

**CONTENT AND FORM IN TRAINING ACTIVITIES OF TEACHERS OF
MATHEMATICS IN INITIAL GRADES**
CONTEÚDO E FORMA NA ATIVIDADE DE FORMAÇÃO DO PROFESSOR QUE
ENSINA MATEMÁTICA NOS ANOS INICIAIS

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ABSTRACT

This article is part of a doctoral research that investigates the content and form of the training activity of the teacher of mathematics in the early years of elementary school. This study is supported by the principles of historical-cultural theory, focusing on the activity theory and on Vygotsky's method. In the evidence found in the teaching planning and organization, both elements, content and form, are taken from the perspective of Kopnin's dialectic, and in line with Leontiev's concept of activity. The continuing training work that comprised the actions discussed was developed by the researcher, with a group of full time teachers of a municipal school in the city of Campo Grande / MS, during the years 2013 and 2014. From the singular case of one of the participating teachers, the data show that, when taking scientific knowledge as the content of teacher training activities, aiming at the development of her/his theoretical thought, the performed actions – in view of the mastering of new meanings about of organization of mathematics teaching – may lead to changes in the content and, consequently, in the form of the educational activity.

Keywords: Content and form of the training activity. Mathematics teaching organization. Activity theory.

RESUMO

Este artigo é referenciado em uma pesquisa de doutorado, em que se investiga o conteúdo e a forma da atividade de formação do professor, que ensina Matemática nos anos iniciais do Ensino Fundamental. Os princípios teórico-metodológicos da teoria histórico-cultural, com enfoque na teoria da atividade e no método em Vigotski, fundamentam esta pesquisa. Nas evidências emergentes das atividades de planejamento e organização do ensino, os elementos conteúdo e forma são tomados na perspectiva da dialética em Kopnin e em consonância com o conceito de atividade em Leontiev. O trabalho de formação contínua, que abarcou as ações em pauta, foi desenvolvido pela pesquisadora durante os anos de 2013 e 2014, junto a um grupo professores de uma

escola municipal, em tempo integral, no município de Campo Grande/MS. Os dados analisados, a partir do caso singular de uma das professoras participantes, revelam que ao se tomar o conhecimento científico como conteúdo da atividade de formação do professor, objetivando o desenvolvimento de seu pensamento teórico, as ações realizadas – visando à apropriação de novas significações acerca da organização do ensino de Matemática – propiciam que ocorram mudanças no conteúdo e, conseqüentemente, na forma da atividade de ensino.

Palavras-chave: Conteúdo e forma. Atividade de formação do professor. Organização do ensino de Matemática. Teoria da Atividade. Anos iniciais do Ensino Fundamental.

1. Introduction

The processes of continuing training, intensified in Brazil in the nineties, especially those addressed to teachers of basic education, have proved insufficient to raise the achievement levels of elementary students, or even to play the role of complementing the initial training process, as expected by some sectors responsible for these processes.

The analyses of the general framework that interfere in the current policies for continuous teacher training developed in Gatti and Barreto's research (2009) show that, in general, these formations – both the programs developed by the federal government and the proposals organized by local education departments – have contributed little to significant changes in teaching and learning processes.

Also in this field, on discussing the 20th century legacy to the training of teachers, Martins (2010) draws attention to the organization mode of most teacher training processes, which focuses on form to the detriment of content, overvaluing the technical dimensions of teaching practice at the expense of their own grounds, as if mastering teaching methodologies were enough for teachers.

Such findings suggest that we rethink the continuing teacher training from a theoretical and methodological framework that considers the educational activity, the object of teacher work, from the concept of activity proposed by Leontiev (1983, 2004), fundamental to understanding the work of the teacher in the capacity of a subject in the act of teaching.

The activity theory, based on the principles of historical-cultural theory, has therefore brought important contributions that make us rethink the role of education in human development, with special attention to school education, hence the training of teachers.

In this sense, the training processes should enable the teachers to take up training activity so that they can get both the knowledge of the content to be taught and the forms of teaching organization. The training processes should also support the access of teachers to the knowledge of educational space and provide involvement in constant search of the knowledge supporting the education organization and the implementation of an educational project proposed by the school community (Moura, 1996).

As a proposal, the historical-cultural theory directed our purpose to observe and discuss the formats of the teachers' teaching activities in a training movement, and the possible pathways that allow them to access the new meanings in such context. This was the collection field of our doctoral research, from which a singular case will be presented in this article.

2. Training activity and development of the teacher's theoretical thinking

According to Leontiev's studies (1983, 2004), the activity of the subject comes from an object-oriented need, which generates a motive that drives the subject to act, through actions and operations, with a view to a certain goal. Based on this understanding, a formative movement that aims to consolidate as a training activity demands organizational structures that make the teachers "enter into activity".

When considering the teachers' needs related to their teaching activity, which consists of the students' learning, the continuing training process can take modes of organization conceived from the activity structure created from motive-generating situations, leading them to act collectively with actions and transactions involving study, planning and evaluation of the classroom work.

The proposed actions should then be planned in order to supply teachers with the articulation of theoretical concepts specific to the training field concerning methodological aspects, considering the approaches with the object of knowledge aimed at teaching activity in various aspects of their theoretical and practical organization.

The objective of this doctoral research was to investigate the content and form of the training activity of the professional who teaches mathematics in the first years of elementary school. The work was conducted with a group of teachers and coordinators responsible for the 1st to 5th grade of elementary school in a public full-time school in Campo Grande / MS.

The school is set up as a teacher's learning space, in the meaning proposed by Cedro and Moura (2007, p.2), "as the place where the learning of the subjects is guided by the intentional action of those who teach." A process that we will call formative movement was held in the school from the second half of 2013 until the end of 2014, with the participation of sixteen teachers and three coordinators who worked in the aforementioned groups.

This formative movement, aimed at becoming a training activity, led to the discussion of issues related to mathematical knowledge itself, analysis of the participants' pedagogical practices, collective planning of educational activities to be developed, in addition to experience sharing.

The assumptions of the historical-cultural theory – and consequently the principles of dialectical historical materialism – were starting and arrival points, from the developed actions undertaken to data analysis. In the development of our research, we also

considered the need to study the movement phenomenon, advocated by Vygotsky (1995).

With this point in view, we have tried to direct our attention to the actions developed by the teachers during the training process. Our purpose was to grasp possible changes in the content and form of their teaching activity, in the route established by the group in training, referenced in the concept of Teaching-Orienteering Activity (Atividade Orientadora de Ensino – AOE) (Moura, 1996, 2002).

The teaching-orienteeing activity maintains the elements of the activity structure (need, motives, objectives, actions and operations), mediating the theoretical and practical dimensions of the activity of teacher and student, and can thus trigger the formation of both. In constituting a general way of teaching organization, AOE's main content is the theoretical knowledge and its object is the establishment of the individual's theoretical thought (Moura, Araujo, Ribeiro, Panossian & Moretti, 2010).

On making reference to the actions developed in the training movement, in an AOE, we consider its principles as a theoretical and methodological guidance to organize education, particularly regarding the sharing of developed actions and the intention of teaching activity.

It is worth enhancing that the existence of a learning-triggering situation, the essence of the concept as the core of the formation of theoretical thinking, the mediation as a precondition for the development of the activity, and the collective work as context of production and legitimation of knowledge are also, as defended by Moraes and Moura (2009), principles of AOE. All these elements, when considered in the organization of educational actions, enable the students to grasp theoretical knowledge and the teacher to develop her/himself.

In the process in which the research object of this narrative develops, we understand each other as researchers in search of possible solutions to problems faced by teachers in the school, contributing, through a mediating action, researcher-knowledge-teachers, to the development of the teacher's theoretical thinking and to a human development-driven school education.

The theoretical thinking understood here is based on Davidov's studies (1982, 1988), who, when considering the differences between the processes of formation of spontaneous concepts and scientific concepts, analyzes the development of two types of thinking: empirical and theoretical.

According to the author, the empirical thinking "is constituted as a transformed and verbally expressed form of activity of the sense organs, connected with real life; it is directly derived from the people's object-sensory activity" (Davidov, 1988, p. 123, free translation). The content of theoretical thinking, on the other hand, is the mediated, reflected and essential existence, and consists of "a process of idealization of one of the aspects of object-practical activity, the reproduction that represents the universal forms of objects" (Davidov, 1988, p. 125, free translation).

For Kopnin (1978, pp.152-153), "both empirical and theoretical aspects are levels of the movement of thought." He believes that it is only at the theoretical level that

"knowledge assumes truly universal character and seeks to produce truth in all the concreteness and objectivity of its content." Thus, considering the content/ form dialectic, it is the development of theoretical thinking that allows the development of higher psychological functions in its full potential. Such a task is in charge of the school and, therefore, is a content of teaching activity.

3. The content/form dialectic in the teaching activity

In many educational studies, when discussing the teacher's activity, references are made to aspects of its content and form. But what do content and form mean? What relationships can be established among content, form and the teacher's activity?

In everyday language, content is often understood as "what is", whereas form refers to "how" a certain thing "is". We also find the idea of content linked to the specific knowledge of a particular area and form, associated with methodological and/or didactic aspects. However, if we consider content and form as philosophical categories, having the Marxist philosophy as reference, these discussions need expanding because, as argued by Rosental and Straks (1960, p. 8, free translation), "each philosophical category synthesizes aspects and connections of phenomena, the moments of movement of the objective world, inherent in every object, every process, whatever the field of nature or society to which they correspond."

Thus, when dealing with content and form, it is necessary to deepen the discussion, considering them as a dialectical unity, since "[...] there is neither phenomenon nor form without content; each form has a content, each content, a form; therefore content and form always exist in indissoluble connection"(Cheptulin, 1982, p. 287).

Content and form, then, must be understood as categories that, along with others – concrete/abstract, quantity/quality, cause/effect, essence/phenomenon, singular/particular/universal– reflect the universal laws of functioning and development of practical activity, serving as a fulcrum of the knowledge process (Cheptulin, 1982; Rosental & Straks, 1960).

In this context, as explained by Rosental and Straks (1960), we understand that,

[...] content is the internal aspect of the objects. This aspect represents a set of elements and processes that are the foundation of existence and development of things. Form is the organization, the content structuring. In phenomena, which belong to the sphere of knowledge, form is the expression of content. (p.197, free translation)

However, being form the expression of content does not mean that it is superficial or external to it, imposed from outside the object and/or phenomenon. Form is not limited to external manifestation, for internally it is also attached to content, "content and form penetrate each other; content has a form, and form has a content"(Rosental & Straks, 1960, p. 199).

Thus it is important to enhance, as discussed by the authors mentioned above, that the content and form relationship is not something immutable, fixed. Rather, content can be converted into form, and form in content according to the mutual relations between the phenomena. For example, pyramids, prisms, cubes, cones etc. are forms of material things; however, in the condition of scientific study of objects, they are converted into part of the Geometry content.

Similarly, when we think about the teacher's organization of teaching, it may be the form of teaching activity, but can also be its content, if considered as an object in a training activity. Thus, on looking into the content and form of the teacher's activity, whether teaching or training doings, it is not possible to analyze them separately, in isolation. As said before, content and form constitute a dialectical, always moving, unity.

Another aspect to be considered in the content/form dialectical relationship refers to the law that content determines form, i.e. content is crucial in the content-form relation, so that form appears and changes in response to content modification (Cheptulin, 1982).

In Fischer's words (1976),

The form is the manifestation of a state of equilibrium reached at a given time. The characteristics inherent in content are movement and transformation. We can, therefore, although it constitutes, without doubt, a simplification, define form as conservative and content as revolutionary. (p. 143)

Keeping this in mind, if we aim at changes in the form of the teacher's teaching activity it is necessary to first provoke changes in its content. It is only "because of the accumulation of quantitative changes in content, [that] there will be, sooner or later, a change in form, which is accompanied by the transformation of the material forming into a qualitatively new state"(Cheptulin, 1982, p. 348).

4. Changes in the content and form of the teacher's educational activity

On considering that development occurs because of the change in content (Kopnin, 1978), and that the content of teaching activity is the theoretical knowledge of the foundations of teaching organization (Bernardes, 2006), we analyze, through a singular case of one of the participating teachers, the new formats that her teaching activity takes from the training movement developed, designed as a training activity.

It is important to enhance that changes in the content and form of this teacher's educational activity were shown, throughout our research, by the changes in the content and form of their actions.

For this analysis, we highlight some reflections of the teacher, identified as P4A, taken from dialogues held throughout the formative movement.

It is important to note that Teacher P4A's speeches in this article are related to the work of the teachers of the 4th grade of elementary school, during the second term of 2014, from the game "The Snail of the Rest". The teachers of the 4th grade, at the end of the 1st term of 2014, pointed out the difficulty that many of their students had in understanding the division algorithm. In our meetings, during the planning time, we discussed the issue and proposed the planning of an educational activity to be developed with students of the 4th grade.

For planning this activity, the game was chosen as a triggering situation. Some studies on teaching and learning division and its algorithm were also carried out. The collective planning of actions was held for the 4th grade teacher group in partnership with the researcher.

While performing these actions, prior to the classroom work, the study about teaching and learning division and its algorithm was pivotal in the planning of the teaching activity. We believe, throughout the formative movement, that,

Knowledge is necessary for man to take up practical action, it must lead to this action, to convert into it. And in order to act successfully on the basis of knowledge, man must be convinced of the truth of knowledge and of the truth of the plan of his practical action. The man who undertakes a practical action without believing in the truth of the idea that he intends to accomplish in life, lacks will, clarity of objectives and emotional motivation, so necessary for the successful accomplishment of the action. (Kopnin, 1978, p. 347)

Thus, for the teachers to be able to organize their teaching activity, to plan actions in order to allow the students to learn the concept of division, specifically the understanding of its algorithm, it was necessary for them to master knowledge about the very object of their teaching.

So that the appropriate knowledge, as stated in the previous quote, may guide the teachers' action, they must be convinced of its truth. Therefore, the development of the planned educational activity and its subsequent evaluation, performed with the group of 4th grade teachers, were actions that have triggered changes in the content and form of the teaching activity. This is shown by the dialogue between Teacher P4A and the researcher in one of the meetings, held in October 2014, in which we evaluate the work done with students.

Though extensive, the dialogue will be presented in full because it is in the whole discussion that we can notice the movement of change in content and form of Teacher P4's teaching activity.

P4A [on commenting on her attitude to the issues that were being discussed from the work developed in the classroom]: But it's funny, I started to get more involved too, to better understand, I think, as it was being explained. Because usually, often, at the moment, it is kind of confusing for you to understand, isn't it? In the training [offered by the municipal education], isn't it? I do not know if the time is not enough, or if there are too many things [...] Then, after you see it again, you will read, will reflect ... It's linked to what you've said [referring to

the researcher]. *Then, you start building something else here too* [referring to the classroom work], you feel like ... I felt like taking the master degree [masters in mathematics education], but then I said: no, I won't ... [laughs]

[...]

Researcher: [...] because you spoke like this: "I have already heard that, but I heard there in the training [offered by the municipal secretary of education], but I had not paid attention, so we resume, discuss again," isn't it?

P4A [referring to the work done with the game "Snail of the rest", with a look at the mistakes made by her students on performing the division algorithm]: Yes, and there was even a moment when I thought: yes, it's wrong, he missed it, he did make a mistake. But then I had to go back, folks, he did not miss much, look, he thought so. Then even the student becomes more excited. [...] He realizes that he thought something different, that there was something different. He then says: "I didn't miss it, I just thought differently."

Researcher: I remember a meeting of ours, some time ago, when you were stressed about the American process [unconventional division algorithm], remember? You said: "I no longer stand these kids that way, I don't want this division, anymore." [laughs]

P4A: *I've changed my mind ever since.*

Researcher: Yeah, I remember you were very upset. You used to look at it and say: "Look, he does make a mistake, it doesn't work." But when you realize and see that he just thought ...

P4A: Differently. He had different thought. It's true. But, he is confused because he understood [...] but it is still confusing, it isn't decided on his mind yet. For example, this same kid, Lúcio [referring to one of her students], began... When I asked him: Do the exercise by yourself, I want to see. Lúcio started dividing the units, then everybody [other students in the class], said, "Lúcio, it's not possible for you to divide like that. "But he was dividing, but beginning from another order [unit]. I mean, it wasn't because he didn't know how to divide, then. These things, we were working on. It isn't the case that he doesn't know. He started to think otherwise, we used the golden material [...], he started to do differently. [...] But now I also understand that he [Lúcio] became more interested. He didn't like to go to the blackboard. But now, he has started to see that he may miss, but everybody is willing to help, then he goes.

Researcher: But it's because something has changed, isn't it?

P4A: *I've changed*, you know. Because I'm very ... [she made an angry face] [laughs]. But then, I started changing. [...] but I'm also learning a lot from them. I found this cool: we're learning together.

Teacher P4A, on assessing her work with students, points out some changes she went through during the training process: "[...] I started to get more involved, to better understand"; "[...] I've already changed my mind." She exemplifies this change through the way of looking at the mistakes made by her students, identifying, from them, knowledge they already had and the possibility that they may "*think differently*"; evidence that her way of organizing teaching has also changed.

It is important, however, to note that this change in the form of organizing teaching is related to P4A's mastering of knowledge about the very mathematical object to be taught, as she points out: "*So then you see it again, you're going to read, to reflect ... [...] Then you start building something else here too [...].*" This unique situation corroborates Fischer's statement (1976, p. 144), when he discusses the content/form dialectics, that "the new content breaks the limits set by the old forms, creating new ones." It is worth enhancing that this is a process that takes time, because, according to the same author, "always and in all parts, the form, the injured structure or organization, offers resistance to anything new."

Considering this concept, for that changes to occur in the teacher's teaching activity, it is imperative that your content be modified, then, as already advocated by Moretti (2007), it becomes

fundamental that the teachers be given theoretical frameworks that can be (re)visited when necessary, so that, in a movement between theory and practice, they can produce educational proposals that, on the one hand, meet the needs of teaching and whose subject they can understand and, on the other, create conditions for overcoming the common sense that their students can master the socio-historically-built human knowledge. (p. 187)

The content of teaching activity to be modified, as explained in the above quote, is not limited only to the knowledge of the specific content to be taught, mathematics, in the case of our research. But it also refers to the knowledge of the theoretical and methodological fundamentals, specific to the organization of teaching, because just the knowledge of teaching objects (school subjects) is not enough for the organization and development of the teaching activity whose aim is the formation of the students' theoretical thinking.

When the training proposals are structured, they must therefore be based in scientific knowledge, enabling the teacher to develop his theoretical thinking, which is not done when they are offered courses focused only on suggestions for new approaches to classroom teaching. The trainings that focus only on methodological aspects scarcely contribute to changes in the way of organizing teaching, as we can see from the words of Teacher P4A:

I remember some time ago [at the beginning of the training process in 2013], I used to think: just imagine, I won't manage to do anything [laughs]. Then you see it's hard, [...], *there is resistance. [...] you always think it's not necessary.* This kind of resistance, oh, it's horrible, it hurts too much! It was very hard for me to learn math, I never took good grades, never, never understood those things. [...] But it was one thing that troubled me a lot, I have to overcome the resistance, but it was so hard [referring to mathematics content and the ways to teach them]. So, I used to think like this: if I learned that way, these things [the

new ways of teaching mathematics] won't meet my needs; I can teach the way I learned, can't I? I ignored all [...] *I'll teach the way I learned, because what they said was very interesting, but very difficult for me. It was not because I didn't want to, but it was very difficult. I may not deal with it properly.* But today I think this idea has changed. (October / 2014)

On commenting on the changes in the way of organizing the teaching of mathematics throughout the training process, teacher P4A points out that the resistance she and many teachers felt in relation to new approaches to the teaching of mathematics was consequence of her difficulties in relation to the object of mathematical knowledge, which led her to repeat the same models she had learned.

The motive that prevented her from changing her way of organizing the teaching of mathematics was not the lack of opportunities to use new methodologies, but her difficulties towards her own mathematical knowledge. It was unclear for her how the relation of conceptual links of the theoretical knowledge of the object was associated with the possibilities of new approaches to teaching: *"I ignored everything [...] I'll teach the way I've learned, because what they said was very interesting, but very difficult for me. It isn't because I didn't want to; it was very difficult, I wouldn't make it do."*

This situation, which is not restricted only to teacher P4A but occurs other times in general data, reinforces Facci's concerns (2004, p.244) about the training of teachers when he questions, "How could you demand that teacher teach well, that he should convey the most developed forms of objective knowledge, if he himself did not and still do not have access to this type of education and knowledge?"

Thus, the mastering of scientific knowledge should also be a concern in teacher training. This feeling of worry is met by the teaching-orienting activity (AOE) – understood here as a teaching organization mode – when it highlights the historical and logical aspect of the concept as an element constituent of the planning of learning-triggering situations.

According to Moura (2014),

The educator's act is the understanding of the historical movement of the concept from which to draw what he considers relevant to be systematized in school as a teaching content. That is why the concept history should not be seen as illustrative of what should be taught. It is the true beacon of educational activities. The concepts are syntheses produced in human history, in Vygotsky's words. This teaching gives us the north of teaching, of curriculum organization, of organization of educational activities. (p. 11)

By mastering the historical and logic aspect of the teaching objects, the teachers, as explained in the above quote, will be able to identify the essence of the teaching object, its conceptual links, which will provide them with capacity to organize their teaching activity from other formats, overcoming the forms of mathematics teaching based on

repetition and memorization, which do not contribute to the development of theoretical thought.

Another aspect that deserves attention in the planning and development of training procedures that aim to be settled as a training activity, is the teachers' needs, which can also be created during the formative movement, as illustrated in the speech of Teacher P4 during a meeting in December 2014, when we – along with other teachers of 4th year –evaluated the training process developed, and also the researcher's action.

I was never worried [...] because you [researcher] would come to check, *I didn't care for you* [laughs], [...] if time were not enough, other stuff ... I had other problems to solve. But you were wise; *you launched the 'stuff'* [new need], and let it for us to notice, right? Then afterwards, *when I realized it, I was the one who was coming to you* [laughs] [...], willing to talk to you [referring to what was happening in the classroom]. So that's what you're talking about it, *I eventually had the feeling that someone was planting something*, because it's no use talking about what one has to do and not having the humility to come and show... This patience [...]is also an exchange, isn't it?

Teacher P4, commenting on her path along the formative movement, explains that in the beginning she was not very concerned about the proposed tasks: "*I wasn't interested in your ideas [...] I had other problems to solve.*" This statement points out evidence that her participation in the training process was not configured as an activity because her initial motive did not match the objective of the training movement. As she said, "*I had other problems to solve,*" i.e. she had other needs.

However, this situation changes throughout the formative movement because the researcher's actions, together with the collective work with the other teachers, enabled new needs to be created and led Teacher P4 to produce another meaning to the actions developed, as can be seen in her speech: "[...] when I realized it, I was the one who was coming to you [...]I eventually had the feeling that someone was planting something [...]"

This situation, also experienced by other participants of the educational movement, show, as discussed by Leontiev (2004), that the needs may be created because they are also a product of human activity. It is necessary, then, that the actions developed during the training activity, be

[...] integrated with the educational activity of the teacher. This is because it is necessary for the teachers' needs to find their determination on the object to be produced by the process, thus becoming a motive. In turn, the actions may turn into activity as the teachers' motives relate to the content of actions, which means being mobilized for a purpose that can satisfy them. This is directly linked to the concrete conditions of their teaching life. If the teachers' relations with reality are modified in an attempt to meet their needs, interests, it means that the forming actions should also be reorganized into their teaching life. These actions will eventually have meaning for their educational and personal performance, at last, in concrete social practice (Gladcheff, 2015, pp. 70-71).

Thus, by taking the teaching activity – more specifically its modes of organization – as the object of the training activity, we enable the teachers to create new needs so that they may “enter into activity”. This would trigger changes in content and form of their teaching activity, as evidenced in the text produced by Teacher P4 in December 2014, when analyzing the contributions of the educational movement for her practice:

This process enabled many reflections about my practice, not only in mathematics [...] I believe that the contributions were innumerable [...]. This year *I realized that we grew much as professionals*, everybody in their own way, but with the same desire to learn. I personally feel honored to have had the opportunity to participate in this valuable process. *I broke barriers that in some way hindered or hampered my practice*. I hope to continue counting on you [researcher] next year; our challenge remains. It was very good to experience *this partnership* that provided significant moments of real and enjoyable learning.

Teacher P4 did notice changes in her educational activity, restricted not only to the teaching of mathematics because, on reflecting on her practice and on mastering new content about teaching organization, she can take on the general modes of action, which also triggered changes in the organization of teaching other school subjects. It is worth noting that we maintain that the specificities of each school content cannot be disregarded, but this does not deny that some general modes of action do exist.

Another aspect to be highlighted in Teacher P4’s record is the reference to the teachers/researcher partnership during the formative movement. As already pointed at the beginning of this article, we have tried, during all the research, to develop a mediating action – researcher-knowledge-teachers – that would favor the finding of solutions to the problems faced by teachers in the school, also leading to the development of their theoretical thought.

Thus, in the discussion on the content/form dialectic of the teacher’s teaching activity, we highlight the key role of content – which is in continuous development – in relation to form (Rosental & Straks, 1960). So if we expect that the continuous training processes may bring about changes in the organization of teaching, it is essential to consider that, by allowing the development of the teachers’ theoretical thought, we will be helping them master scientific concepts that will define a new content to teaching activity, which will affect its shape.

Thus if we are to make changes in the current context of the Brazilian school, it is necessary to review content and form of organization modes in teacher training processes, aiming to organize

[...] formative environments that make it possible for them [teachers] to replace the theoretical thought with the empirical one that, in its continuity, interaction and complex character may promote the changing of meanings attributed to objects that support their educational action. [...] because it is in the interaction processes that they can change, taking place of the old

concepts, new buildings and knowledge, movement that leads the teacher to replace an old with a new and diverse quality. (Souza, 2013, p. 43)

Thus, replacing an old with a new, diverse quality in teachers' actions will involve, as advocated throughout this article, taking the scientific knowledge as the content of the teachers' training activities. The aim is to develop their theoretical thought so that the undertaken actions – with the purpose of mastering new meanings about mathematics teaching organization – may provoke changes in the form and content of the teachers' education activity. According to Fischer (1976, p 146.), "form, what persists in a relatively stable state of equilibrium, is always liable to be destroyed by the movement and change of content."

5. Final considerations

In this article, we have presented an excerpt of the data analyses of a doctoral research, focusing on the unique case of one of the teachers participating in an educational movement that had the school as a teacher learning space.

We sought to break with the idea that most times permeates school: that it is considered a place to prepare students to meet the demands of the labor market. This goal is defended by neoliberal ideologies present in the policies of the current Brazilian education that results in an education limited to the work with spontaneous concepts, not promoting the development of the students' theoretical thinking.

Our objective was to investigate content and form of the training activity of the teacher of mathematics in the early years of elementary school. A historical-cultural theory was proposed that directed our purpose of observing and discussing the formats of the educational activities of teachers in a training movement and the possible routes that allow them to have access to new meanings.

It is important to note that discussing teacher training, whether initial or continuous, also means discussing the role of schools in society today. When taking on the assumptions of cultural-historical theory, we believe that the school must allow students to master elaborate knowledge, scientific concepts. The school is responsible for teaching the knowledge historically produced by humanity, thus offering students full development of human potential, reinforcing the thesis of Vigotskian studies according to which education should promote development.

However, it is not any teaching that ensures development. Often, in the current school context, as pointed by Bernardes (2012), neither teachers nor students perform actions that favor the humanization movement through the understanding of historically-improved knowledge, i.e. the mode of organization of the current school has not led to the development of the maximum human potential.

When discussing the teacher's activity, aspects related to its content and form were pointed, and also the relationship of these philosophical categories with the teacher's activity. In a sense, looking into content and form of the teacher's activity, whether teaching or training actions meant observing them as a dialectical unity, in constant motion.

Thus, the changes observed from the processes of the teacher's school organization revealed that, on constituting an activity on a theoretical thinking level, the process of training supported by the organization of education as a training activity is assumed as content and form by aspects and connections inherent in the relationships established with the mathematical object and movement of the teaching-learning posed by the objective reality (Rosental & Straks, 1960).

It is evident that the researcher's actions and the collective work throughout the formative movement favored the creation of new needs and enabled the participating teachers to produce another meaning to the actions developed. Therefore, when taking the teaching activity, specifically its modes of organization, as the object of the training activity, the teachers can find new needs and thereby "enter into activity", making changes in the content and form of their teaching activity.

In summary, the data analyzed from the singular case presented shows that the actions taken can lead to changes in content and, consequently, in the form of educational activity.

6. References

- Bernardes, M. E. M. (2006). *Mediação Simbólica na Atividade Pedagógica: Contribuições do Enfoque Histórico-Cultural para o Ensino e Aprendizagem*. Tese de doutorado, Universidade de São Paulo, São Paulo, SP, Brasil.
- Bernardes, M. E. M. (2012). Pedagogia e mediação pedagógica. In J. C. Libâneo (Org.). *Temas de Pedagogia: diálogos entre didática e currículo* (pp. 77-97). São Paulo: Cortez.
- Cedro, W. L. & Moura, M. O. de (2007). Uma Perspectiva Histórico-Cultural para o Ensino de Álgebra: o Clube de Matemática como espaço de aprendizagem. *Zetetiké*, 15 (27), 37-56.
- Cheptulin, A. (1982). *A dialética materialista: categorias e leis da dialética* (Leda Rita Cintra Ferraz, Trad.). São Paulo: Editora Alfa-Omega.
- Davídov, V. (1982). *Tipos de generalización en la enseñanza*. Havana: Editorial Pueblo y Educación.
- Davídov, V. (1988). *La enseñanza escolar y el desarrollo psíquico*. Moscú: Editorial Progreso.

- Facci, M. G. D. (2004) *Valorização ou esvaziamento do trabalho do professor? - um estudo crítico comparativo da teoria do professor reflexivo, do construtivismo e da psicologia vigotskiana*. Campinas,SP: Autores Associados.
- Fischer, E. (1976). *A necessidade da arte* (5a ed., Leandro Konder, Trad.). Rio de Janeiro: Zahar Editores.
- Gatti, B. A & Barreto, E. S. (Orgs.). (2009). *Professores do Brasil: impasses e desafios*. Brasília: UNESCO.
- Gladcheff, A. P. (2015). *Ações de estudo em atividade de formação de professores que ensinam matemática nos anos iniciais*. Tese de doutorado, Universidade de São Paulo, São Paulo, SP, Brasil.
- Kopnin, P. V. (1978). *A dialética como lógica e teoria do conhecimento* (Paulo Bezerra, Trad.). Rio de Janeiro: Civilização Brasileira.
- Leontiev, A. N. (1983). *Actividad, conciencia, personalidad*. Habana: Editorial Pueblo y Educación.
- Leontiev, A. N. (2004) *O desenvolvimento do psiquismo* (2a ed., Rubens Eduardo Frias, Trad.). São Paulo: Centauro.
- Moraes, S. P. G. de & Moura, M. O. de. (2009). Avaliação do processo de ensino e aprendizagem em matemática: contribuições da teoria histórico-cultural. *Bolema*, 22 (33), 97-116.
- Moretti, V. D. (2007). *Professores de matemática em atividade de ensino. Uma perspectiva histórico-cultural para a formação*. Tese de doutorado, Universidade de São Paulo, São Paulo, SP, Brasil.
- Martins, L. M. (2010). O legado do século XX para a formação de professores. In L. M. Martins & N. Duarte (Orgs.). *Formação de professores: limites contemporâneos e alternativas necessárias* (pp. 13-31). São Paulo: Editora UNESP; São Paulo: Cultura Acadêmica.
- Moura, M. O. de (1996). A atividade de ensino como unidade formadora. *Bolema*, 2 (12), 29-43.
- Moura, M. O. de (2002). A atividade de Ensino como Ação Formadora. In A. D. Castro & A. M. P. de Carvalho (Orgs.). *Ensinar a ensinar didática para a escola fundamental e média* (pp. 143-161). São Paulo: Pioneira Thompson Learning.
- Moura, M. O. de (2014). Conceitos algébricos: do movimento lógico-histórico à organização do ensino (prefácio). In M. do C. de Sousa, M. L. Panossian, & W. L. Cedro. *Do movimento lógico e histórico à organização do ensino: o percurso dos conceitos algébricos* (pp.7-11). Campinas, SP: Mercado de Letras.

Moura, M. O. de, Araújo, E. S., Ribeiro, F. D., Panossian, M. L. & Moretti, V. D. (2010). A atividade orientadora de ensino como unidade entre ensino e aprendizagem. In M. O. de Moura (Org.). *A atividade pedagógica na teoria histórico-cultural* (pp.81-110). Brasília: Liber Livro.

Rosental, M. M. & Straks, G. M. (1960). *Categorías del materialismo dialéctico* (Adolfo Sanchez Vasquez & Wenceslao Roces, Trad.). México: Editorial Grijalbo.

Souza, N. M. M. de. (2013). *Professores que ensinam alunos que não aprendem: paradoxos em contextos de escolarização básica e a busca da compreensão do papel da atividade de ensino em matemática*. Relatório de Pós-Doutorado, Universidade de São Paulo, São Paulo, SP, Brasil.

Vigotski, L. S. (1995). *Obras escogidas. Tomo III*. Tradução de Lydia Kuper. Madri: Visor Dis., S/A.