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Knowledge to teach and knowledge for teaching Mathematics present in Brazilian lay teacher education in the 80's: curriculum of the LOGOS Project II

Os saberes a e para ensinar matemática na formação do professor leigo brasileiro na década de 1980: o currículo do projeto LOGOS II

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Abstract

This paper aims to present knowledge to teach and knowledge for teaching Mathematics present in the eight-module project named Didactics of Mathematics of the Logos Project II, which aims at qualifying high school lay teachers who were working in some regions of Brazil. The research was based on Cultural History which mobilized conceptions of Knowledge to Teach and Knowledge for Teaching in Teacher Education by Hofstetter and Schneuwly (2017, 2003); and Valente (2017, 2017a, 2007, 2004). We attempted to answer the following question: What mathematical knowledge and methodological guidelines were conveyed in the Logos Project? There are indications that there was an articulation between knowledge to teach and knowledge for teaching Mathematics in this course. Furthermore, we observed an interplay of three pedagogical trends: modern formalist, technicial and empirical-activist. Apparently, the teachers were in touch with the professional knowledge, enabling them to carry out the task of teaching mathematics.

Keywords: Keywords: Logos Project II; Lay Teachers; Knowledge to Teach; Knowledge for Teaching

Resumo

O objetivo desse texto é apresentar os saberes *a* e *para* ensinar matemática, presentes nos oito módulos de Didática da Matemática do Projeto Logos II que visava habilitar, no nível de 2º Grau, professores leigos que estavam atuando em algumas regiões do Brasil. A pesquisa foi orientada pela História Cultural, mobilizou os conceitos de saberes a e para ensinar de Hofstetter e Schneuwly (2017, 2003); de Valente (2017, 2017a, 2007, 2004). Procuramos responder a seguinte questão: Quais saberes matemáticos e orientações metodológicas foram veiculados no Projeto Logos? Há indícios que nesse curso havia uma articulação entre os saberes *a* e *para*

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ensinar Matemática. Além disso, observamos uma interação de três tendências pedagógicas: formalista moderna, tecnicista e empírico-ativista. Ao que tudo indica, os professores tiveram contato com os saberes profissionais dando condições para realizar a tarefa de ensinar matemática.

Palavras-chave: Projeto Logos II; Professor Leigo; Saberes *a* ensinar; Saberes *para* ensinar.

Introduction

This paper aims to bring the analysis carried out about the contents and pedagogical guidelines for the teaching of Mathematics in the early school years that circulated in the LOGOS Project II, which was elaborated and developed in late 1970's and early 1980's. The LOGOS Project II was destined to train and certify lay teachers who worked mainly in the country's rural schools. But who was this lay teacher? A lay teacher was understood to be one who worked in the teaching of 1st to 4th grades, whose schooling needed to be the, whether complete or not. These teachers often had not even completed their elementary school period (PICANÇO, 1986).

With the changes in the Law n.º 5.692/71, it was necessary for the government to plan some training for the teachers who did not have the necessary school level training, since, according to the Art. 30, it became mandatory "as a minimum training for the exercise of teaching, the completion of the elementary education to teach 1st to 4th grades, a specific high school qualification" (BRAZIL, 1971). In 1975, there were 166,693 teachers who did not have this qualification in the country (ANDRÉ; CANDAU, 1984). As a way of complying with what was established by law, the LOGOS Project I and II were crafted at the national level, in order to promote the training and the certification necessary for these teachers.

This paper has its scope on The LOGOS Project II, and more specifically on the knowledge to teach and knowledge for teaching Mathematics in the initial primary grades, having as its sources, the Didactics of Mathematics collection consisting of eight volumes, which circulated among the course takers during the period of operation. The focus of this guidelines' analysis was raised by the following question: what wast the knowledge to teach and knowledge for teaching[3] Mathematics included in this teacher training course? The answers to this question became the base and data for the curriculum building The LOGOS Project II's teachers at the time.

This research is historical in its nature, for it is necessary to consider the context in which this course was carried out, the materials transmitted and used, the content in these

[3] This notion of *knowledge to teach and knowledge for teaching* used in this paper is related to a "theoretical systematization that has been elaborated by the Swiss group, ERHISE – from the University of Geneva. The knowledge to teach leads us to a whole toolkit that must be mobilized by the future teacher to fulfill their teaching task. Thus, if '*knowledge to teach*' constitute the object of the teaching labor, '*knowledge for teaching*' is translated as a knowledge capable of taking this object, constituting it as teachable, as a knowledge for labor instrument" (VALENTE, 2017, p. 216).

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materials as well as the curriculum was constituted in this teacher training course. Thus, this study is situated in the field of the history of Mathematics Education, for it is configured itself as a documental-exploratory research. According to Valente (2004, p. 81), when considering a

> study that should belong to the field of History of Education, it is worth reaffirming Michel de Certeau on how the production of this history should occur: it takes place through the historian's labor in his task of producing objects, promoting operations with documentation to be transformed into research sources, and submission of its text and control rules by the historian community.

In this study, we had Certeau (1982), Barros (2019), Valente (2017, 2017a, 2007, 2004), Hofstetter and Schneuwly (2017, 2003) and Costa (2013) as theoretical and methodological support.

> Historical facts are constituted from traces, from traces left in the present by the past. Thus, the historian's labor is to work on these traits in order to construct the facts. Thus, a fact is nothing other than the result of an elaboration, of a reasoning, from the marks of the past, according to the rules of a critique (VALENTE, 2007, p.31).

However, "there are no historical facts by nature. They are produced by historians based on their work with sources, [...] which one wants to explain based on answers to previously prepared questions" (VALENTE, 2007, p.32). In this sense, we will present to the reader a characterization of the lay teacher, who participated in The LOGOS Project II and from the mobilized sources, and also the knowledge to teach and knowledge for teaching Mathematics present in the modules of the Didactics of Mathematics.

Lay teacher and The Logos Project II

According to The Free Dictionary online (2021) the word layman means "one who is a nonprofessional in a given field", or even, "a person who does not have specialized or professional knowledge of a subject". From these definitions and considering the specificity of teaching, we can infer that it is not possible to attribute these meanings to the lay teacher, since they have, even with common sense, knowledge about the teaching process.

So, what does it mean to be a lay teacher? For this paper, we consider appropriate two conceptions that, in some way converge to the sense of considering the one who develops a teaching process. According to Picanço, the lay teacher

> is the so-called untitled teacher. Strictly speaking, the origin of the expression "lay teacher" is not known by many and it is assumed to be related to the secular education as opposed to the religious one and/or to the freedom to exercise teaching consecrated in the country by the normative school education legislation for a long time (1986, p. 9).

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According to the author, in 1982, most lay teachers – 55.7% – were in rural areas, that is, "in good measure, the lay teacher is, among us, the rural teacher. As in other professional sectors, rural areas are obliged to accept unqualified agents for longer" (BRANDÃO, 1986, p.14).

The lay teacher was a teacher who had not even completed elementary school and with no professional training. However, he was sensitive to the relationship between school culture and local culture due to his own experience (BRANDÃO, 1986). Most of these lay teachers were women, aged between 20 and 60 who had a large number of children, for they had a four-shift day, as they carried out housework, teaching, administrative activities at the school and also agricultural activities and, in addition to it all, they had low wages (STAHL, 1986, p. 20).

According to Brandão (1986) the lay teacher is a part of the teaching staff, usually state and municipal workers, whose salaries are lower and they do not enjoy the same labor rights as those who have formal schooling for teaching as for instance in the case of entering and advancing the teaching career.

The Logos Project II took place in 19 locations in Brazil, aiming at qualification and certification for the lay teachers' high school teaching certificate. The project was carried out in distance learning with instructional modules, linked to the Department of Adult/Continuing Education which actions involved the Ministry and the Secretary of Education and Culture, as well as the City Halls. It "was instituted due to the problems of the teacher training course for it was diagnosed, in 1972, about 150/200 thousand lay teachers [...] were teaching teaching 1st to 4th grades (COSTA, 2013, p. 170).

The requirements to take part in the course were:

> 1) to be 19 years old at the time of registration; 2) to be a non-qualified teacher from the state, municipal and/or private educational chains; 3) to be the 1st-to-4th-class-regent teacher from the initial primary grades; 4) to hold at least a 4th-to-8th elementary certificate. (DIÁRIO DO PARANÁ, 1980, p.4).

Teachers had "1,330 hours of study for General Education subjects and 2,150 hours for Special Training related to curricular subjects within a 30-month theoretical program." (NISKELER, 1978, p.9). Although there was an estimate of time, the participants could study at their own learning pace and keep the teaching. One of the positive aspects of the project was the possibility of immediate application in the classroom of what was being studied.

The criticism leveled against the The Logos Project II is due to the "imposition of packages from Federal Agencies, generally with no considering local and regional needs or development experiences" (STAHL, 1986, p. 21).

For, unlike what The Logos Project II proposal brought, the teacher training should

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> to provide the teacher with the knowledge of his own person and that of others, leading one to trust his vital experience, helping him to incorporate the ideas collected in other fields [...] to encourage spontaneous expression and fluency, to feed the imaginative faculty, to sharpen curiosity (STAHL, 1986, p. 20).

In keeping with the author, the teacher sharpening would have as its principle:

> to be tuned to the reality: personal and professional expectations of the lay teachers, considering their experience, leading them to face theory with their own practice. Critical reflection on their own work is the most appropriate way to make teachers more aware of their responsibilities and limitations in the educational process. (STAHL, 1986, p. 21).

Everything indicates that The Logos Project II did not meet all these requirements, since the modules were the same for all regions of Brazil which applied. In other words, the working context was totally disregarded. What could have changed the situation would be the possibility of giving voice to these lay teachers in the elaboration of the programs as they could contribute, indicate and point out what their real needs were.

Another point is that the government should have considered proposing conditions to study the modules independently to the teachers who were low-leveled readers and writers during their training process (STAHL, 1986). Furthermore, the teachers' training course could not be understood as a quick solution to contemplate a legal aspect of teaching but a training that would lead its participant to appropriate the knowledge to teach and the one for teaching in teacher training professionalization. Dialectically, with the implementation of The Logos Project II, many teachers considered lay people had access to professional teaching knowledge and, in some cases, access to cultural elements beyond their context and, in this sense, appropriation of knowledge necessary for the teacher's performance.

Professional knowledge in lay teacher training

Before indicating the professional knowledge present in the Mathematics Didactics of The Logos Project II, it is necessary to conceptualize knowledge *to teach* and knowledge *for teaching* Mathematics for this is the bias on which we will analyze Project itself. According to studies by Hofstetter and Schneuwly, (2017, p. 131-132) the concept of these two types of knowledge is:

> knowledge to teach, that is, the knowledge that is the object of the labor itself and the knowledge for teaching, in other words, the knowledge that is the tools of their labor. [...] What at a glance seems simple, is, however, more complicated. "Knowledge" should first be understood in a broad sense that encompasses (mathematical knowledge, literary knowledge, historical knowledge) and know-how ("know how to swim", "know how to write" or even "know how to teach").

Throughout our research we analyzed how this teacher training course contemplated mathematical knowledge. According to Pinto and Novaes (2018, p.142),

> only the mastery of the contents to be taught is not enough for the teaching professional. To teach them, other kinds of knowledge are needed, considered

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> indispensable for the exercise of teaching, knowledge to teach, the teacher's work tools.

What was most important in The Logos Project II? Which kind of knowledge took up more space in the modules? We understand that, in any teacher training course, it is essential that both types of knowledge are covered. According to Valente et al. (2017, p. 227) there is a difference between the terms knowledge and know-how for the first relates to "the experiences lived by the subject" and the second "historically institutionalized cultural product whose purpose is the systematization and organization of certain knowledge".

Knowledge is also produced where the teacher training course takes place and some other several boards responsible for education (HOFSTETTER; SCHNEUWLY, 2003). During this paper's research, it was possible to identify which were the theoretical references used to elaborate the Didactics of Mathematics modules and which portions of knowledge to teach and portions of knowledge for teaching Mathematics were present in each module. The studies by Costa (2013) identified vestiges and remnants of the Modern Mathematics Movement in this project.

> The movement, inserted and developed in Brazil, produced a symbiosis between the ideas brought from other countries, which elaborated and disseminated the renewal in ways of teaching Mathematics. In Brazil's case, the influences came predominantly from the United States along with some ideas of Brazilian educators who were the protagonists of the insertion process and development of the Modern Mathematics Movement in Brazil. In accordance with that, we can observe variations regarding the concept of modernization, sometimes centered on content, sometimes focused on methods, didactic manuals or manipulative materials (COSTA, 2013, p. 30-31)

The discussion about where to place the portions of knowledge in teacher training processes is already the focus of several investigations because some of these processes have prioritized specific content, which brings some some difficulty in teaching to the teacher for theses processes "are the building blocks for teaching, which constitute a set of didactic and pedagogical elements necessary for teaching, which do not focus only on material resources, but encompass knowledge of how the student learns and the relationship between teaching and learning (FRANÇA , 2017, p. 42-43). In accordance with studies by Valente (2017a, p. 226), in teacher training courses, knowledge to teach and knowledge for teaching Mathematics underwent changes. He states that Mathematics *to be* taught is relevant in teachers training, however, the nature of teaching "is more closely affiliated with the knowledge to teach mathematics".

In this paper, we analyzed sources referring to the eight modules of Didactics of Mathematics with them having summary and script with the following content: theme, prerequisite, probable duration, goal, pre-assessment, objectives, teaching activities, post-assessment and supplementary activities. The manuals were printed by Minas Gráfica Editora Ltda., in the city of Belo Horizonte – MG. The cover was pink and had an image of children

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sitting with books in their hands. The photo was from the MEC photographic archive, as shown in Figure 1.

Figure 1 – Module cover

Source: Brasil, 1981d

The Logos Project II

The eight modules analyzed were developed by: Ione Ferraz Haeser[4], Neusa Stumpf Lessa[5], Maria Antonieta Jordão Emerenciano Berrondo[6] in collaboration with the Technical Team of the Centro de Ensino Técnico de Brasília – CETEB, a private enterprise that was responsible for the distribution logistics of materia

The knowledge to teach and knowledge for teaching Mathematics was presented in texts, with examples and concepts, followed by exercises to verify the student's learning. In some modules, there were suggestions for activities to be applied in the classroom. The contents studied were: readiness[7] and its meaning; study of sets; reading and writing of numerals; the fundamental facts of addition and subtraction; the addition and subtraction algorithms; numbering system; the four operations; fractions, measurement system; geometric figures; decimal numbers; multiples, divisors, prime numbers and geometry.

During the analytical process, we identified that one of the teachers' goals was to understand that the student, upon arriving at school, brought with him experiences related to

[4] She was appointed to exercise, on a provisional basis, the role of Pedagogical Director of the Centro Educacional Politécnico de Brasilia.
[5] In this search it was not possible to find information on Neusa Stumpf Lessa.
[6] He held the position in the Advisory Committee of the Educational Planning Department of the Federal District Education Department in 1990 (DIÁRIO OFICIAL, 1990).
[7] "READINESS means that the student is ready or mature enough to learn a certain concept, that is, he/she successfully performs tasks required to acquire this concept." (BRAZIL, 1981, p.4)

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Mathematics and that the teacher should verify if such student was mature enough to learn a certain concept. Teacher and student should be prepared because learning did not depend only on the student, but on the teacher's preparation. Here lies a paradox because it considers the reality and context of the student and the knowledge that he already has, but that does not apply to the established training process that does not start from the reality of lay teachers.

Thus, in the first module analyzed, the teacher was instructed to observe his students in the following factors: physical, socioemotional and intellectual in the justification that all these factors would contribute to the learning of Mathematics. There was also a diagnostic test model for the teacher to identify the knowledge that students already had in relation to: discrimination, reproduction of images of shapes, serialization, classification, correspondence, conservation of quantity, knowledge of numerals and fractions and their readiness to solve mathematical problems. This perspective was close, at that moment, to the idea of carrying out the diagnostic evaluation that according to Sant'Anna (2014, p.32) “aims to determine the presence or absence of knowledge and skills, including seeking to detect prerequisites for new experiences of learning." Knowing how children think, how they solve questions, can contribute to teaching planning because, based on the results, the teacher can “develop potentially rich activities or materials that lead students to learn playfully and discover Mathematics from experimental activities or problems” (FIORENTINI, 1995, p. 12).

The teaching Set Theory would allow the student to develop concrete activities, which would lead to abstraction and generalization. In the 1st grade, the work touch intuitive notions and in the 2nd grade, abstraction. Emphasis was given to the fact that the teacher should not offer ready answers to the students, but make them reflect through questions so that they could rediscover the concepts. The activities should be varied, with different materials[8], giving students the opportunity to participate. Gradually, the teacher should expand their knowledge. The Set Theory, according to the material, would allow students to develop concrete activities, which would lead them to abstraction and generalization (BRASIL, 1981c).

When teaching the reading and writing of numerals, the teacher was advised not to start in the natural order, but, for example, to start with the number three. Only after the idea of the number was well fixed should the teacher represent the writing of the numeral. Some techniques were suggested, such as: observing the trace, running your finger over the numeral cut in sandpaper and passing the pencil over the numeral. To teach the decimal number system and the four operations, it was suggested that the teacher use materials such as: abacus, place-value box, numbered line, pleat board, etc. Only after working with the concrete material, should they work with various exercises. Addition and subtraction operations could not be taught in isolation.

[8] During the analysis of the modules, the use of concrete, semi-concrete and unstructured materials were mentioned.

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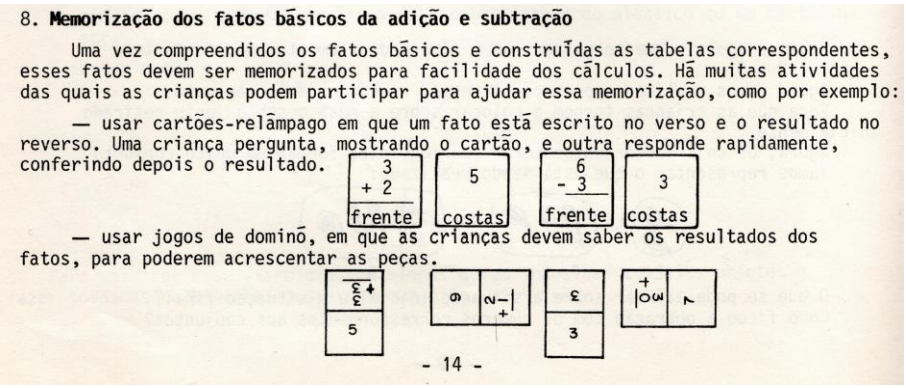
According to Santos et al. (2013 p.13), "the concrete material develops the students's reasoning, stimulates logical-mathematical thinking and makes them learn without psychological pressure." For this reason, so much emphasis was placed on the use of concrete material that was often collected by students, such as: pebbles, Popsicle sticks, bottle caps, seeds, tree leaves, among others. These would help the child until he reached abstraction. It is interesting to observe that the teaching of Mathematics was not only focused classroom. There were suggestions for the teacher to leave the classroom and beyond the walls of the school.

In the 2nd grade, Mathematics should be more abstract. The student would only use pencil and paper, but could use concrete material if necessary. The 3rd grade's activities should involve a greater degree of abstraction, using other resources, such as activities that involved the use of flash cards and dominoes, as shown in Figure 2.

Figure 2 – Activity suggestion



8. **Memorização dos fatos básicos da adição e subtração**

Uma vez compreendidos os fatos básicos e construídas as tabelas correspondentes, esses fatos devem ser memorizados para facilidade dos cálculos. Há muitas atividades das quais as crianças podem participar para ajudar essa memorização, como por exemplo:

— usar cartões-relâmpago em que um fato está escrito no verso e o resultado no reverso. Uma criança pergunta, mostrando o cartão, e outra responde rapidamente, conferindo depois o resultado. 3 + 2 / frente — 5 / costas — 6 - 3 / frente — 3 / costas

— usar jogos de dominó, em que as crianças devem saber os resultados dos fatos, para poderem acrescentar as peças.

- 14 -

Source: Brasil, 1984d

To teach operations, the teacher should always start with a problem situation and gradually grade the difficulties – taking care not to present two or more difficulties at the same time then the teacher was recommended to use examples of graduated calculations[9], which should encourage students to use the crease board whenever possible for when they felt secure, they would let it go. In this way, we observe that it is not up to the teacher to withdraw a resource from the class because he thinks it is the appropriate time. It is the student who must signal that he is ready to carry out the activities without the concrete material:

> [...] it is important for the teacher to make a correlation between the two domains involved, that of the material (concrete) and that of representations (symbolic-

[9] The graduated calculations provided for the study of arithmetic in stages, that is, gradually presenting the situations involving numbers and quantities for each operation. The child goes from the cases of addition and subtraction without reservation, and gradually, advancing to the difficult cases. "Whenever the teacher passes a series of accounts for fixing the facts and mastering the mechanism of the operation, he should orally present two or three of these accounts in a problem situation, in order to lead the child to master, in parallel, the meaning" (PARANÁ, 1965, p. 108)

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> abstract), to make sure that the students understand well the relationships between aspects of the two domains (NOGUEIRA; ANDRADE and PAVANELLO, 2009 p.71 apud MINTO, 2013, s/p).

The guidelines contained in the Mathematics Didactics material emphasized that the teacher should allow students to use the manipulative material. In this sense, we identified an approximation of what the material presented with the official guidelines for teaching mathematics at the time:

> However, it is very important that you let them use this material because, by manipulating it, they will organize their thinking and expand their vocabulary. Thus, mental images are formed, leading the student, little by little, to abstraction. This always happens when a new notion is presented; the notion is introduced with concrete material and, after carrying out several exercises, the student will be able to abstract (BRASIL, 1981a, p. 13-14).

It is worth remembering that "no didactic material – manipulable or otherwise – is the salvation for the improvement of Mathematics teaching and to emphasize that its effectiveness or not, will depend on the way it is used (NACARATO, 2005, p. 5).

For the teaching of measurements to be meaningful, the teacher should take advantage of the school's physical structure, estimating measurements of the rooms, patios, windows, etc. The teacher should also present measuring instruments and demonstrate how each of them was used and, whenever possible, make the study of measurements practical, such as magnitudes and measures of capacity, time and value. Concerning the monetary system, it was suggested that the teacher take fake bills and coins to the classroom to do oral activities. In addition, the use of games[10], ies1 was suggested, including problem-situation dramatization. All these activities aimed to develop the children's reasoning.

For the fraction teaching, it was initially oriented to work with concrete and semi-concrete material and then move on to abstraction. Regarding the use of the material, there was the following guidance:

> When proposing activities about fractions, you should be concerned with helping the child to detach himself from the physical characteristics of the material used, taking care to prevent students from associating the concept of fraction to very particular cases. To do so, you should always vary the graphic representations, using circles, rectangles, rhombuses, triangles, etc., divided into different shapes (BRASIL, 1981c, p. 6).

The course-participant teacher should request the child's active participation[11]. Teaching fractions should be carried out through representation on the board, questions and exercises to establish this content. The guidelines emphasized the resources to be used by the teacher as observed before. Indications for posters using and their exposure in the classroom, always according to the student's point of view and the information on the content they were studying, were also used, as we can see in the example of Figure 3.

[10] Bank teller, simulating deposit and withdrawal and grocery store, involving purchases with change.

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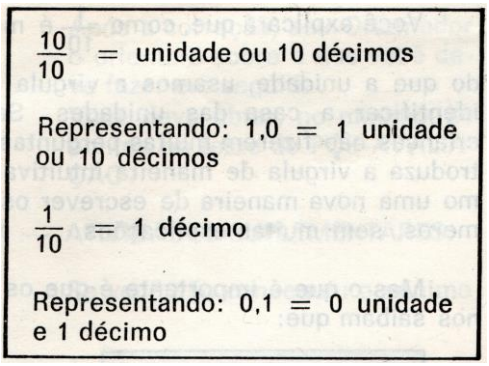
Figure 3 - Poster with representation of fractions



Source: Brasil, 1981b

The teaching of multiples, divisors and prime numbers suitable for 4th grade students. Before starting teaching, the teacher was instructed to do a survey for if the children were not confident in the multiplication and division operations, they would not be able to learn this content. Hence we understand why the first module addresses the issue of readiness. Students could only learn a new concept if they were prepared. The teaching of geometry followed the same guidelines: it should happen through dialogue, research, presentation of objects, posters, questions, various activities involving problem situations, activities on paper, on the board and in the notebook.

Regarding the theoretical framework used for elaborating the modules, we observed that the most used work was *A Matemática na Escola Primária Moderna* by Norma Cunha Ozório[11] and Rizza de Araújo Porto[12]. When identifying the knowledge to be taught related to Set Theory, we inferred that there were indications of the Modern Mathematics Movement (MMM) in the modules of Didactics of Mathematics, considering the presence in the materials of the study of sets and emphasis on symbology.

According to Fiorentini (1995, p.4)

> Behind each teaching technique, there is a particular conception of learning, teaching, Mathematics and Education. Teaching styles is also influenced by the values and purposes that the teacher attributes to the teaching of mathematics, the way he conceives the teacher-student relationship and, in addition, the vision he has of the world, society and man.

The analyzed modules are full of values, worldviews and concepts that the authors believed to be ideal for the teaching and learning process. Apparently, there are traces of three trends in the process carried out for the training of lay teachers through The Logos Project II

[11] She graduated as a primary teacher at Escola Normal Carmela Dutra and in Pedagogy at the Faculty of Philosophy, Sciences and Letters of Rio de Janeiro – FNFi. She has an extensive professional trajectory in teacher training. (BATISTA et al., 2016, p. 87)

[12] She was a member of the faculty of the Instituto de Educação de Minas Gerais [...], she was the main member of the Department of Arithmetic", she was the author of books and articles. (BATISTA et al., 2016, p. 88)

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One of them is the empirical-activist method. In the curriculum, there was a concern with the biological and psychological development of the student, some activities were grouped and the students had contact with manipulative materials. The discovery method was also present: the teacher should propose activities that allow discovery, use concrete material, use symbolic representation, take advantage of classroom situations, etc. One of the characteristics of this trend is that the "student learns by doing" and "seeks to value the learning processes and involve students in activities" (FIORENTINI, 1995, p. 11-12). The other trend is the modern formalism method. In it we identify traces of the MMM due to the presence of Set Theory, the excessive use of symbolic mathematical language and the representation of mathematical situations through diagrams as a way of representing mathematical situations. We also identified the technicist teaching tendency due to "the way of conceiving the organization of the teaching-learning process" because, during the analysis, we observed that the contents were "arranged in sequential steps in the form of programmed instruction", in which the students and the student himself student should perform a series of exercises" (FIORENTINI, 1995, p. 16).

In addition to these three trends, there are indications that the authors of the modules contemplated the knowledge to teach and knowledge for teaching Mathematics, since in this analysis, we were able to "capture methods, didactics, pedagogical guidelines that can be read as part of the movement of constitution of knowledge to teach and knowledge to teach" (BERTINI; MORAES; VALENTE, 2017, p. 21).

Final considerations

Regarding the knowledge to teach, the contents worked in the Mathematics Didactics modules of The Logos Project II followed a sequence that began with the Set Theory, introduction to the concept of number, the four operations, decimals, fractions, measures, prime numbers, least common multiple and greatest common divisor, notions of geometry and monetary system. We identified the close relationship between the knowledge to teach and knowledge for teaching Mathematics, as concepts and guidelines on how to teach were presented, always with examples and suggestions for exercises. The authors who developed the modules did not present just one way of teaching, as we observed the presence of various resources, use of the board, posters, questions, varied activities, dramatizations, etc.

Therefore, from the perspective of The Logos Project II, there is an articulation between the knowledge to teach and knowledge for teaching Mathematics, that is, a convergence between these two dimensions that was observed when the contents were presented together with the methodological guidelines because in The Logos Project II, there was an integration between mathematical content and guidelines on how to make this knowledge teachable. Thus, in this course, the lay teacher learned the content and how to teach it at the same time.

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Furthermore, we identified an interaction of didactic tendencies in mathematics education: the modern formalism method, the technicist teaching tendency and the empirical-activist method. The identification of the first is due to the traces of the Modern Mathematics Movement, referring to the content of Set Theory, the theoretical framework used and the way in which the contents were presented. The second, technicist, due to the theoretical and methodological references used in the construction and orientation of the curriculum of the 1st grade education and finally, the empirical-activist method due to the form and ways in which the contents should be presented to the students, that is, using concrete materials to represent mathematical situations that were related to the student's life and daily life.

The outstanding vestige of the ideals of modernization of the teaching of Mathematics, the Theory of Set, was the beginning of the pedagogical foundation present in the material. The guidelines also indicated the use of concrete material, reinforcing the need for manipulation by the child as a way of stimulating observation, representation and verbalization. What is important to emphasize is that, even at the end of the period of effervescence of ideas related to the Modern Mathematics Movement, its concepts and knowledge were still part of the training of lay teachers. The insertion of symbology was remarkable and always present in the materials of the LOGOS II Project.

The material, from our stand point, in addition to the methodological aspects involved in the teaching process, also brought the content to be taught. Thus, we realized that the guidelines were concerned with both methodological processes and mathematical knowledge. The intention was to train the lay teacher in the pedagogical dimension and in the specific content of Mathematics. Still, in relation to the knowledge to teach, we identified a concern in relation to the physical, socioemotional and intellectual aspects of the students. These aspects and the activities proposed in these areas required habits of order, reflection and mental and physical agility, thus contributing to mathematical learning. Also, during teaching, the teacher should use different materials, and the student should first work with concrete material, and then use pencil and paper. Also, there was guidance that the material should be available for the student to handle, if he had difficulty performing the calculations abstractly.

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