.). **Euclides Roxo e a Modernização do Ensino de Matemática no Brasil**. Brasília: Editora da Universidade de Brasília, 2004.

VALENTE, Wagner Rodrigues (Org.). **Osvaldo Sangiorgi – um professor moderno**. São Paulo: L F Editorial, 2008.

VALENTE, Wagner Rodrigues. Matemática, Educação e História da Educação Matemática: campos disciplinares e o saber profissional do professor que ensina matemática. In: VALENTE, Wagner Rodrigues (Org.). **Ciências da Educação,**

Campos Disciplinares e Profissionalização: saberes em debate para a formação de professores. São Paulo: L F Editorial, 2020. P. 187-210.

VINCENT, Guy; LAHIRE, Bernard; THIN, Daniel. Sobre a História e a Teoria da Forma Escolar. **Educação em Revista**, Belo Horizonte, n. 33, 2001.

Wagner Rodrigues Valente is Associate Professor at the Department of Education of the School of Philosophy, Letters, and Human Sciences of Unifesp. President of GHEMAT Brasil (ghemat-brasil.com.br).
ORCID: http://orcid.org/0000-0002-2477-6677
Email: ghemat.contato@gmail.com

Editor-in-charge: Luís Armando Gandin