

## **São Paulo Curricular Mathematics Material: using option by teachers of a São Paulo municipality**

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**ABSTRACT – São Paulo Curricular Mathematics Material: using option by teachers of a São Paulo municipality.** This paper analyzes the material concerning the Mathematics Curriculum of the State of Sao Paulo, in force since 2008, and the perceptions of teachers regarding its use. It is a qualitative, analytical-descriptive research, grounded on the material analysis and in a questionnaire applied to 80 Mathematics teachers from the public school network of Presidente Prudente municipality (SP). The material does not indicate significant changes in the contents in relation to previous curricula, but it establishes learning situations as teaching organizers. Results highlight that most teachers would not use the material in a spontaneous way. The rationale presented by the teachers refer mainly to the lack of theory in the material and to the students' lag of knowledge.

**Keywords: Curriculum. Curricular Proposal. K-12 Education Teachers. Mathematics Teaching.**

**RESUMO – Material Curricular Paulista de Matemática: opção de uso por professores de um município paulista.** Este artigo analisa o material referente ao Currículo de Matemática do Estado de São Paulo, vigente a partir de 2008, e as percepções dos professores quanto à sua utilização. Trata-se de uma investigação qualitativa, de delineamento analítico-descritivo, fundamentada na análise do material e no questionário aplicado a 80 professores de Matemática da rede pública de ensino do município de Presidente Prudente (SP). O material não aponta mudanças significativas nos conteúdos em relação a currículos anteriores, mas estabelece situações de aprendizagem como organizadoras do ensino. Os resultados evidenciam que a maioria dos professores não usaria espontaneamente o material. As justificativas por eles apresentadas se referem predominantemente à falta de teoria do material e à defasagem de conhecimento do aluno.

**Palavras-chave: Currículo. Proposta Curricular. Professores de Educação Básica. Ensino de Matemática.**

## Introduction

In an attempt to summarize what the term curriculum means, Moreira and Candau (2007, p. 28) claim that this word represents “[...] a set of practices that propitiate the production, circulation, and consumption of meanings in the social space, which contribute, intensely, for the construction of social and cultural identities.” For Goodson (1997, p. 17), “[...] curriculum is a social artifact, conceived to accomplish certain specific human goals”, encompassing not only the official proposals, systematized in programs, but also attitudes and values practiced in the school daily routine, although not in an explicit way, what is called a hidden curriculum. In other words, these authors understand the curriculum as all the experiences mediated by the knowledge transmission and by the social relations that contribute to the formation of students’ identity.

In relation to the school, the curriculum is more than a set of rules or prescriptions, it is a way of organizing the space and time for the purpose of educating. The curriculum represents a place where culture is produced and reproduced, although this process is not linear nor unidirectional, given that it takes place in the middle of tensions and conflicts.

Seen in this way, the curriculum is the result of a social construction and cannot be considered as neutral and timeless (Ferreira, 2004). On the contrary, the conceptions of curriculum and the way they appear in educational systems translate the conflicts of conceptions and practices. In fact, the formulation of a school curriculum implies in a process of choice of both content and practices that reveal conceptions that do not represent all social and cultural interests.

Throughout history, according to Goodson (2007, p. 243), “[...] the curriculum became a mechanism of reproduction of power relations that exist in society”. In this sense, it also emerged as a way of “[...] directing and controlling teacher accreditation and their potential freedom in the classroom” (Goodson, 2007, p. 243) as they are subject to established rules and values and should address specific topics, “[...] to a great extent, by the judgments and practices of specialists who conduct investigations in this field.” (Layton, 1972, p. 12-13 apud Goodson, 2007, p. 246). Such characteristic produced, over time, a strong relation between prescription and power, which allows to understand why, in most of the curriculum reforms, there is no effective involvement of teachers in the elaboration process of such proposals (Pires, 2009).

The critique to these assumptions has emphasized the need for a curricula elaboration based on a new stance that contemplates the plurality and the construction of a critical and dialogic space, named culturally oriented curricula (Moreira; Candau, 2007). In this context, the curricular organization should not be characterized as something established and close-ended. The documents that compose the curriculum must be constantly resumed in a democratic process involving reflection, action, evaluation and new actions. Such understanding

“excludes the proposition of ready-to-use templates” (Ferreira, 2004, p. 19) that the actors only have to execute. It is essential the existence of space and time for the permanent deconstruction and reconstruction of the curriculum.

According to Lopes (2004), the curriculum has assumed the center of attention in educational policies in the globalized world. Even though an educational reform involves legislation, financing, school management, professional training and assessment of results, the emphasis is on the curriculum policy. The author emphasizes that such condition produces a trap, given that, on one hand, the curriculum is the center of reforms, while on the other, the schools have limitations for its implementation. In the face of the dispute between the prescribed/official curriculum and the actual/lived one in schools, Goodson (2007) points out as a possibility the curriculum to be guided by a narrative identity, that considers the life story of learners and educators and that of formal institutions. The author also states that “[...] learning is seen as a formal task that is not related to the students’ needs and interests since much of the curriculum planning is based on the prescriptive definitions about what has to be learned, without any understanding of the students’ life situation” (Goodson, 2007, p. 250).

In turn, Young critiques the instrumentalist curriculum, in which the concern is contributing to the Economy, captivating students and meeting market demands. For him, the curriculum must have as its purpose “[...] the intellectual development of students” (Young, 2011, p. 614). To achieve this purpose, it must be grounded on concepts. Such model recognizes that knowledge is external to apprentices, but, unlike the traditional approach, the exteriority has “[...] historical social basis” (Young, 2011, p. 614), which determines a different form of pedagogical work, permeated by the *engagement* (Young, 2011, p. 611) of the actors involved.

According to the author, another problem of the instrumentalist curriculum regards the indistinction between curriculum and pedagogy. Curriculum refers to the knowledge considered important for a specific country, to which students should have access. Pedagogy is related to the activities that the teachers use to involve and make the curriculum significant for students.

[...] teachers cannot, themselves, create a curriculum, but they need it to guide them in what they should teach, the curriculum developers can only stipulate the important concepts to which students need to have access. Curriculum developers count on teachers to motivate students and transform these concepts into reality for students (Young, 2011, p. 612).

When no distinction is made between curriculum and pedagogy, Young (2011) asserts that the role of curriculum developers and the one of teachers are mixed, when in reality they are different. Such situation leads to an instrumentalist curriculum, based on the proliferation of

curricular guidelines and examinations to verify if such guidelines are followed, which confers to the curriculum a controlling nature, more than a guiding one.

In view of the considerations presented regarding the curriculum, we developed a research involving the deployment and implementation of the *Curriculum* proposed by the São Paulo State Educational Secretariat (SEESP) and in force since 2008. The focus of this investigation is the training process of Math teachers for the implementation of the curriculum proposed and the impacts of the use of this material in their practice. The research, conducted in the Presidente Prudente municipality (SP) with 80 Math teachers from the state network, was organized in three axes: constituent aspects of the basic document of the proposed curriculum, teachers' perceptions regarding the proposal and its use in the classroom, and how they describe the training process for the curricular implementation. In this paper, we describe the results of the first two axes, analyzing the material distributed to teachers and students for curricular implementation, as well as the responses to the questionnaire applied to teachers, about the option for using or not the material.

## Trajectory of Mathematics Curricular Reforms

From the French Revolution and Industrial Revolution, is started the search for education with a systematic nature, carried out by the school institution, already concerned with the curriculum standardization. According to Goodson (2007), the prescriptive curriculum, which persists until today, has led to the belief that, to ensure a democratic schooling, it is crucial for it to be put into practice. It so happens that such curriculum is developed in an abstract way, far from the daily life, assuming an exclusionary nature. It can be seen, here, a visible contradiction: the policies of broadening schooling advocate the importance of school access, however, they keep the mechanism of exclusion of the poorest, when they propose a curriculum distant from reality.

Regarding the Mathematics course, the instruction, in general, was performed through the approach of elementary contents, with emphasis on formal aspects and in a decontextualized way. In this context, in 1908, under the leadership of the mathematician Felix Klein, it was created the *Internationale Mathematische Unterrichtskommission* (IMUK), which defended the urgency of the math instruction reform.

In Brazil, the legal changes will only come to light after 1930, influenced by Euclides Roxo's programs for Math teaching for the Pedro II School and the book *Curso de Matemática* [Mathematics Course], launched in 1929, which proposed alterations regarding what was being proposed in Math. Until then, French books grounded on demonstrations were used, with a large amount of exercises and organized according to the topics Algebra, Arithmetic and Geometry. Roxo, concerned with the modernization of Math teaching and sharing the IMUK ideas, joined all three subjects under the name of Mathematics (Valente, 2004).

The Francisco Campos reform of 1931 sought to organize the Brazilian educational system and incorporated the main points of view defended by Roxo in relation to Mathematics programs (Carvalho, 2000). This reform represented an improvement in the curriculum conception, as it included didactic orientations (Pires, 2011). In the Capanema Reform of 1942 and 1946, the Mathematics programs, from these two reforms, followed the characteristics advocated by Roxo at least in two points: the integrated study of Mathematics addressing the topics Algebra, Arithmetic, Geometry and Trigonometry, and the presence of Mathematics in each grade of the curriculum (Carvalho, 2000).

Only in 1961, from the National Educational Bases and Guidelines Law (LDB), Law N. 4024/61 (Brasil, 1961), there were changes in the programs proposed in the previous reforms, influenced by the Modern Mathematics Movement (MMM). One of the key milestones of curricular reforms in several countries, this movement was conceived in the context of a training policy that had to take into account the economic modernization. "The concern was that of having a Mathematics useful for the technique, for science and to the modern economy" (Pires, 2000, p. 11). It was desired an active and open pedagogy. However, in practice, the reform was marked by an excess of symbolism and abstractions at rigorous levels. Official curricula incorporated the MMM principles starting from textbooks collections, which dealt with the Theory of Sets, with an emphasis on the symbolic language. For Kline (1976), the criticisms to MMM relate, mainly, to the excessive emphasis on logical structures and the unsatisfactory results of learning presented by students.

From the MMM, study groups on Math teaching were established, strengthening the field of Mathematics Education. In 1980, in the United States, in the *National Council of Teachers of Mathematics* (NCTM) event, it were presented recommendations emphasizing the resolution of problems as the focus of Math teaching, as well encouraging the capabilities to perform basic operations, the use of computers and the applications of mathematical concepts to the apprentice's reality (Pires, 2000).

In this context, Mathematics curricular proposals were drawn up in different states and municipalities of Brazil at the end of the 1980s. Barreto (2006) claims that the movement of curricular reorientation in Brazil in that decade was led by the southeastern and southern states. Moreover, in an environment of democratic transition, when the population yearned for participation, claims burst in the sense of recovering the social relevance of the content present in the curricula to go beyond the "[...] technicist orientations of the 1970s, which valued the methods and strategies of teaching" (Barreto, 2006, p. 5).

Mathematics curricular proposals organized by different states and municipalities had as the main element in common the review of Modern Mathematics principles. In most of such proposals it was emphasized the articulation of school to life, the Mathematics application to other fields of knowledge, the emphasis on the student's activity

through problems resolution and topics related with estimating, probabilistic calculations and statistical treatment in elementary education. Evaluation appeared with a diagnostic function, assigning a constructive role to error (Pires, 2000).

From the analysis of the different curricular proposals developed by different states and municipalities, in 1995, close to the LDB approval in 1996, the Education Secretariat of Elementary Education of the Ministry of Education and Sport began the elaboration process of a national reference document, the National Curriculum Parameters (PCN), that was concerned with organizing a curriculum that indicated parameters for the whole country, without disregarding the local characteristics of each region (Pires, 2011).

The Mathematics PCN (Brasil, 1997) present guiding principles resulting from studies in the field of Mathematics Education. They bring the blocks of contents divided into Numbers, Magnitudes and Measures, Space and Shape and Information Treatment. In the document, there is a section for Didactic Orientations, in order to meet possible difficulties in the learning of certain concepts, as well as to offer methodological possibilities to face them.

Pires (2011, p. 60) claims that it was predicted that states and municipalities would organize themselves to suit the PCN aiming to meet regional needs. The *Analysis Report of Curricular Proposals of Elementary and Middle School, published in 2010 by the Ministry of Education* reveals that this was done (Sampaio, 2010). On the national scene, of curriculum reforms and the PCN's adequacy to regional needs, in 2008 the State of São Paulo proposes the deployment and implementation of a proposal that becomes the state Official Curriculum in 2010 and is the object of analysis of this research.

### **Mathematics Curriculum Reforms in the state of São Paulo**

In 1975 it was published, in the state of São Paulo the Curricular Guides for primary schools in the context of Law N. 5692/71 (Brasil, 1971), which structured the elementary school of eight years. Curricular Guides, in the general introduction, described a school of general and instrumental culture, directed toward the comprehensive formation of children and adolescents, concerned with the students' active participation in learning.

In the Guides, it was evident the influence of Modern Mathematics, when emphasizing the important role of mathematical structures and the predominance of topics involving the theory of sets. The material divided the subjects into Relations and Functions, Numeric Fields, Equations and Inequations and Geometry. Although not diminishing the rigor of the axiomatic method, the authors asserted that the concepts should start from experiences accomplished with the students, close to the concrete and using material handling (São Paulo, 1975). After the publication of the guides, subsidies were produced for the curricular implementation until 1984.

The subsidies were built with a rather colloquial language; they were presented in the shape of manuals for the teacher, as a 'prescription book' indicating the content distribution, time, assessment and even words that the teacher should use. It was huge, hence, the extent of detail and specification, seeking to direct and control the teaching practice (Souza, 2006, p. 208).

For Pires (2000), the main criticisms to the guides were the excessive concern with training; the repetition aiming the memorization of rules and ways of solving problems; the prioritization of algebraic topics at the expense of geometric concepts; the early formalization of the students, even without their proper cognitive development.

In 1985, in the context of redemocratization and political opening, from the criticism to guides and negative experiences resulting from MMM, it has begun an elaboration process of the Curricular Proposal by the Mathematics Technical Team of the Coordination of Studies and Pedagogical Standards/Education Secretariat of the state of São Paulo (CENP/SEESP). Such process was peculiar for having the participation of different educational segments, among them teachers who worked in the state public schools. If compared to the processes already described, this was the one that had the widest participation of teachers in its elaboration. A preliminary version was discussed extensively with all the public network in 1987. The first edition was published in 1988 (Magni, 2011).

It was evident in the proposal not only the concern to deal with the nature of Mathematics and its function, as that of comprehending the reality in its quantitative aspects, in addition to developing logical reasoning, as well as the ability to abstract and generalize. It was used the spiral approach of contents, divided into two topics: Numbers and Geometry. The Measures topic was suggested with the aim of articulating Numbers and Geometry. The proposal comprised indications oriented to the work with fundamental ideas as proportionality, equivalence and similarity, involved in different content to be developed. Each topic was accompanied by methodological guidance about the concepts involved (São Paulo, 1992).

For Souza (2006, p. 206), the 1988 proposal incorporated principles consonant with "[...] critical theories of curriculum, explaining political and social values, stating the commitment with popular classes". From the proposal, various materials were organized as subsidies for its implementation. According to Pires (2000, p. 50), the implementation process of the São Paulo curricular proposal met resistances not due to its ideas, principles and proposal organization, but arising from "[...] decisive factors related to wage issues, staff turnover in schools and the teacher training itself."

In 1997, as already mentioned in the previous section, the Mathematics PCN were published. From then on, the state of São Paulo had two official documents, one national and another state, its curricular proposal of 1988.

In the introductory part of the Mathematical component, the PCN (Brasil, 1997) considered that, in general, the schools in different states did not incorporate the previous curricular orientations. Apparently, educational policies had suffered modifications resulting from historical moments of the country and its states; however the schools were functioning at the margin of the changes suggested in official documents, and the math learning remained unsatisfactory.

Curricular reforms, in general, relate to alterations in educational systems and, as a rule, the teachers' participation is reduced, both in the proposal elaboration process and in the stage of discussion and implementation. There has not been experienced yet proper implementing ways accompanied by an evaluation process (Pires, 2009).

For Goodson (2007, p. 242), the difficulty of proposals implementation is related to the fact of the curricula being prescriptive; such prescription "[...] sustains the mystique that specialization and control are inherent to central government, education bureaucracies and the university community". Thus, it would be almost natural the exclusion of teachers in the construction process of the curriculum. For Young (2011, p. 613), "[...] the curriculum itself is increasingly becoming a way to render accounts instead of being a guide for teachers".

When describing the curriculum reforms, we have identified that, in general, teachers do not consider themselves as participants in the organization and development process of the curriculum. As a result, "[...] quite often it is adopted an attitude of disbelief in educational reforms, declaring that they are distant from the reality of their students and unattainable in the current school conditions" (Pires, 2011, p. 64). The trajectory of distinct reforms reveals how the curricular issue is involved in conflicts of various orders, being one of them the resistance of teachers and schools. It is precisely in this context of reforms and curricular crisis that we have analyzed the policy of curriculum reform deployed and implemented from 2008 in the state of São Paulo.

## Methodology

In this paper, we present the results of a qualitative, analytical-descriptive investigation, carried out by means of documentary analysis, from responses obtained with a questionnaire. The documental analysis refers to documents regarding the Mathematics *Curriculum* proposed from 2008 on in the public network of the state of São Paulo as the basic text of Math Curriculum, accompanied by the teacher's edition of the student's workbook respectively distributed. The analysis seeks to identify information in documents, based on issues of interest. For this reason, the analyzed material becomes the source from where it was obtained evidences that may substantiate the statements and reflections throughout the investigation process (Lüdke; André, 1986). In accordance with Cellard (2014), the documentary analysis represents a fundamental resource for the analysis of a problem to be studied in its temporal dimension. The material analyzed in this study was produced



in a specific time to comply with the policy of curriculum reorientation in the state of São Paulo started in schools in 2008. With this procedure, we have identified the characteristics of the proposed material, as well as the conception of curriculum, school, the teacher's teaching activity and the student's learning underlying the learning situations proposed to be developed in classroom.

In a second moment, we have used the answers to a questionnaire applied during the Hours of Collective Pedagogical Work (HTPC) in 24 schools of Presidente Prudente (SP/Brazil). The schedules were planned in advance and 80 Math teachers offered to participate in the study, 64% of the 125 teachers who worked in these schools. The questionnaire addressed several issues about the *Curriculum* proposed. Particularly in this study, it was outlined the perceptions of teachers in relation to the use of the curricular material.

Data tabulation was performed by means of content analysis of the answers, followed by the definition of categories. It is a research procedure in which, according to Franco (2005), the verbal expression, its assertions and messages can be considered as essential indicators for the understanding of the problems linked to educative practices and their psychosocial components. For data treatment, it was used the PSPP free software, an alternative to the *Statistical Package for the Social Sciences* (SPSS) software. The analysis was performed from the articulation of different data collected based on the theoretical background and researches related to the topic.

## Research Findings

### *The Curricular Proposal of the State of São Paulo (2008): documental analysis*

For the developers of the Mathematics curricular proposal (São Paulo, 2012), in force since 2008, it is important to consider the rich pedagogical inheritance already developed in relation to previous curricular proposals and supporting materials for curricular implementation. In the introductory part, the basic text of the curriculum acknowledges advances contained in the São Paulo proposal of 1988 and other materials produced by the CENP, although the new proposal should replace the previous one.

The deployment of the curricular proposal began in February 2008, with the distribution of a preliminary version of the curriculum's basic document and the *Jornal do Aluno São Paulo faz escola* [São Paulo Makes School Paper]. The paper, used in the initial 42 days of class, proposed activities for reviewing and resuming mathematical concepts (São Paulo, 2012). When this phase was concluded, specific teacher's editions were distributed to the teachers by course, prepared in accordance with the curriculum basic text. Only in 2009 the students' workbooks arrived at schools.

The proposal reveals a curriculum conception as “[...] the expression of what exists in scientific, artistic and humanistic culture transposed to a learning and teaching situation” (São Paulo, 2012, p. 11) and identifies as basic principles “[...] the school that learns; the curriculum as a space of culture; competences as the learning axis; the priority of reading and writing competence; the skills articulation to learn; and the contextualization in the working world” (São Paulo, 2012, p. 10). For the developers of the proposal, “[...] the closeness between school contents and the universe of culture, the contextualization appreciation and the constant pursuit of a critical instrumentation for the working world” (São Paulo, 2012, p. 30) are not new ideas, but constitute the starting point for new possibilities of organization of the teachers’ pedagogical practice.

In relation to the content blocks, the current proposal is closer to the previous proposal of 1988 than from the PCN. In 1988, the blocks were Numbers, Geometry and Measures. In 1997, in the PCN, there were Numbers and Operations, Dimensions and Measures, Space and Shape and Information Treatment. The curriculum proposed in 2008 defines as content blocks: Numbers, Geometry and Relations. It should be noted that there is no exclusion of any of the blocks of previous proposals. The topic Information Treatment is considered quite broad by the proposal developers, since they understand that all topics are information to be transformed into knowledge. In this way, they chose to adapt the contents that were addressed within it in the three blocks Numbers, Geometry and Relations (São Paulo, 2012). The document makes it clear the importance of articulation and intersection between the three Math blocks of content, having in mind the work with fundamental ideas of each topic and the possible relations to be established. For instance, “[...] since the idea of number is born both from counting and measuring and that the Geometry study certainly involves metrics relations, interconnections between the three thematic blocks – Numbers, Geometry, Relations – occur almost naturally” (São Paulo, 2012, p. 43). In the same way, the ideas of proportionality, equivalence, order, approximation, problematization and optimization are present in different content intended to be developed in schools (São Paulo, 2012).

It should be noted, on the other hand, that the main focus is the way of approaching mathematical contents. In proposing the development of skills and competences, it is expected to develop not only the construction of concepts, but the critical spirit and the ability to make decisions, for which working with problem situations is fundamental. Such assumption demands the overcoming of a Math teaching that is mechanical and reproductive, already advocated in the PCN.

Within the material this assumption is translated into a teaching organized through learning situations, with the intention of fostering the abstraction of mathematical ideas from a context. By means of learning situations, dominant topics are presented, which play the role of articulators of contents and activities as a possibility of methodological treatment to the topics addressed. The learning situations proposed

in the material require a high degree of preparation and decision-making of the teacher because it is necessary to identify the concepts involved, both explicit and implicit and the important relationships between them.

Likewise, it is incumbent upon the teachers to decide in what way other materials may be used. In the same way, it is their responsibility to choose the most indicated one, depending on the subject matter. At the same time, they must recognize the need for concepts resumption whenever necessary. The teachers have the possibility of using “[...] complementary exercises, or even modifying the activities proposed to adapt them to the requirements of their course and to the characteristics of each class” (São Paulo, 2014, p. 7).

Only the teachers, in their school, respecting their own circumstances and projects, can have the discernment to favor one subject more than another, establishing centers of interest and slowing down in some of them, without deleting the others (São Paulo, 2012, p. 50).

It is explicit in the proposal that the teacher has autonomy to prioritize contents and topics, create learning situations and use supplementary materials. As indicated in the basic text, the model organized from learning situations requires a different conception of school, shifting from an institution that teaches to an institution that also learns how to teach.

Regarding the student, learning is addressed as the center of the school activity, understood not as the seizure of isolated knowledge, but involving “[...] knowledge that can be mobilized in skills and competences that, in turn, empower students to confront the problems of the world” (São Paulo, 2012, p. 18). The skills geared to learning expressed in the curricular material are those that guide the High School National Test (called ENEM), being reading and writing the main ones. Like in the theoretical foundation of ENEM, skills development should be fostered based on problem-situations in a context that challenges the student to seek new solutions.

In terms of the material organization, the Student’s Workbook and the Teacher’s Edition provide guidelines for the accomplishment of an interdisciplinary and contextualized work, by means of learning situations that value the technology and attach a cultural meaning to learning. The structure of the learning situations is repeated in both the Student’s Workbook and the Teacher’s Edition. In the latter, there are pedagogical and didactic orientations on the subjects and different units to be developed. In the former, there are exercises to be performed during or after situations with space for them to register what was learned.

The presentation of the basic aspects of the proposal leads to reflections and questions. It must be emphasized that the proposed curriculum has some flexibility, having in mind that the teachers can choose subjects and contents. On the other hand, it seems to be less lin-

ear than the previous proposals, even if significant alterations do not occur regarding the proposed contents.

If novelty is not present in the principles that guide the curriculum, as well as in the mathematical subjects to be addressed, would it be in the material structural characteristics? It seems that the proposal's originality is the explicit definition of a methodological approach, i.e., the option for the use of specific learning situations by topics, with different implicit contents for the establishment of mathematical relations from a particular context. In previous curricular official documents, it is listed various didactic suggestions regarding the content approach, whilst in the current proposal it is established the specific methodology that the teacher must develop.

However, in relation to the methodological aspects, many questions can be raised. The first one concerns the possibility that the proposal must create within the teachers a need to develop new learning situations, considering that those presented in the material are sequences that can work as a reference for other situations and complementation. It seems unlikely that teachers can, without more close and continuous assistance, accomplish such relatively complex task, especially considering that a similar way of teaching was not experienced in the teachers' trajectory.

On the other hand, what is the possibility of accession to the development of this curriculum, bearing in mind that its implementation has not considered the wider participation of teachers? It is possible to imagine that regarding the content, there should not be problems of resistance of teachers. However, the determination to work with learning situations reveals a methodological option of the curriculum, not the teacher. It seems unlikely of teachers to accept such interference in their practice, in general already traditionally based on lectures and organized on the basis of the textbook. In fact, would not this be a determination that hurts the didactic autonomy? Although teacher's autonomy is an aspect highly valued in the document regarding the selection of contents and supplementary materials, it emerges relativized, having in mind that the methodology is defined beforehand.

It should also be considered that this curriculum model, although innovative from a theoretical point of view, presents a visibly broader degree of requirement for its implementation in relation to which was in force at school previously. The fact that, in general, both the Student's Workbook and the Teacher's Edition provide, through different learning situations, a panorama of mathematical concepts, implies the necessity and the continuous use of other didactic materials, to substantiate theoretically and deepen concepts proposed by the suggested topics. Such a situation requires that the teacher has both didactic pedagogical and conceptual solid domain. The proposal requires, therefore, a teacher with differentiated profile. In general, what we have in the classroom practice is professionals with both initial and continuing training, which does not instrument them to the development of this type of work.

Another doubt concerns the type of school that the development of this curriculum demands. We are far from having a less bureaucratic school, which plans collectively, with autonomy and pedagogical decision-making pondered from its problems and needs.

*Perception of Math Teachers regarding the Curricular Material: analysis of the questionnaire*

In the research's second axis, we have analyzed the responses of Math teachers aiming to characterize their perception about the use of the Mathematics curricular material proposed in 2008. Initially, we have described the profile of teachers regarding their initial training, length of teaching experience and working situation. Among 80 teachers, 47 (58.7%) attended public higher education and 77 (96.2%) had a licensure degree, being 70 (87.5%) in Mathematics, four in Sciences with qualifications, two in Physics and one in Social Studies. From the total number of teachers, 26 (32.5%) responded that they took a second graduation, among which 25 (96.1%) chose a licensure degree, being 19 (73.1%) in Pedagogy, four (15.3%) in Mathematics, one in Biology and one in Physics. Of the total number of teachers, 22 (27.5%) completed the training at *lato sensu* post-graduate level. Concerning the working time in the teaching profession, Table 1 shows a wide variation, with a higher concentration of teachers (approximately half) with up to ten years of professional work.

**Table 1 – Time of teaching in Elementary School II (ES II) and in High School (HS)**

Years	ES II		HS	
	Frequency	%	Frequency	%
0 – 5	20	25	18	22.5
6 – 10	22	27.5	18	22.5
11 – 15	9	11.25	9	11.25
16 – 20	12	15	13	16.2
21 – 25	8	10	8	10
26 – 30	4	5	4	5
More than 30	0	0	1	1.3
Blank	5	6.25	9	11.25
Total	80	100	80	100

Source: Prepared by the authors.

Note: N= 80.

We have observed that only 25% of the teachers who work in Elementary School II and 22.5% in High School were not on the network when the proposal was implemented in 2008. Regarding the working situation, 59.3% are effective employees<sup>1</sup> and 96.3% are teachers from regular education<sup>2</sup>. When asked about the number of classes per week, approximately half (51.8%) responded to be working more than 20 hours.

Next, we examined how Math teachers perceive the material of the implemented curriculum. We have asked them: *If the teacher could choose to use the material from the new curriculum of the state of São Paulo, would you do that? Why?*

When analyzing the responses, the positives were considered as *absolutely yes*, accompanied by the explanations for the endorsement to the material due to its qualities. The rationale of those who answered yes, although with some restriction/suggestion, were categorized as *yes with caveats*. In the column *I don't know* it is found the answers that pondered some conditioning factors in the decision to choose the use of the material. Negative responses regarding the use of the material also appeared. The frequencies of the responses are described in Table 2.

**Table 2 – Frequency of Teachers’ Responses regarding the Material Option for Using the Mathematics Curricular Proposal**

Absolutely yes		Yes with caveats		I don't know		No		Blank		Total	
F	%	F	%	F	%	F	%	F	%	F	%
15	18.8	16	20.0	17	21.2	31	38.7	1	1.2	80	100

Source: Prepared by the authors.

Note: N= 80 / F = Frequency.

When analyzing the data from the Table, it can be verified that only 18.8% of teachers would freely choose to use the proposal, while 38.7% would not use it. The others would not use it, would do it with caveats or would have doubts. In face of this data, it can be inferred that the proposal acceptance was restrict. Such finding merits attention because it is not about novice teachers, as 68.7% of those who work in Elementary School II and 66.2% in High School have more than five years of teaching experience.

The option for using the material was categorized, considering the answers relating to the material, to the student, to the teacher, to the educational policy of the Education Secretariat and to the school, as shown in Table 3. It is worth noting that both positive and negative aspects arose in the responses, resulting from the nature of the rationale presented for *absolutely yes*, *yes with caveats*, *I don't know* and *no*. Blank answers (10) and those without rationale (4) were not counted for the purpose of analysis.

**Table 3 – Frequency of Response Rationale and Positive and Negative Aspects of the Material Option for Using the Mathematics Curricular Proposal**

Rationale	Negative Aspects		Positive Aspects		Total responses by category	
	Frequency	%	Frequency	%	Frequency	%
Regarding the material	65	56.5	19	16.6	84	73.1
Regarding the student	17	14.8	3	2.6	20	17.4
Regarding the teacher	4	3.5	2	1.7	6	5.2
Regarding the Secretariat policy	1	0.9	2	1.7	3	2.6
Regarding the school	2	1.7	0	0.0	2	1.7
Total of responses (positive/negative)	89	77.4	26	22.6	115	100

Source: Prepared by the authors.  
 Note: N= 115 (total of responses)<sup>3</sup>.

Table 3 shows that the negative aspects were predominant, totaling 77.4% of the rationale, while the positive aspects of the material were only 22.6%. The higher frequency of negative aspects focused on the material (73.1%), followed by those related to the student (17.4%). It draws the attention that, in both cases, the percentage of negative aspects were much higher than the positive ones.

The nature of the positive aspects pointed out in the rationale is shown in Table 4.

**Table 4 – Positive aspects related to the Option for Using the Mathematics Curricular Proposal**

Rationale		Positive Aspects	Frequency	%
Regarding the material (16.6%)	Content (8.8%)	Material allows complement/adjustment	5	4.5
		Material rich in exercises/content (quality/quantity)	3	2.6
		Serves as a guide/meets the required content	2	1.7
	Layout (7.8%)	Organizes the class/planning	3	2.6
		Methodology (learning situations/activities)	3	2.6
		Sequence/Contents order	3	2.6
Regarding the student (2.6%)		Favors autonomy/learning/challenges	3	2.6
Regarding the teacher (1.7%)		Saves working time	2	1.7
Regarding the Secretariat policy (1.7%)		Standardizes the network knowledge	2	1.7
Regarding the school (0%)			0	0
Total number of positive aspects			26	22.6

Source: Prepared by the authors.

Note: N= 115 (total responses).

The rationales regarding the material were categorized into two groups, related to content and form. In the case of contents, the largest percentage highlights the possibility of complementation. This aspect, even if indicated as positive, reveals an incompleteness of the material. Regarding the form, aspects of planning, methodology and contents sequence were indicated with the same percentage. In relation to the student, the highlighted positive aspect of the material was to support autonomy, learning and being challenging. Concerning the teacher, the positive aspect indicated relates to saving working time. It is relevant to notice that only two teachers considered the policy of the Education Secretariat as positive with regards to the use of a standard material across the network. It was not pointed out any positive aspect in relation to the school. The nature of negative aspects pointed out in the rationales becomes clear in Table 5.



**Table 5 – Negative aspects related to the Option for Using the Mathematics Curricular Proposal**

Rationale		Negative aspects	Frequency	%
Regarding the material (56.5%)	Content (46.9%)	Lack of theory/content (quality/quantity/insufficient material)	22	19.2
		complex/academic material/difficult/poorly measured exercises	8	7.0
		Few exercises/questions/current matters	6	5.2
		Material has to be used as a supplement or the material is the supplement	6	5.2
		Lack of contextualization	5	4.3
		Material needs adaptation	5	4.3
		Difference from textbook/preference for the textbook	2	1.7
	Layout (9.6%)	Sequence/contents order	7	6.1
		Methodology/presentation form	4	3.5
Regarding the student (14.8%)		Gaps (of autonomy/knowledge)	15	13
		Does not favor the autonomy/learning/does not challenge	1	0.9
		Resistance to the textbook	1	0.9
Regarding the teacher (3.5%)		Requires more of the teacher	4	3.5
Regarding the Secretariat policy (0.9%)		Implementation of curriculum	1	0.9
Regarding the school (1.7%)		Lack of infrastructure	2	1.7
Total amount of negative aspects			89	77.4

Source: Prepared by the authors.

Note: N= 115 (total responses).

Just as the positive aspects, the negative ones were grouped regarding content and form. In relation to the content, it should be noted that the negative aspects mentioned more frequently refer to the lack of theory/content and complexity. Regarding the form, the most indicated negative aspect was the sequence of contents. With regard to the students, the answers concerning the lag of their knowledge stand out. In relation to the teacher, the only aspect present in four responses was

the fact that the material requires more of the teacher. The lack of school infrastructure was flagged in two responses, and the inadequate way of curriculum implementation was mentioned once.

Some hypotheses have been raised concerning obstacles arising from the teachers' reactions in face of new proposals. Hernández (1998) points out some attitudes of teachers when facing the training process, such as what he named *refuge in the impossible*, when a utopian character is assigned to the proposals of change, being them related to time, number of students or school reality. Added to this is the fact that admitting the change or that the practice needs revision, attempts against their own experience and threatens the professional identity. Lopes (2004) also notes that the teachers' resistance to the proposals implemented by educational policy is in general due to the belief that such decisions are arbitrary and do not consider the reality of schools and the teaching work. Pires (2009), in turn, highlights that the resistance to reforms in the case of mathematics would be in the absence of teacher participation in their own process of preparation and implementation.

These hypotheses can assist in a more general understanding about the rejection of teachers to any proposal that intends to modify their *habitus*. In the case of this research, such hypotheses can be complemented with the specific rationales presented by the teachers themselves.

It should be highlighted that, in this research, the more intense rejection to the proposal is associated with the material characteristics, both regarding content and form. In the first case, the teachers emphasize the lack of theory, content, exercises and the complexity of the material. Such perception suggests a misunderstanding of the material, based on learning sequences, fleeing from the model usually favored by teachers, of technical rationality, in which the theory precedes the application.

In turn, in relation to the layout, it is clear that the material, for prioritizing the use of learning situations, hinders the work of teachers, who are used to the textbook systematics. By being prior to the theorizing, learning situations invert the traditional way of approaching mathematical contents. In addition, the theoretical formalization of concepts is not presented at the material, being it under the teacher's responsibility, as well as the creation of other situations or activities, based on the situations proposed. Differently, in the case of the textbook, there is some contextualization to start a topic, but the content is made explicit and exercises are presented, which probably leads the teacher to self-identify more with this material because it gives them an apparent safety.

The second highest percentage of negative aspects, 14.8%, refers to the students, of which 13% are related to their lag of knowledge, a great teacher's concern as shown in the research of Pires (2000) and Garnica (2008), among others. Probably, the teachers understand that some mathematical content should already be *stored, available for use*,

valuing the logic precedence. Underlying this idea, reinforced by the curricular tradition, is the belief that “[...] the mathematical knowledge is something that is acquired linearly, deduction after deduction” (Pires, 2000, p. 67).

The remaining percentages of negative aspects, related to the teacher, the school and the Secretariat policy are not very significant. Faced with criticisms done to the material and the student, it was expected that teachers would indicate, more often, negative aspects of a personal/professional nature for the job development. The rejection of the material and, consequently, the non-involvement with it may explain the absence of difficulties that would occur in case there was a wider involvement with the proposal. In any case, in general, as stated by Hernández (1998), admitting difficulties can generate discomfort, blocking in face of the new and feeling of professional immaturity. It also causes strangeness the low percentages related to the school and the Secretariat policy. Some minimal conditions for the curriculum development should have been fulfilled, connected to working conditions and a cooperative environment at school, aspects that were not mentioned. As for the Secretariat policy, only one teacher pointed out the curriculum implementation as a negative aspect.

## Conclusion

Based on a documental analysis of the proposal, it became clear that the mathematical contents do not differ substantially from those that appear in the previous curricular proposals of the state of São Paulo, nor of what is indicated by the PCN and by the Math textbooks. The proposal differential is the organization of both the Student’s Workbook and the Teacher’s Edition under the layout of learning situations, in the perspective of a contextualized and interdisciplinary work with the goal of developing students’ skills and competences. It is expected that the teacher, based on such organization, has an overview about the mathematical topics to be developed and identify the need to use other materials for the resumption or deepening of concepts that are implicit in the situations.

Based on the analysis, it is clear that in addition to a prescription of a minimal curriculum (topics and units) there is also a methodological prescription (proposal of learning situations), although the material indicates the importance of the teacher’s autonomy. The guidelines for the use of the material are clear about the need for its suitability/complementation, just as they make explicit the teacher’s autonomy to do so.

The research data, however, show that there are resistances to the proposal’s use. Although the proposed curriculum is in use, teachers indicate that there are many problems for its implementation in the classroom. In fact, only 18.8% would freely choose its use. The others predominantly pointed out the restrictions related to the material characteristics and the students’ lag of knowledge.

The results obtained allow an analysis taking into account two dimensions: the one of prescription and the teacher's didactic autonomy. Regarding the former, based on Goodson's ideas (2007), we can say that the implementation of curricular proposals has been supported much more by control mechanisms than by the involvement and intentional accession of teachers, a fact that seems to be reproduced in the case of this investigation.

In the curriculum implementation, power relations are involved, and a relationship of complicity is established between the school and the teachers. The consequences of such complicity are catastrophic to the extent that there are no effective reactions about what is proposed, neither there are guarantees that by complying with what was proposed, it would actually materialize in classroom practices (Goodson, 2007). In other words, the incorporation of some ideas in the discourse does not find correspondence in the practice.

In the same sense, Sacristán (2000, p. 147) states that the curricular prescription established by the administrative political level has impact in relation to regulate the field of action, but "[...] the determination of pedagogical action in schools and classrooms is in another level of decisions". The teachers, when developing the curriculum in their classes, must deal with several other variables that go beyond the work with the specific concepts of the discipline that they teach. In fact, in an attempt to provide a guide to the teacher's work, the curriculum earns a prescriptive character, considering that the curricula, in general, are prepared by a team of specialists with a minimal participation of the teachers who work in schools (Pires, 2011).

As to the second dimension, of the teacher's didactic autonomy, Young's (2011) observation regarding the differentiation between curriculum and pedagogy makes sense, emphasizing that the prescription fits in relation to the knowledge considered important by a given country, and it is up to the teachers to choose methodologies for the development of the classroom work. The resistance to the proposal analyzed is supported by the fact that it has the character of prescription not only regarding the knowledge but methodology as well, what hurts the didactic autonomy of teachers.

Faced with the question that motivated this investigation and the data regarding the teachers' perceptions about the implemented curriculum, we can claim that the proposed curriculum, due to the characteristics presented, provides few conditions to interfere in the reality of Math classes. The conclusions related to the data collected by the research lead us to think that the process of curricular implementation must be guided by other parameters.

It is necessary to consider that the education practiced in schools "[...] results from a curricular version assumed by the teacher individually or by the body of teachers and the school pedagogical team" (Santos, 2014, p. 17-18). For the author, the legitimacy of the curriculum becomes effective by the active and autonomous presence of teachers,

which goes far beyond the curriculum application prescribed by official bodies.

In this sense, the chances that a proposal has to influence the teaching practice are intrinsically related to the teachers' identification with the guidelines resulting from the proposals. Such identification requires a continuous training activity permeated by the collaborative work of the pedagogical staff of the school, through which teachers are encouraged to exercise an authorship role of their practice. We can say that the policies of curricular implantation that disregard such aspects present great chances of being innocuous, a condition that points out to the necessity of a substantive modification in these processes.

Translated by Jeong Cir Déborah Zaduski and proofread by Ananyr Porto Fajardo

Received on April 2, 2018  
Accepted on November 9, 2018

## Notes

- 1 Teachers approved by public tender.
- 2 Teaching that follows the steps advocated by Law N 9394/96, namely, Early Childhood Education, Elementary Education and High School.
- 3 Blank answers (10) and without rationale (4) were not counted for the purposes of analysis.

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