

# Knowledge in (Trans)Training and the Role of Experts: Curricula, Mathematics Education and Teacher Training, 1920-2020

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## ABSTRACT

**Background:** Mathematics for basic and elementary schools and teacher education changes over time; and their official expression is given by these documents that guide teaching work in schools. **Objective:** What processes and dynamics are involved in the systematisation of new knowledge in the production of curriculum references? In particular, the text focuses on mathematics for the first school years. **Design:** The analysis of curricular reforms, considering official documents, prioritises the role of specialists, treated as experts, considering that following the actions of these researchers it may be possible to answer the main question of the study. **Results:** Analysis shows that the changes that have occurred over time, from teaching programs to the current BNCC, are linked to the progressive stratification of experts who go from being a highly visible public authority to an increasing set of representatives from different social segments interested in the curricular debate. **Conclusions:** This stratification makes it more difficult to locate those specialists responsible for the internal organisation of the proposals with regard to teaching objects, the content of mathematics to be present in teaching and teacher training.

**Keywords:** experts, curriculum, mathematics, mathematics education.

## Saberes em (Trans)formação e o Papel dos *Experts*: Currículos, Ensino de Matemática e Formação de Professores, 1920-2020

## RESUMO

**Contexto:** A Matemática destinada à escola básica, elementar, e à formação de professores muda com o tempo; e a sua expressão oficial é dada por documentos oficiais orientadores do trabalho docente nas escolas. **Objetivo:** Que processos e dinâmicas estão envolvidos na sistematização de novos saberes nos movimentos de produção de referências curriculares? Em específico, atém-se à

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matemática para os primeiros anos escolares. **Design:** A análise das reformas curriculares, a partir de sua documentação oficial, prioriza o papel dos especialistas, tratados como *experts*, considerando que seguindo as ações desses personagens poderá ser possível dar resposta à questão norteadora do estudo. **Resultados:** Essa análise mostra que as mudanças ocorridas ao longo do tempo, desde os programas de ensino até a atual BNCC, ligam-se a uma progressiva estratificação dos *experts* que passam de uma autoridade bem visível publicamente a um conjunto cada vez maior de representantes de diferentes segmentos sociais interessados no debate curricular. **Conclusões:** A estratificação dos *experts* torna mais difícil a localização daqueles personagens responsáveis pela organização mais interna das propostas no que toca aos objetos de ensino, aos conteúdos da matemática a estarem presentes no ensino e na formação de professores.

**Palavras-chave:** expert, currículo, matemática, educação matemática.

## INTRODUCTION

This text aims to problematise historically the production of knowledge for teaching and teacher education. To this end, it discusses the specialists' role in the development of different curricular proposals. What processes and dynamics are involved in the systematisation of new knowledge in the production of curriculum references? The answer to the question can be found by investigating the trajectories of the experts in these movements. Specifically, this study focuses on mathematical knowledge developed for the teaching and early years teachers' education.

### The curricula

Teaching programs, curricular guidelines, proposals, parameters, curriculum base, and many other terms are found in historical research that takes privileged official documents as sources of study of which knowledge should be present in both teaching and teacher education. How are such documents prepared? Indeed, at each historical time, processes, and dynamics specific to a given context are responsible for this production. Specifically, mathematics for basic and elementary schools and teacher education changes over time; and their official expression is given by these documents that guide teaching work in schools. Different authors highlight the importance of the official documentation in the context of the History of Education, such as Moreira (1996), Nery (2009), Shieh (2010), among others.

The relationships that are established between official regulatory documents and teachers' professional practices are always a tensioned relationship, of greater or lesser intensity, depending on the context of the establishment of official references, but it is a tensioned relationship. At the heart of these tensions are the differences between discourses about the teaching activity and the actual practice, which are irreducible.

The analysis of the production of knowledge for teaching and teacher education, from the historical point of view, which attempts to make intelligible the options taken, the processes and dynamics that took place in the making of a new curricular document,

considers these documents as “black boxes” (Latour, 2000). So, just like Bruno Latour, who studies scientists, engineers, and others to understand how the knowledge systematisation takes place, we consider that the researcher’s task is to open those boxes to realize how they are closed, i.e., the processes and dynamics that consolidated a specific curriculum reference. This closure movement of the black box, i.e., of the officialisation of a new curricular document, seeks to consolidate knowledge for teaching and teacher education. A historical operation gives the opening process of those boxes, i.e., it implies investigating the past before the publication of the curricular documents. A strategy that seems essential to us to open the black boxes takes us to those characters who were summoned by the education authorities to prepare the new proposals. They are the experts.

### **The Experts...**

Porret, Brandli, and Lozat (2013) say that the earliest appearance of the term expert was in the 14th century, when the word began to designate an individual versed in a concrete knowledge derived from the practice of observation, analysis, and power of material investigation. An expert is a technical specialist who solves practical problems.

Historian Peter Burke (2016) reports that the term expert appeared in Great Britain in 1825, naming a specialized consultancy hired by governments to solve practical problems such as sanitation, urban planning, or administration of public accounts, all issues connected to the growth of cities.

A team of researchers from the University of Geneva, Switzerland, coordinated by Professor Rita Hofstetter, studied the appearance of experts in education and their institutionalisation as of the 19th century. If the expert emerged hired by governments to solve problems in society, especially in cities, in previous times, for the construction of national education systems, in the last century, governments needed new specialised knowledge. They needed to support decisions to be taken at the school level regarding the teaching efficiency, management of the flow of students, adequacy of the school to different audiences, organisation of content and stages of education, etc. (Hofstetter et al., 2017).

Therefore, an education expert is defined as a person or a group of people who are assigned by the education authorities to assist in the production of knowledge to support official decisions to solve practical problems.

Maxim and Arnold (2012) point to the growing movement of governments calling experts from the scientific community. The fact that the experts were also scientists, researchers, puts them in a different work situation: they live between the logic of the academic research and the logic of producing the expertise for which they were hired. So, in their effort to resolve practical problems, they mobilise knowledge differently from the way they are used to do in their academic activities.

In fact, two fundamental differences arise when we analyse more closely the experts' work. First, a difference in time. While scientific research increases progressively, advancing at a slow pace, the supply of knowledge, the expertise brought by the expert must occur in a relatively short time. Also, time regulation is not in the experts' hands, but under the command of whoever hires them, and of the needs imposed to solve a practical problem. Second, a difference in purpose. While fundamental research develops new knowledge, the experts' job is to explore existing knowledge to support a practical decision (Maxim; Arnold, 2012).

On the other hand, Hofstetter et al. (2017) give an important contribution to the experts' work that was not yet included in Maxim and Arnold's studies (2012). When experts mobilise existing knowledge to solve practical problems, they promote the production of new knowledge to respond to practical issues. It is not necessary to think, therefore, that the expert's work is restricted to the choice of existing knowledge that is applied to practical problems. By mobilising knowledge confronted with a context and the expectation of solving a practical problem, education experts produce new knowledge for teaching and teacher education.

Over the years, Maxim and Arnold (2015) progress in their studies on knowledge production toward what the Swiss authors had pointed out in 2013, indicating an important problem for the investigation of new knowledge production resulting from the tension the expert lives. This tension involves, on the one hand, attending to the logic of academic research, its canons, rules, internal references in the disciplinary field; on the other hand, it is imperative to provide practical solutions to problems to which the expert has been hired to instruct. This irreducible and always present tension reveals a process of producing new knowledge that is somewhat different from that developed in the academic environment; it also changes the nature of the knowledge produced.

The elaboration of a new curricular proposal led governments to institute some persons or groups of people as experts. They were allocated for the practical task of producing a new curriculum, a new curriculum base. Increasingly coming from the heart of the university, from academic research, they led teams to work on the production of new knowledge for teaching and teacher education. Investigating the locus of the production of this knowledge and its nature is a task that begins with official documents, which we call "black boxes." Opening those boxes involves historical research, for which following the experts' trajectory seems appropriate.

However, the task of identifying the expertise, the individuals, the experts who elaborate curricular references is not always easy because "the official texts are a corpus by right anonymous and precisely located, although, from time to time, some privileged agents (such as general inspectors) also enact rules in their personal name" (Chartier, Hébrard, apud Shieh, 2010, p. 106).

Nevertheless, historical research that attempts to make intelligible processes and dynamics for the development of new knowledge for teaching and teacher education challenges the identification of the experts based on the study of all subsidiary documentation that can clarify the process of closing black boxes of the curriculum

documents (Latour, 2000). In most cases, those documents bring the signature of educational authorities such as the Superior Council, Secretaries of State, General Directorate of Education, and many other titles over time.

What will be presented below are relevant moments in the production of new curricular references. Centred on them, we try to identify clues that can lead to the knowledge of processes and dynamics of the production of new knowledge. The experts' location will prove fundamental for this task.

### **The 1920s, the program, mathematics, and experts in São Paulo**

André Chervel (1994) considers that the notion of “Program” - as a teaching program - has been historically consolidated as a document that is “established by a higher authority, and encompasses practically everything that concerns teaching contents or exams, imposed to the set of teachers and students, the application of which is controlled by the school management and school inspection services” (Chervel, 1994, p. 13). In the Brazilian case, on the other hand, the educational programs historically may include some elements beyond content, as mentioned by Shieh (2010):

By the way, it is worth recalling that, although a minority, some teaching programs did not only present disciplines and contents: the 1887 program (1st grade of primary education) and, especially, the 1904 (model schools and *grupos escolares*)<sup>1</sup> and the 1911 programs (isolated schools) are clear examples of the recommendations that, interspersed with school knowledge, were given to the teachers on how to deliver that knowledge. (Shieh, 2010, p. 108, translator's emphasis)

In the 1920s, in São Paulo, there was a dispute in the educational field about the teaching programs for the first school years. Actually, the production of this type of school reference document in Brazil has been the subject of disputes since the early decades of the 19th century. However, there are noteworthy singularities related to the teaching programs, their elaboration processes, and the experts' role during what was seen as the modern times of Brazilian education.

At the beginning of this second decade of the twentieth century, there was what became known as Sampaio Dória Reform (Law n. 1750, of December 8, 1920). This educational reform law was regulated by Decree no. 3.356, of May 31, 1921. Amid so many others, one change proposed in this Decree deals with how the production of teaching programs should take place. Apparently, something unprecedented in the history of Brazilian education occurs: the teachers, with “didactic autonomy,” would be the authors of the “lessons” that would compose the teaching programs of each school category (Nery, 2002). The freedom would not be total; the teacher of each discipline

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<sup>1</sup> TN: In Brazil, “grupos escolares” comprised kindergarten and primary school, for 6 to 10 year-old children.

would elaborate his/her program in agreement with the grounds settled by the Decree and would deliver the document for the director's analysis. In turn, the director would refer the teacher's production to the Secretary of the Interior - at the time, the highest authority responsible for education - who could, or not, approve the proposal (Article 253 of the Decree). In some way, the teachers and knowledge that would systematise the knowledge for teaching in terms of methods, and even content, would be the specialists, i.e., the experts that would themselves produce knowledge for their profession. It was indeed an unprecedented proposal.

However, Sampaio Dória's proposals were short-lived. Soon, there was a new official change in teaching, and the originality of the production of curricular items through teachers was halted.

(...) didactic autonomy did not come true. Sampaio Dória was removed from his position as Public Instruction general director in 1921, taking office Guilherme Kuhlmann, who made several changes in the 20's reform, including the extinction of the didactic autonomy. (Nery, 2002, p. 2)

There followed a new teaching reform in 1925, without any room for teachers' participation in the elaboration of teaching programs. And, it seems, the authors of this reform, led by Pedro Voss, who was then General Director of Public Instruction in São Paulo, also developed a teaching program, issued by an Act in February of the same year. In this way, the idea of a Teaching Program Chervel says to be consolidated is resumed: a higher authority would develop and impose on teachers the list of contents, methods, and would prepare a graded education into the different school years. And so it was done. The 1925 Teaching Program was launched.

The attempt to open this program's "black box" takes back in time and analyse, although briefly, previous contexts and programs.

In 1894, Oscar Thompson and Benedito Tolosa, directors of the Escola Modelo in São Paulo, designed new teaching programs. Antônio Rodrigues Alvez Pereira, a school inspector, also participated. A concentric teaching program, where a content core would be followed in each school term in more depth, emerged. There is evidence that Thompson also wrote the 1905 programs (Shieh, 2010).

Oscar Thompson was the head of the Normal School of the Capital for about twenty years, between 1901 and 1920, during which he also traveled for study trips abroad. He was twice the General Director of Public Education: in 1909-1911 and 1917-1920. In 1916, Oscar Thompson was commissioned by the state government to organise a proposal for the education reform (Nery, 2002).

Everything suggests that the programs that came from 1894 evolved with the same characteristics, gaining details for teaching - in terms of guidance to teachers-, and getting to 1925 at the hands of Pedro Voss, Thompson's contemporary. Thus, the

mathematics teaching programs for the first school years reveal a kind of *continuum* of Oscar Thompson's ideas and actions, with a view to intuitive teaching, a hallmark of the late 19th-century proposal in São Paulo, in the creation of the *Grupos Escolares*. Thus, the first modernising phase of the São Paulo primary school and the teaching of mathematics found in the teaching programs from 1894 to 1925 were established (Frizzarini et al., 2014). There is only a small gap during the Sampaio Dória Reform, after which the previous programs were resumed, with no possibility of changes coming from the teachers as initially proposed.

The 1925 teaching program will last long. It will continue as a reference for about twenty-five years, despite the new-school pedagogy that came after the intuitive method modernisation. In vain, Lourenço Filho, General Director of Public Instruction in São Paulo as of October 1930, tried to resume the “pedagogical autonomy,” now as a strategy to reorganise teaching along the lines of the active school. Paradoxically, the proposal was rejected in schools (Valente, 2016), and the 1925 program went ahead, reissued in 1934, and used until the early 1950s (Ribeiro, 1996; Frizzarini et al., 2014). So far, it seems, education historians have not given a more palatable justification for that moment. This longstanding teaching program has been attributed to “the qualities that met the needs of the times and, to a certain extent, to the state of political instability of the State” (Ribeiro apud Nery, 2009, p. 132). Continuity, progressive improvement, or the continuous appropriations carried out in the school environment of a determined teaching method that had been disseminated since the end of the 19th century was ignored.

The research that involves “opening the black box” of the 1925 teaching program shows us that this document strives to detail, for teaching, and for the teacher, the offer of an intuitive mathematics during the first school years. An improvement of the proposals that came from the end of the previous century. Together with this program was Oscar Thompson. Thompson, therefore, seems to have emerged as an expert summoned by the government in the exercise of his varied educational functions in São Paulo. His actions, texts, and proposals have been the object of much study and still deserve works that intend to reveal processes and dynamics that were present in the assembly of this long-lived intuitive program for mathematics, especially for arithmetic.

### **The eight-year school, curriculum guides, mathematics and experts**

The 1971 Guidelines and Bases Law (Lei de Diretrizes e Bases - Law No. 5.692) reformed the 1961 Act, establishing new parameters for the graded classification of basic education, as well as the expansion of its mandatory nature. The law created the eight-year, 1<sup>st</sup> degree school, until then called primary education. The new law also enforced the compulsory enrollment of children aged seven at this level of education (BRASIL, 1971).

Given the arguments set out in the official documents, the LDB 5.692 was meant to overcome the problem of the discontinuity between the primary and middle levels, which, until then, LDB 4.024 (Brazil, 1961) had not discussed.

With the compulsory education of eight years, curricular changes would be necessary. The discussion paved the development of the Curriculum Guidelines for the First Degree Education (Guias Curriculares para o Ensino de 1º Grau - São Paulo, 1975).

In São Paulo, the mathematics guidelines were written by teachers Almerindo Marques Bastos, Anna Franchi, and Lydia Condé Lamparelli, according to the Guidelines Technical Sheet (Ficha Técnica dos Guias - São Paulo, 1975).

The analysis of the processes and dynamics that resulted in their systematisation, precisely the mathematics guidelines for the initial years, leads us to follow the trajectory of those teachers summoned by the State, who were instituted as experts.

Notably, we found the trajectory of teacher Lydia Lamparelli in partnership with teacher Amabile Mansutti. Although her name is not in the Technical Sheet, it is present in the document's "Critical Analysis Collaborators" item.

Maria Amabile Mansutti, the granddaughter to Italian immigrants, was born on July 28, 1949, in Santana, a neighborhood in the North Zone of São Paulo. She graduated in Pedagogy at the University of São Paulo, and soon added several courses to her curriculum, among them the specialization in Didactics of Mathematics at the Pontifical Catholic University of São Paulo, as she was interested in Mathematics teaching for the first school years (Mansutti, 2018).

The advance in research about the trajectory of teacher Lamparelli shows us the activities of teacher Mansutti, especially related to the mathematics of the first school years, within the scope of a dedicated laboratory for the production of the new eight-year curriculum: Imep.

(...) the Municipal Institute of Education and Research - Imep - was in Bela Vista, where Emef Celso Leite Ribeiro Filho is today. It was created because Paulo Natanael de Souza, then Secretary of Education of the Municipality, wanted to be part of the National Council of Education, and this innovative experience could accredit him. This happened at a time when the dictatorship was repressing experimental schools precisely because they found them too alternative. However, everything was innovative at Imep. Primary school teachers from the municipal system and teachers from the high school, coming from vocational gyms and State Experimental Schools, were invited, including schools that were being boycotted. (Mansutti, 2018, p. 237)

At Imep, Lydia Lamparelli coordinated the mathematics area and taught the 5th through the 8th grades. Mansutti taught in the early school years, establishing a dialogue with teacher Lamparelli in mathematics, in an integrated work. As far as the project for the establishment of Imep is concerned, there was an intention to "build a continuous educational process from 7 to 14 years old" (Mansutti, 2018, p. 238). Such a purpose certainly encompassed mathematics teachings. How to graduate mathematics in a proposal of continuity for eight years? It would be necessary to modify the situation that

has prevailed until then. A “(...) very traditional [mathematics teaching]. We consulted manuals that presented mechanical arithmetic activities, such as teaching how to divide into 11 steps” (Mansutti, 2018, p. 238).

The development of curricular experiences for the eight-year school within the scope of Imep was the basis for a new organization of mathematics for teaching.

The laboratory to elaborate a new curriculum set in motion in the 1970 school year. The pedagogical work was seen and reviewed weekly by teachers and area coordinators. Lamparelli and Mansutti worked in an integrated way with classroom and meetings with the mathematics coordination. Lamparelli provided Mansutti with specific texts for the mathematics teaching, based on proposals from the Movement of Modern Mathematics (Movimento da Matemática Moderna – MMM). There was a double challenge: building work for an eight-year integrated school and incorporating MMM references (Mansutti, 2020).

The integrated work between Mansutti and a mathematics teaching expert as a middle and high-school discipline (former *ginásio* and *colégio*), represented by Lydia Lamparelli, posed the challenge of continuity. The task is to prepare a mathematics teaching for the initial years - 1st to the 4th grades - that may constitute the initial teaching bases for the other levels – from the 5th to the 8th grade- already covered by textbooks prepared by Lamparelli, referenced in MMM. Thus, the program for the first years began at the end, with a schedule already set for the middle school. The activities Mansutti developed were fundamental for the elaboration of the proposal for the first years (Mansutti, 2020).

From experimentation, from the construction of new bases for teaching in each school year, Mansutti, after three years, was inserted in the circulation of the work carried out at Imep. She was summoned to work in teacher training for all the municipal education system in São Paulo: “Imep’s experience was a pilot, to be known. And win all education in the municipal school network. It is necessary to remember that there were no first degree schools, only primary education [*ensino primário*]” (Mansutti, 2020).

This experience of curriculum construction for the eight-year school also started to circulate in private schools. Colégio Santa Cruz is one of them. Teachers of the fourth year migrated to this school to implement the same work that was being done at Imep. The close relations favored those actions: the sciences coordinator at Imep was also a teacher at Santa Cruz (Mansutti, 2020). Mansutti relocated to that school, taking the experience of Imep. By this point, Mansutti was already sedimenting the “semipolivalent” professional, i.e., the teacher of the first years per teaching area. Mansutti worked with mathematics of the fourth year, with a view to propaedeutic teaching of eight years. Her stay in Colégio Santa Cruz proved to be decisive for Mansutti’s actions, later, in the National Curriculum Parameters.

Historical research aimed at the “opening of the black box” of the eight-year mathematics curriculum takes us to situations that are perhaps unprecedented compared to those of the elaboration of teaching programs, portrayed in the 1920s. The teaching

programs, as it turned out, were authoritative, however hard teachers attempted to participate. Government-appointed experts seem to have interacted little with the school environment. “Didactic autonomy,” in any case, would be something monitored, not shared. On the other hand, the elaboration process of a modern program, in terms of MMM, which later gained the curricular guidelines, the so-called “verdão” (greenish), involved experimentation actions in pedagogical practices, for later systematisation. Before being made official, the new production needed to be tested. Again, it was the teaching authorities that promoted the laboratory through the creation of Imep. In this case, a kind of stratification of experts seemed to raise. Lydia Lamparelli, mathematics coordinator, who had been appointed by the State, needed expert help for the early school years. Mansutti was that specialist and composed the team that developed the new graduation and mathematics organisation of the first school years, given the eight-year school (Mansutti, 2020).

After being tested, the organisation of the eight-year curriculum that came from experimental practice at Imep gained new systematisations, new levels of objectification, to spread as a reference from the state of São Paulo to the rest of the country.

### **The “verdão,” mathematics and experts: from guidelines to proposals**

The Curriculum Guidelines, already referred to in this text, was an official document published in the state of São Paulo, in the educational context after the approval of the Law of Guidelines and Bases for the teaching of 1st and 2nd degrees, Law n. 5.692 of August 11, 1971, entitled “Guias Curriculares para o Ensino de 1º Grau” (Curriculum Guidelines for the 1st Degree Education). As a part of the State Plan for Implementation of the 1st degree school, seven guidelines were proposed to structure the curriculum: Portuguese Language, Art Education, Physical Education, Social Studies, Sciences, Health Program, and Mathematics.

In Brazil, curriculum views, within a technicist perspective, influenced educational thinking, aiming to adapt school and the curriculum to the capitalist order, within the principles of order, rationality, and efficiency, especially in the 1960s and 1970; principles that were strongly expressed in the curricular proposition of the state of São Paulo, known as “Verdão.” (Duran, 2012, p. 2067)

The Centre for Human Resources and Educational Research “Prof. Laerte Ramos de Carvalho” - CERHUPE, an organ created in 1973, took on this task of revising and organising the curriculum along the lines of the perspective mentioned above, previously carried out by the extinct Division of Pedagogical Assistance - DAP, of the São Paulo Government’s Education Secretariat.

According to the introductory text of the curriculum guidelines, written by Prof. Therezinha Fram, director of the CERHUPE at the time, there was a demand for the recruitment of teachers to produce them:

Once the primary school was characterised, more general guidelines for the construction of the curriculum could be established. Therefore, specialists were recruited for the task. The constitution of the teams reflected the concern to see a total vision of the school process ensured: its members added experiences, covering all levels of education in force - primary, secondary - middle and high school - and higher education. (São Paulo, 1975)

The above excerpt puts to use the criteria for selecting experts who could solve practical problems - the construction of a curriculum for the eight-year school. According to the text, a person with higher education was considered to have the expertise for the task. So, experts Almerindo Marques Bastos from Colégio Macedo Soares, Anna Franchi from the Experimental School of Lapa, and Lydia Condé Lamparelli from the Brazilian Institute of Education, Culture and Sciences - IBECC were recruited for the mathematics team.

Lydia Lamparelli, the curriculum team leader, was considered an expert because of her work at the Brazilian Institute of Education, Science and Culture (IBECC), an organ linked to the United Nations Educational, Scientific and Cultural Organization (UNESCO), which already collaborated with DAP in “studies related to the scientific and legal foundations of new curricular content” (Lamparelli, 2018).

Following this technical proposal, the theoretical texts of the Curriculum Guidelines, popularly known as “Verdão,” incorporated elements of the Modern Mathematics Movement, which was based on mathematical structures with more formal and abstract logic for teaching.

Thus, the “Verdão” and its subsidies, in their different versions, brought a rigid curriculum, in the sense that it did not relativise the graduation and organisation of teaching that would be taught based on their precepts. They were produced during the military dictatorship. Such educational proposals were aligned with technicism, in a logic strictly linked to the content of each discipline (Duran, 2012).

It is evident that all this practical work that the expert developed at the service of the State modified the configuration of the knowledge that was conveyed for teachers’ and students’ education. The changes are noticeable, especially in the configuration of the teaching programs, which, in 1975, received the name of “guidelines” (guia) and ten years later, a document called “proposal” (proposta) come out.

The propositions were built assuming a scholar and an intellectual teacher and structured to explain, inform, and persuade teachers. The discourse constructed

was addressed to a teacher-reader, with a vast domain in the pedagogical field and his area of knowledge. All propositions sought to reconstruct its construction process historically. Besides, they reaffirmed their political-pedagogical difference concerning the curricular guidelines and the democratic political direction of the context in which they were generated. (Souza, 2006, p. 206-207)

The curricular prescriptions also suffered changes according to the government propositions in force. We can notice that the knowledge was also being modified in the course of creating a school towards a movement of redemocratisation, started by André Franco Montoro, who was elected governor of São Paulo in 1982, in the first direct election for the position after so many years.

In the organisation of the new curricular proposal, in force since 1985, Mathematics, which used to be classified into four axes, was now organised into three: Numbers, Geometry, and Measures. It seems reasonable to say that this happened due to the decreased interest in the Modern Mathematics Movement, which had an essentially abstract proposal, based on mathematical structures.

Thus, during the curricular reform, there was a profusion of new knowledge. At first, those that were most systematised as an official reference: the Guidelines, indicating, in this specific case, the mathematics that should be present in teaching. After defining the way this mathematics could be taught, they brought the Subsidies. At that time, Lydia Lamparelli, the head expert of the process, was granted the opportunity to attend a teaching internship in France, which led to what seems to be the most appropriate happening in terms of aligning pedagogical practices with the curricular proposals: the elaboration of activities, a new didactic material.

### **NCPs, mathematics and experts**

To comply with Article 210 of the 1988 Brazilian Constitution, a new nationwide curricular reform was set in motion. It became necessary to elaborate and systematise new knowledge for teaching and teacher education in basic school. They would compose what the Ministry of Education, Education, and Sport would call National Curriculum Parameters (Parâmetros Curriculares Nacionais – PCN) (Moreira, 1996).

The initial phases of the elaboration of the NPCs were summarised by Moreira (1996): as of late 1994, the Secretariat of Elementary Education of the Ministry of Education and Culture - MEC summoned 60 national specialists, bringing them together with other internationals from Argentina, Colombia, Chile, and Spain. These countries had recently gone through curriculum reforms and, supposedly, could help the government develop a Brazilian national curriculum. Beyond this call for experts, the government also commissioned a study from the Carlos Chagas Foundation for the curricular proposals in force in all Brazilian states, besides the municipal proposals of states of São Paulo, Rio de Janeiro, and Belo Horizonte. However, due to this broad scenario of consultations and

studies by national and international experts, in 1995, the elaboration of the NCP passed to the hands of school teachers, not university specialists.

It should be noted that the teachers participating in this team were mainly teachers linked to Escola da Vila, located in São Paulo. The truly inspiring experience for the preparation of our parameters was the Spanish experience, with Professor César Coll, professor of Educational Psychology at the University of Barcelona, and one of the most directly involved theorists in educational reform in Spain, who took over the position of consultant of the work developed in our country. At the end of 1995, the same specialists who participated in the meeting in São Paulo were called to Brasília to receive the first version of the NCPs (Brasil, MEC, 1995; Moreira, 1996).

The first version of the NCP was prepared. In 1995, a document for the 1st and 2nd Cycles (1st to 4th grades) was sent to be reviewed by specialists and institutions. At the end of 1997, the NCPs for the 3rd and 4th cycles (Pietropaolo, 1999, p. 86) were delivered. The preliminary version of the NCPs for all the cycles was distributed to around 400 reviewers (Moreira, 1996, p. 16). The evaluation request by MEC was accompanied by a question script. Amid broad questions, there are some that most purposely refer to the knowledge to be present in teaching and those related to the teacher's work. For example: "4. Do the content blocks meet the objectives defined? Are they consistent with each other? Are they appropriate for students in these cycles? Which blocks of content should be expanded, reduced, eliminated, and contemplated?"

Such questioning, in more specific terms of mathematics education, motivated reviewers to suggest broadening, thus including and excluding mathematical content.

On the other hand, item 6 refers to the teacher's work: "6. Are didactic guidance and evaluation criteria clear and accurate enough? Should they be elaborated in more general terms, or, on the contrary, more concretely and accurately formulated?"

78% of the total reviewers returned their reviews for the first two cycles, and close to 50% for the two final cycles. The new versions of the NCP were published in February and November 1998, respectively (Pietropaolo, 1999, p. 86).

The attempt to open the black box of the PCN to analyse the processes and dynamics that occurred for the elaboration of new knowledge configured in mathematics for teaching in the first school years and the new demands on the teachers' pedagogical work involved searching for answers to questions that universities had been asking for a long time:

(...) who should coordinate, and how should the process of defining minimum contents occur? Should such an initiative be left to a team selected by the MEC authorities? Why was this team basically composed of teachers from Escola da Vila, located in São Paulo, failing to consider the work and experiences of other excellent teachers from other states in the country? Why did they not try to guarantee the participation of a significant number of male and female teachers from different school systems in the country? Why were scientific institutions and universities not called to participate in the first moments of the work? Why was

the experience of the ANPEd Curriculum WG not used, given that the work group has been discussing the issue for so long? (Moreira, 1996, p. 16)

And also:

(...) how did the work carried out by the researchers from the Carlos Chagas Foundation affect the proposal? Did the Brazilian curriculum elaboration experiences, developed in states and municipalities, actually provide subsidies for the Parameters, or did, in fact, the two processes - the Foundation's and the MEC's - go hand in hand during 1995? Still, why were alternative curricular experiences promoted by different social movements in the country not analysed? Why were the local proposals not widely discussed in the country before the document was prepared? (Moreira, 1996, p. 17)

Add to these questions the questions about the contributions coming from the reviews: What changes were suggested? What was removed and what was included, following the reviewers' reports? What justifications were given for those actions?

So, it was possible to make a synthesis based on the analysis of the NPCs. The stages of elaboration of the NCP revealed a progressive increase in the complexity of actions planned by the government in the demand it makes to the experts. Apparently, a new phase of explicit internationalisation of curriculum production was inaugurated. The dynamics involved also portrayed different levels of expertise that participated in the official call. Those levels were represented, as described by international and national analysts, by César Coll's consultancy, elaboration of an integrated team of private school teachers, consultation with specialists, among the main stages of development of the new curricular references. This stratification made it even more challenging to research the processes of the development of new knowledge. There were several fronts to be investigated, as suggested by the description of the elaboration stages of the NCP. For example, we had to discover how the teachers from Escola da Vila – who had been taken to the position of experts - had done the work. Also, as previously said, we had to investigate the contributions of the reviews from individual experts from universities and professors who received the preliminary version of the NCP, the work of the Carlos Chagas Foundation, etc. Through these paths, we could analyse and express what Chartier (2006) considers to be the classic and essential requirement of a historian's work: "making an object, a corpus, a problem, as intelligible as possible" (p. 10). In our case, to make intelligible the processes and dynamics that led to the development of mathematics for teaching and mathematics for teacher education in the times of the NCPs.

## **BNCC, mathematics, and experts**

An internet consultation of curricular documents that refer to the National Common Curricular Base (Base Nacional Comum Curricular – BNCC) revealed the stages of its elaboration, among several other elements. In the “History” tab, on the website of the Ministry of Education, we can obtain a timeline since 1988, year of the promulgation of the new Brazilian Constitution, which, through Article 210, provides for the preparation of the BNCC. Following this timeline, there is Ordinance No. 592, of June 17, 2015, which establishes a committee of experts to prepare the proposal for the Common National Curricular Base. Such information is available on the MEC website.

On September 16, 2015, the 1st version of the BNCC was published. The second version came on May 3, 2016; and, finally, in August 2016, “the third version begins to be written, in a collaborative process based on version 2.”<sup>2</sup>

The “Technical Sheet” of the third and last versions of the BNCC brings a list of hundreds of authors and collaborators that participated in the elaboration of the Base. There were members of the base management committee, writers, reviewers, translators, institutional partners of the National Council of Education Secretaries-Consed, the National Union of Municipal Directors of Education-Undime, an advisory committee, experts’ committee, teachers who collaborated as proofreaders, the systematisation team of the contributions to the BNCC portal involving researchers, research assistants, institutional coordinators of the state commissions for the discussion of the BNCC, and critical readers.

The authorship of the new curricular references was thus institutionally configured as including a complex process of initial versions, reviews, adjustments, and formulation of the final document. On the part of the MEC’s website related to the BNCC, we can find the frequent question: “How was the BNCC written?” which is answered on the website.

In the first two versions, a writing group was composed of specialists appointed by MEC and of teachers and technicians from secretariats with experience in curriculum, indicated by Consed and Undime. The writing group was formed by 116 people, divided into 29 commissions, each composed of two specialists in the areas of knowledge, one secretary manager or teacher with experience in curriculum and one teacher with classroom experience. For the final version, a management committee made up of members and surrogates from different bodies and entities linked to the MEC were held responsible for indicating the group of specialists responsible for reviewing the documents previously prepared, based on inputs from public consultations and technical reviews. This management committee was also responsible for proposing guidelines for the final draft of the document sent to the National Education Council - CNE<sup>3</sup>.

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<sup>2</sup> See <http://basenacionalcomum.mec.gov.br/historico>

<sup>3</sup> Read this and other information at <http://basenacionalcomum.mec.gov.br/historico>

On the way, the reader is guided through the BNCC elaboration history. By consulting its Technical Sheet, we know who systematised the new references for school education. Concluding, it is a document in which all hundreds of people are authors. So, the notion that all social segments directly and indirectly involved with Brazilian education are represented in the BNCC authorship was built.

The experts are among the hundreds of people mentioned in the BNCC Technical Sheet. Those who, surrounded by the most diverse advice, organised, for each school level, the objects of knowledge that should be present in each disciplinary branch. They were also responsible for establishing which graduation to be followed throughout the different school years. And more, they defined which competences and skills should articulate with those objects of knowledge. An example: What is the importance of fractions in terms of skills, of abilities in different school grades? When should we start to teach fractions? How should such teaching be graduated? In which school year did the pedagogical work reach the final, systematised form of the mathematical object fractions?

There are experts at various levels and with different assignments. In a broad sense, it is possible to say that the hundreds of people that appear in the BNCC Technical Sheet can be considered specialists in the curriculum subject. Indeed, the elaboration of “general competencies” and those “specific competencies” involved groups with different people. Thus, the levels of expertise that we were interested in observing more closely refer to those individuals who systematised, for the final document, answers about the articulation of objects of knowledge and competencies, graduation of education, year of the beginning and the end of treatment of the object of knowledge, etc.

The task of observing the actions and work of those “specialist experts” placed us in a kind of ethnographic study about them, especially about those who were most directly responsible for the systematisation of mathematics for the first school years. We could, like in Bruno Latour’s (2000) studies, penetrate those laboratories where they prepared the new curricular knowledge to show what processes and dynamics were present in this movement of curriculum elaboration of mathematics for the first school years.

In this sense, as mentioned above, any curricular proposal, the object of analysis of our research, should be seen as a “black box” to be opened, regardless of, as in the mentioned case of BNCC, the enormous amount of information, reviews, different versions, etc. In this case, we faced a significant challenge. BNCC is a well-closed “black box,” despite - or even due to - the immense amount of information available on the Ministry of Education website. In this recent reference to the Brazilian basic school, it is a “black box” that has been closed in an extremely sophisticated way. Its opening requires historical studies, going back in time, analysing how the closing process took place. It requires investigating who, among the hundreds of specialists, were those most directly involved in the systematisation of the information collected, who were the actual experts. And, from there, analyse the production of new knowledge contained in the BNCC.

## **FINAL CONSIDERATIONS**

The longlasting life the teaching programs considered as official references for teachers, as seen in the 1925 teaching program, gave way as of the 1970s to what was intended to be a less peremptory, more collaborative program on the part of the creators and the authorities who started to approve a new type of curricular documentation. First, we had the guidelines, then the proposals, then the parameters, and, today, a curriculum base. Such expressions to name the new curricular documents sought to convince the teachers that the official systematisations of knowledge constituted references, landmarks rather than commandments for teaching practice. And more: all interested parties should be seen as experts, i.e., summoned by the official power to give their opinion and interfere in how those curricular references should be written.

Amid this official discourse indicating curricular production, the development of new knowledge for teaching, and teacher education as a collective work, this discourse must be considered as a “black box” in the research. If the programs production in more distant historical periods was given by an authoritarian practice, being imposed on the group of teachers and students under the control of the school inspection – in which the experts were somehow more visible -,the immense collective described in the Technical sheet of the current references made the task of identifying the dynamics and processes of producing new knowledge more complex.

To follow the trajectory of some individuals who somehow have their names connected to the official documents - the experts - is a research strategy that seems to be decisive for the understanding of the production of new knowledge that must be present in teaching and teacher education. This investigative path highlights the personal collections of teachers and teaching authorities. Among a set of documents seemingly unimportant such as letters, drafts of activities, professional background data, handouts, and all sorts of papers, we can start opening the black boxes of official documentation and their discourses. The analysis of the materials from the personal collections of teachers and teaching authorities allows us to reconstruct decisive contact networks in the assembly of teams, and assignment of responsibility which, after all, decide on the inclusion of a specific content or its elimination; choose to incorporate new themes in school disciplines; associate specific mathematical objects with some competencies, among many other fundamental elements, to understand the reasons for teaching some specific mathematics, in this and not in that way...

## **AUTHORS' CONTRIBUTIONS STATEMENTS**

All the authors have made substantive contributions to the article and assume full responsibility for its content. All those who have made substantive contributions to the article have been named as authors.

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