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Formation of theoretical thinking in preschool children in the cultural-historical perspective[1]

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ABSTRACT: This article discusses the process of theoretical thinking development through school work based on the theoretical and methodological foundations of Cultural-historical theory. Through the analysis of a pedagogical activity carried out with a group of preschool children and organized in the light of the proposal of the Teaching-Orienteering Activity, the study sought to highlight the pedagogical mediations that are considered as necessary for placing the theoretical concepts as the central content of the teacher's teaching activity. The research aimed to demonstrate and defend the thesis that theoretical thinking can begin from early childhood education when teaching organizes actions in which theoretical knowledge, expression of the unity between the product and the process of the logical-historical movement of concept elaboration, is placed as a core element of the subjects' activity.

KEYWORDS: Theoretical thinking; Pedagogical Activity; Child education.

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1. INTRODUCTION

This text presents a discussion about the development process of theoretical thinking through the organization of school work, based on the theoretical-methodological foundations of Cultural-historical theory. We sought to analyze the pedagogical mediations that are presented as necessary so that the theoretical (Davidov, 1988) or scientific (Vygotsky, 2009) concepts, identified in a given area of knowl-

edge, effectively place themselves as elements that promote the development of the subjects' theoretical thinking (teachers and students). In this direction, we aimed to apprehend the relationship between empirical thinking and theoretical thinking in Pedagogical Activity, problematizing interpretations that establish a *linear* relationship between concept and thought.

The Pedagogical Activity is understood as the unit between the (teacher's) Teaching Activity and the (child's and/or student's) Learning Activity (Moura, Araujo, Ribeiro, Panossian, & Moretti, 2010). Considering the concept of *activity* from the Cultural-historical theory (Leontiev, 1983), this dialectical unit between Teaching Activity and Learning Activity is expressed in the understanding that Teaching Activity, as the teacher's *activity*, seeks to create conditions for the subjects to enter into a learning *activity* with a certain object of knowledge, which is only possible when this learning assumes for the subject a concrete form of human activity: the play, the study, the work (Elkonin, 1987).

The need to develop this problem emerges from our investigations on the organization of Pedagogical Activity, particularly in relation to the formation of theoretical thinking, a process that can be explained considering the Vygotskian premise that "[conceptual] learning does not begin only at school age, it also exists at preschool age]" (Vygotsky, 2009, p. 388). We make this discussion, having as a theoretical-methodological reference the studies about the Teaching-Orienteering Activity, developed by Moura (2012), who understands that the

> *Teaching-Orienteering Activity* has a necessity: to teach; it has actions: it defines the way or procedures of how to put knowledge into play in the educational space; and it elects auxiliary teaching tools: the methodological resources appropriate to each objective and action (book, chalk, computer, abacus, etc.). And finally, the analysis and synthesis processes, throughout the activity, are moments of permanent evaluation for those who teach and learn [emphasis in the original text]. (p. 155)

In the present text, we emphasize the analysis of the pedagogical activity in the context of early childhood education, considering, for this, the thesis that theoretical thinking is a permanent *movement* of the subject's *activity* that seeks to consciously appropriate the many and diverse human activities objectified in the world. Being a permanent *process*, and not a "final state", theoretical thinking *can* be worked on from the beginning of school education, depending on the way teaching is organized, because, as expressed by Davidov (1988) "work, according to such programs, forms the basis of theoretical thinking in many underage students" (p. 7).

In order to develop this thesis, we analyzed a teaching situation, aiming to show how the *way of organizing* the pedagogical activity can promote the basis for the development of theoretical thinking since early childhood education.

2. THE RELATIONSHIP BETWEEN THE EMPIRICAL AND THEORETICAL CONCEPTS IN TEACHING

One of the issues to be faced in the discussion of the relationship between empirical thinking and theoretical thinking in pedagogical activity refers to the interpretation of what the *theoretical* dimension of knowledge in the teaching and learning processes would be. An interpretation of theoretical knowledge based on common sense is materialized in teaching propositions in which *theoretical knowledge* is reduced to the *definition* of the concept. From this interpretation, there is, as a corollary, a pedagogical expectation that the learning of a concept is manifested fundamentally by the verbal declaration of its definition. If, on the one hand, a concept does not depend on its verbal materialization, such as a "definition" or set of definitions, on the other hand, this form of presentation of the concept is not sufficient to make its theoretical dimension explicit and, thus, provoke the movement of theoretical thinking in the students' learning activity. For this reason, we may say that the theoretical concept *is* and, at the same time, *is not* in its verbal definitions.

The assumption to understand this relationship is that the theoretical dimension of knowledge must always be *revealed* to and by the subjects, from their engagement with the human activity that produced such knowledge, as shown in the studies by Davidov (1988), Davydov (1982), Galperin (2001), Leontiev (1983), Vygotsky (2009), and Vygotsky (1996, 2001). From the teaching organization point of view, this assumption is fundamentally related to the proposition of actions that are capable of triggering the subjects' *movement of thinking* in relation to the *product* and the *process* of elaborating a certain concept.

In order to develop these positions about pedagogical work with the theoretical concept, we based the work on four Vygotskian theses (Vygotsky, 2009): a) Thinking is an *action* that is always directed towards solving some *problem*; b) The word is the main mediating sign of thought; c) Outside the conceptual system, the concepts assume empirical links with the object; and d) The concept itself is only formed in the transition age (around 12 years old). From these theses and from the discussion on how teaching can trigger theoretical thinking in pedagogical activity, some specific questions unfold that start to play the role of instruments for the analysis of teaching situations (Table 1).

Table 1. Vygotskian theses and guiding questions to analyze the teaching situations

Vygotskian theses	Guiding questions to analyze the teaching situations
Thinking is an *action* that is always directed towards solving some *problem*.	What is the quality of the *problem* that is proposed to the subjects in their process of engaging in a pedagogical activity?
The word is the main mediating sign of thought.	What types of word generalization are materialized in the teaching situations?

Outside the conceptual system, the concepts assume empirical links with the object	How does this *conceptual system* appear in a concrete pedagogical activity that we will analyze?
The concept itself is only formed in the transition age	How to consider the *movement of theoretical thinking* since early childhood education?

Source: Authors' elaboration.

The first Vygotskian thesis that guides us in this debate about how teaching can trigger theoretical thinking in Pedagogical Activity is the very concept of what *thinking* is. According to Vygotsky (2009), thinking is an action that is always directed towards solving some *problem*.

> Thinking is not reflected in the word, but it takes place in it. For this reason, one can speak of the formation process (the unity of being and not being) of thinking in the word. Every thought tries to unite something with something, to establish a relationship between this and that. Every thought has movement, course, unfolding, in a word, thought fulfills some function, some work, it performs some task. (p. 409)

The highlight, from this first Vygotskian thesis, is the need of not losing sight of the *living* dimension of thought: it emerges as a means of solving a certain problem, as an integral part of a certain *activity*, understood as a psychological process to satisfy a need that takes shape in actions to objectify the reason that originates it (Leontiev, 1983).

Therefore, it is essential to explain which human activity will be reconstituted in teaching, considering the socialization of a given social experience in the process of constituting a concept; what historical and cultural needs does it respond to?

The second Vygotskian thesis is that this human thought is always mediated by a *sign*, the *word* being the main mediating sign of the subjects' activity in their relationship with the world. In this context, Vygotsky (2009) understands that

> the concept is impossible without words, thinking in concepts is impossible outside verbal thinking; throughout this process, the central moment, which has all the foundations to be considered a cause resulting from the maturation of concepts, is the specific use of the word, the functional use of the sign as a means of forming concepts. (p. 170)

Generically, a sign represents a means of the subjects' *action-guiding*, a conscious way to dominate their own conduct. So, the central question is to know *what kind of sign this is and how it is used*. In addition to knowing the *ends* of a given activity, it is essential to know the *means* that have been historically formed to achieve such ends. It is in this sense that the sign is configured as mediation.

For Rubinstein (1979), through thinking, there is a relationship between "man and a system of knowledge socially elaborated and objectified in the word" (p. 72). When communicating thinking through word, "at the same time, a greater awareness of it is acquired, given that understanding, in general, takes place through the correlation with the word, expressing what is understood through the – socially elaborated – content of knowledge, objectified in the word"(p. 159).

It is for this reason that Vygotsky (2009) states that thought is not expressed in the word but takes place in it. There is, here, a unity *in the formation* between thought and word. The thought is not "ready" in search of a word to express itself, but it is formed by composing these words in a continuous process. Metaphorically, we have that "thought is a cloud, from which speech comes off in drops" (Vygotski, 1991, p. 125).

The third Vygotskian thesis is that the specificity of the scientific concept in relation to everyday life is in the *systematic* character of the first one, that is, "the development of scientific concepts follows an opposite path to that through which the development of the spontaneous concept in children takes place. In a sense, these paths are reversed with each other" (Vygotsky, 2009, pp. 344-345). For Vygotsky (2009), the scientific concept is close to the theoretical, although he argues that the scientific one can take place in a non-theoretical (that is, non-dialectical) way. In order to assume a theoretical dimension, the concept needs to appear in a *system*.

> Outside the system, concepts maintain a different relationship with the object than they do when entering a given system […] Outside the system, in the concepts, it is only possible to have links that are established among the objects themselves, that is, empirical links. (p. 379)

This statement is an important key to our discussions. Taken alone or as a pure definition, a concept (for example, "mammal", "number", "game") is never a theoretical concept itself. Taking the mathematics area as an example, the concept of "number" is revealed to the subjects and by them, as they manage to act autonomously or consciously with the relationships between the *human problem* historically arisen to control quantities and the *means* that have been discovered to solve this problem. These relations appear, for their part, in a conceptual system that involves the meanings of numerical sense, one-to-one correspondence, one-to-many correspondence (grouping), place value, and numbering system. The concept of number, therefore, is being built for the subjects in their *learning activity*, as the teacher's *teaching activity* organizes actions with this conceptual system.

For this reason, despite the importance of understanding the Vygotskian position that the concept itself is formed only in the transition age (fourth thesis in table 1), we can consider that teaching that intentionally seeks to organize the development of theoretical thinking in the subjects must have this orientation at all stages of school education (including, therefore, early childhood education). It is so because it is teaching guided by the understanding that the concepts make up a given *system*, and

it reflects the unity between the *human problem* historically arisen in a given activity and the *means* historically found to solve it.

Such position allows us to affirm that the formation of theoretical thinking, as a process of production and/or use of theoretical concepts, begins in childhood. A core question that arises is: How to consider, in pedagogical activity, the *movement of theoretical thinking* since early childhood education?

As it is the central assertion of this study, this question will be further developed below, based on the idea of thinking as a process of human activity. Thus, when discussing the movement of theoretical thinking in pedagogical activity, we need to centrally analyze the quality of the *problem* that is posed to students and teachers and that triggers in them a certain need to *think*, as well as the specific *content* or *object* of this thought. To this end, we directed our discussions to the analysis of a pedagogical activity organized based on the premises of the Teaching-Orienteering Activity. Thus, we discussed the *learning-triggering situation* and the *triggering problem* as those elements of the pedagogical activity that effectively materialize the quality and direction of the subjects' object of thinking.

3. METHODOLOGICAL ASPECTS

The present research, of theoretical-bibliographic character, had as empirical material for the analysis a teaching situation, carried out in the University Daycare, with children of the average age of 5 years, and organized through the theoretical-methodological principles of the Teaching-Orienteering Activity (Moura, 1996, 2012). It is important to highlight that those responsible for the participating children signed a consent form regarding the intervention as well as the recording of the meetings that were later transcribed.

The teaching situation analyzed here was elaborated and developed by a Pedagogy student in the context of the Mathematics Teaching Methodology undergraduate subject, in a Pedagogy undergraduate course, as part of a project that involved several activities such as counting one by one, games, and graphic situations and it was carried out during an academic semester, totaling 60 hours. The entire project was recorded in the teacher's field notebook and discussed in the undergraduate subject, in addition to the production of a 22-minute video, in which the entire process is presented in a theoretical-methodological systematization. We chose this situation because it reveals the synthesis of the process.

In this article, the focus of our analysis of this teaching situation was in relation to the teacher's *mode of organization* of the pedagogical activity, seeking to highlight the theoretical and methodological aspects that allow promoting the bases of the development of theoretical thinking since early childhood education.

When we focus on teaching from the perspective of Cultural-historical theory, we highlight the role attributed to the Teaching-Orienteering Activity (TOA), proposed by Moura (1996, 2012), based on the psychological concept of *activity* (Leontiev, 1983). The theoretical-methodological principles present in the concept of the

Teaching-Orienteering Activity, as already indicated, make it explicit as the unity between teaching activity and learning activity in the context of school education (from early childhood education to higher education).

Teaching-Orienteering Activity is structured

> in a way that allows subjects to interact, mediated by content negotiating meanings, with the aim of collectively solving a problem-situation (Moura, 1996). It is an *orienteering activity* because it defines the essential elements of educational action and respects the dynamics of interactions that do not always reach the results expected by the teacher [emphasis in the original text]. The teacher establishes the objectives, defines the actions and chooses auxiliary teaching instruments; however, he/she does not own the whole process, precisely because he/she accepts that the subjects in interaction share meanings that change before the object of knowledge under discussion. (Moura, 2012, p. 155)

The principles that guide the Teaching-Orienteering Activity pay attention to individual differences, the particularities of the problem put into action, and the different kinds of knowledge present in the educational environment. Thus, a fundamental dimension that constitutes it is pedagogical intentionality, which, according to Moura (2012), imposes a unique responsibility on those who organize teaching. Therefore, it constitutes a theoretical-methodological orientation "specifically directed to the reconstruction of a human activity, in its essential and necessary features, in the teaching and learning processes" (Nascimento, 2014, p. 277).

As indicated by Gladcheff (2015), teachers, by taking teaching objectives translated into content to be appropriated by students, create a *triggering problem* as part of a *learning-triggering situation* that mobilizes them and the students. Thus, the contents, considered as social objectives to be conveyed in the classroom, start to express a story, the story of humanity solving problems (Caraça, 2010; Ifrah, 2005). Therefore, the learning-triggering situation aims to

> contemplate the genesis of the concept, that is, its essence; it must make explicit the need that led humanity to the construction of the referred concept, how human problems and needs appeared in a given activity and how men developed solutions or syntheses in their logical-historical movement. (Moura et al., 2010, p. 103-104)

The historical movement of the concept experienced by humanity presents the essence of human needs that motivated the production of this concept in a certain time and place, and this production also required its logical systematization. For Kopnin (1978),

> By historical, it is understood the process of changing the object, the stages of its emergence and development [...] The logical is the reflection of the historical in theoretical form, that is to say, it is the reproduction of the essence of the object and the history of its development. (p. 183)

Thus, this teaching, organized in a way that privileges the logical-historical movement of the concept, works methodologically with the proposition of problem situations organized in learning-triggering situations, which can be materialized in: a game, with pedagogical purpose, that preserves the problem character; *emergent everyday situations*, that make it possible for children to face the need to experience the resolution of significant problems for them; or a *virtual history of the concept*, which places the child facing a problem situation similar to that experienced by humans in the process of creating concepts (Moura, 2012). It is important to emphasize that the story that involves the triggering situation "is not the factual history, but the one that is impregnated in the concept when considering that this concept aims at a historically posed human need" (Moretti & Moura, 2011, p. 443).

The teaching situation analyzed in this article reflects a learning-triggering situation materialized in the form of a virtual story that sought to place teachers and children in teaching and learning activities, respectively, with the mathematical concept of *grouping*.

4. THE MOVEMENT OF THEORETICAL THINKING RAISED BY THE PEDAGOGICAL ACTIVITY

The virtual story "The Journey of Ulysses" has its origin in a work developed with a literary classic, *Odyssey*, in the adaptation by the author Ruth Rocha. From the story of Ulysses, a virtual story is created by the teachers in which the Greek hero is captured by the powerful sorceress Circe, who holds him hostage and forces him to do certain tasks. According to the virtual story, as soon as he arrives on the island, the witch deprives Ulysses of all his mathematical knowledge and gives him the task of taking care of the island's animals so that none is lost. Without mathematical knowledge, Ulysses asks the children for help, through a letter, to solve the following problem: how could he do this without knowing how to count? Otherwise, he would not be released. Children are mobilized with the hero's need and help him through a letter, proposing that he control the number of animals by means of one-to-one correspondence: one pebble for each animal. Continuing the teaching activity, Ulysses thanks the received help and presents a new problem that he has to solve: the number of animals has increased a lot, and it would no longer be possible to control them using the correspondence of one pebble for each animal. So, very concerned about the large number of animals that he should now take care of, he asks the children for help again so that he can do it using a small number of pebbles.

Thus, the story summarizes the following learning-triggering problem: How can Ulysses control a very large number of animals that he has to take care of without

carrying so many pebbles? Such a problem places the child in a situation similar to the human problem experienced in the process of creating the concept of number: controlling even greater quantities with the fewest possible sign-objects.

The organization of the Teaching Activity by the teacher made it possible for the children to elaborate and discuss some hypotheses, demonstrating that they were mobilized to assume for themselves the triggering problem proposed in the story. Returning to the Vygotskian thesis that "*outside the conceptual system, concepts can only assume empirical links with the object*," a first question to be analyzed about *The Journey of Ulysses* is, precisely, the *conceptual system* to which the concept of grouping is linked to. To what extent is the concept of grouping presented to children as part of a system in this teaching situation that we are analyzing? What system is this, and how can it *trigger* the movement of theoretical thinking for children?

The concept of grouping belongs to the conceptual system of "number", as well as to the Numeral System (NS). Thus, on the one hand, we could think of this conceptual system as a succession of increasingly complex concepts, being the NS itself, including the Decimal Numeral System (DNS), its final link: *one-to-one correspondence – grouping – place value – frequency – power – base – decimal numeral system*.

Although we have an important dimension of this conceptual system in this description, this linear way of presenting the concepts gives us – from the point of view of pedagogical analysis – only the *definition* of these concepts. More than that, when we make the composition of this conceptual system only in *this* way, we create a tendency to reinforce the position that the theoretical dimension of the concept is at the last link in the concept chain (in this case, the concept of DNS), considering, therefore, all other stages are *empirical* modes of the concept.

Thus, although visualizing this sequence of the system is important as a reference of its links, it is necessary, in the analysis of the movement of the subjects' theoretical thinking to make explicit the conceptual links that unite these concepts. This must be done from the point of view of *human activity* embodied in the content being taught, seeking to make explicit the relationship between the *problem* that arose in humanity's social practice and the *means* created by it, in its *activity*, to solve it, a process that expresses the concept's logical-historical movement (Moura et al., 2010). In the case referred to here, the problem is *how to control large quantities with the fewest possible sign-symbols*, and one of the means to solve it is in the mathematical concept of *one that is worth many*.

Considering the theoretical-methodological principles of the Teaching-Orienteering Activity, we can say that, in order to analyze the *movement of theoretical thinking* triggered by the Pedagogical Activity, it is necessary to observe the specific way in which the conceptual system to be taught can materialize in the proposed actions.

In this perspective, affirming that a given concept assumes a theoretical or empirical dimension in teaching requires that we analyze its effective *role* in the subjects' thinking when solving the learning problem proposed in the pedagogical activity.

Considering the Vygotskian thesis that thinking always aims to establish a relationship and is a movement of forming thinking in the word (Vygotsky, 2009), we can resume some questions presented at the beginning of the text: what is the *quality of the problem* posed to the subjects in a pedagogical activity capable of triggering their thinking to develop theoretical thinking?

Let us resume the teaching situation, *The Journey of Ulysses*. It proposes as a problem for children's activity a real problem that arose in social practice: *controlling the movement of quantities*, seeking to control *large* quantities with the fewest possible sign-symbols. And it suggests working with a specific *means* of solving this problem: the *concept* of one-to-many correspondence (one that is worth many – grouping). Let us note, for now, that the concept of "one-to-many correspondence" is *one* of the possible links to solve this problem and, therefore, it allows a certain *quality* in this resolution. The concept of "place value" (which expands the idea of "one that is worth many" by replacing the physical characteristics of the sign-objects with the *place* it occupies) is *another* possibility in this case and allows another quality in the resolution. We have, therefore, different ways to solve the same problem, synthesized in two concepts: "one that is worth many" and "one that is worth many *in the place*."

However, despite all the "simplicity" of the concept of grouping, compared to that of *place value*, when the subjects get to the idea of *one that is worth many* as a synthesis of *their* thinking activity when engaging in a problem of *how to control large quantities with the fewest possible sign-symbols*, this answer indicates a *movement of conceptual thinking* of these subjects. It indicates their conscious relationship with the problem and, to a certain extent, their own thinking activity since they use this concept (grouping) as *a real means of organizing their actions*. This conscious relationship with the proposed problem and the means to solve it constitutes one of the central indicators for assessing *the movement of conceptual thinking* of the subject in the pedagogical activity.

When a child says, in an attempt to solve the triggering problem, "*I already know, a pebble is worth 3... or 4 or 5!*"[2], the speech shows his/her thinking towards solving the human problem synthesized in the learning-triggering situation here analyzed and mediated by the concept of *one that is worth many*. This child's speech does not allow us to affirm that he/she has "definitively" appropriated the concept, but it enables us to say that this concept becomes part of his/her activity of thinking about the human problem of *controlling large quantities with the smallest possible number of sign-symbols*.

For the other children, this synthesis presented by the classmate *may* have appeared as a ready solution to the problem, thus, as an unaware instrument of their activity. Even if this other child verbalizes the desired solution in his/her answers ("*it's a pebble that is worth 3*"), this relationship may be nothing more than a phrase, a "rule for his/her action" to control quantities (for example: "Every 3 animals, I take a pebble"), but not yet an orienting "concept" of the activity, a conscious synthesis between the human problem that arose in social practice and the possible means

2 Transcription of the video recording.

to solve it ("*I already know, a pebble can be worth 3!*"). The fact that the subject *knows* that an object (pebble) can be worth any quantity and that this quantity can be attributed *by himself/herself* makes a lot of difference in the *quality* of the movement of thinking that is formed in the subject, as it is a manifestation of the *movement of his/her thought towards theoretical thinking*.

Thus, we seek to highlight the possibilities of apprehending the movement of the subjects' thinking towards theoretical thinking (towards a conscious relationship with the problem and the means in given human activity) and not definitively classifying their thinking either as empirical *or* as theoretical.

This position may be ratified when it is recognized that even the concept of *place value* may take on an empirical dimension in teaching. A pedagogical activity that works with NS and DNS in the "do" / "solve" style (for example, exchange every 10x for 1y) brings a less possibility of mobilizing the students' theoretical thinking than working with the proposed concept of grouping, for instance, in the virtual story *The Journey of Ulysses*. Thus, although the concept of grouping is simpler than that of place value, for *both,* it is possible to show both an empirical and a theoretical dimension of the concept, which poses to the pedagogical activity the task and the *possibility* of working with the movement of theoretical thinking since the beginning of schooling.

Let us take, then, the concept of grouping and try to show what would be its empirical and its theoretical dimension in concrete teaching situations. When the concept of grouping appears in situations such as *gathering to count* (3, 6, 9, 12...); *gathering to move the squares on the board* (return two – advance two); and *gathering to make operational exchanges* (4 red = 1 yellow; 10 red = 1 yellow), the concept of grouping appears much more as an *action-operation* (in Leontievian terms) than conscious action. It turns out that, in these examples, the *problem* posed to the subjects is not directly related to the problem of *controlling large quantities*, which conditions the role that the concept of grouping can play in the subject in these situations. According to Vygotsky (2009), for whom a concept always arises from some need, as a means of solving some real problem posed to the thinking/subject, in these teaching situations described above, we *use* the idea of grouping to solve concrete-empirical problems (about counting, board game, exchange game), so that the concept of *one that is worth many* does not appear as a necessity for the subject.

We can use these teaching tasks in the perspective of working with the concept of grouping because in fact, it *is there*. But, at the same time, the concept *is* only for those who have already appropriated it and can "notice it" in such situations. For children, this concept would still need to be revealed *for* and *by* their *activity*; that is, conditions must be explicitly proposed for the subject to perform an activity that reproduces the essential features of human activity embodied in the concept (Leontiev, 1983).

In the story *The Journey of Ulysses*, children, by solving the proposed problem, attribute meaning to the concept in motion, remembering, as Vygotsky (2009) states, that meaning is dynamic, fluid, complex, and has several stability zones. Even if the

solution, at first, came from a single child, the fact of solving the problem contributes to make explicit the need for this concept for each of the children who participate in the story.

In this context, we also evidence actions organized by the teacher made concrete using the material resource chosen for the development of the pedagogical activity. The sensory material used, the island model, shown in Figure 1, composed of plants, animals, and boulders, plays an indispensable role in the concept formation process for children at this stage of education.

Figure 1. Island model, composed of plants, animals, and boulders. (Image taken from the video recording made during the activity)

In words by Vygotsky (2009):

> the concept, especially for the child, is linked to the sensory material from whose perception and elaboration it arises; the sensorial material and the word are indispensable parts of the concept formation process and the word, dissociated from this material, transfers the entire concept definition process to the purely verbal sphere, which is not inherent in the child. (p. 152)

In this direction, going back to Vygotsky (2009), we have the problem of the *systematicity of the concept* and the purpose of (school) teaching, which is the subject having *voluntary and conscious conduct*. In order to deal with this problem, we need to focus on the concrete analysis of teaching activities, seeking to understand the ways in which a given *conceptual system* is materialized in teaching and study actions: the materialization of the relationship between problem and means that arose in given human activity and that, as a social experience, must be reconstituted *for* and by the subjects in the pedagogical activity.

5. THINKING AS A PROCESS OF HUMAN ACTIVITY

The discussion about the development of theoretical and empirical thinking in Pedagogical Activity presupposes considering thinking as a process and a product of the human activity, as treated by different authors of Cultural-historical theory, such as Davidov (1988), Galperin (2001), Kopnin (1978), Rubinstein (1979), and others.

Going back to the contributions by Kopnin (1978) about thinking as a reflection of reality, we can affirm that thinking is a purely human faculty, a way of knowing reality by man and a means of creating ideas, resulting from the interaction between man (social being) and object; "It is a reflection of reality in the form of abstractions" (p. 121).

Thus, as proposed by Kopnin (1978), we can understand that human thinking is a subjective image of the objective world, configuring it as an objective and creative process. For Kopnin (1978), the subjectivity of thinking consists

> in the fact that thinking always belongs to man as a subject; [...] its result is not the creation of the object itself as such, with all its properties, but only the ideal image of the object. In thinking, we always operate with the ideal image of the object and not with the object itself [...] the object being represented with varying degrees of completeness, adequacy, and depth of penetration in its essence. (pp. 126-127)

In this sense, we can understand the existence of an empirical and theoretical dimension of thinking as expressions of variability in understanding the objective reality.

The existence of thinking as a subjective image of the objective world, as defended by Kopnin, may be perceived in the pedagogical activity through the story *The Journey of Ulysses*, when children raise hypotheses of answers to the learning-triggering problem, indicating that they could "*chain the animal's leg*," or "*walk one at a time*," or even "*I know, it could be a pebble that is worth three [animals]... or four... or five... or six!*". Such hypotheses express particular ways of subjectively apprehending the problem of controlling increasing quantities with the smallest possible number of sign-objects, and when analyzed by the children themselves with the teacher's mediation, they can contribute to the elaboration of syntheses that express each time greater adequacy and depth in relation to the essence of reality.

This is an analysis and synthesis process that "has a creative character and its result is the advancement of our knowledge" (Kopnin, 1978, p. 236); it is an indispensable analytical-synthetic movement to the thinking process. This movement, as an expression of the subject's activity, presents itself in unity with emotions and sensations, as Vygotsky (2009) reminds us: "Thought itself is not born out of another thought but from the field of our consciousness that motivates it, which encompasses our inclinations and needs, our interests and motivations, our affections and emotions" (p. 479).

It is from this comprehension that we can understand the importance of organizing teaching situations that, reconstituting a human problem and a social experience, may equally *mobilize* the subjects to seek a solution to this problem: why am I going to get involved in the search for an answer on *how to control a very large amount of animals that Ulysses has to take care of without carrying so many stones*? The fact that we affirm that, in the teaching situation *The Journey of Ulysses*, the concept of grouping appears as an expression of the related *control of large quantities – one that is worth many and many that are worth one* leads us to consider that the children's thinking was mobilized for the reasons of each one, in order to help Ulysses in his quest to solve the posed problem. When triggering this reason in the subjects, how can the Pedagogical Activity contribute to evidence the generic dimension of this problem faced by Ulysses and lead to a theoretical approach to the concept of *grouping*?

This idea is presented by Davidov (1988, p. 125), when stating that the content of theoretical thinking is its mediatized existence, as a process of idealization of the practical activity, of the universal forms of things; and this existence, when considered in the context of school education, implies considering in the Pedagogical Activity the concepts as historical formations, which bear the mark of human work, as they are also a process and a product of man's activity. As stated by the materialist-dialectic theory of knowledge, thinking, in the dimension of human activity, has humanity as its subject, in its dimension of human gender, in its universal relationship; thus, the individual's thinking is a historically developed function, as an expression of the maximum human wealth, whose appropriation may be initiated from early childhood education.

Next, we are going to discuss the relationship between teaching organization and the development of theoretical thinking, so that frequently asked questions in the pedagogical scenario about theoretical thinking and teaching may guide us to defend the thesis that the development of theoretical thinking *may* begin in childhood, depending on how teaching is organized.

6. THEORETICAL THINKING AND TEACHING ORGANIZATION

Considering the perspective of Pedagogical Activity defended in this text, a central issue refers to the need of positioning ourselves on the importance of directing teaching to the formation of theoretical thinking. Why is working with theoretical concepts relevant in pedagogical work? What is the role of this type of learning for the subjects' education?

In order to get closer to answers to these questions, in this article, we seek to explain the meaning attributed to the expression *theoretical thinking*, relating it to a process from which the subjects may become aware of the activity of their thinking.

The awareness of the thinking activity itself, which invariably transforms the subject's action in the world, is not extinguished in its immediate action. Being aware of one's own thinking activity when operating, for example, with the concept of Numeral System (NS), is not limited to being able "to do the math faster" or "not to make

a mistake in the calculations," etc. Although this operability is part of the product aimed at forming theoretical thinking in relation to the concept of NS (knowing how to do math well and, in some contexts, do it quickly), the central issue is the possibility that this conceptual learning provides for *us to discover ourselves as subjects that create ourselves* and *the world*. Recognizing it means understanding this knowledge as a process and product of a specific human activity – in this case, an activity that sought to solve the problem of how to control ever-increasing quantities with the fewest sign-symbols and how this control could occur, attributing different meanings according to the *place* occupied by the sign-symbol. Thus, it is a matter of forming awareness not simply the activity process but of it as a product of human social practice, which implies the possibility of the subjects being aware of what they know. As highlighted by Vygotsky (2009), "by generalizing my own activity process, I gain the possibility of another relationship with it" (p. 289).

The formation of concepts as a mental act takes as a principle the understanding that

> a concept is more than the sum of certain associative bonds formed by memory, it is more than a simple mental habit; it is a real and complex act of thinking that cannot be learned through simple memorization, [...] the concept is, in psychological terms, an act of generalization. (Vygotsky, 2009, p. 246)

For Davidov (1988), from the point of view of the formation of scientific concepts at school, developing theoretical thinking, due to its logical-historical essence, will allow new generations to appropriate the most advanced stage of human culture since the

> contemporary knowledge presupposes that man dominates *the process of origin and development of things through theoretical thinking*, which studies and describes dialectical logics. Theoretical thinking has its specific types of generalization and abstraction, its procedures for the formation of concepts and operations with them. Precisely the formation of such concepts opens the way for students to master the foundations of the current theoretical culture. [...] School, in our opinion, should teach students to *think theoretically*. [emphasis in the original text] (Davidov, 1988, p. 6, our translation)

We can bring these ideas to our time and consider that theoretical knowledge is the main objective of the pedagogical activity, as it is through its appropriation that the formation of theoretical thinking is structured (Marco, 2009). However, for this process to be triggered in the subjects, there is a need for teaching specifically organized for this purpose.

Putting children in this movement means putting them int activity and, therefore, we may, as Rubinstein (1979) argues, consider thinking as an activity, in its psychological dimension, because, for the author,

> thinking appears, mainly, as an activity when it is examined in its relationship with the subject and with the objectives it has to achieve. Thinking as an activity erupts not only the regularity of its course as thinking (as analysis, synthesis, generalization, etc.) but, moreover, on the sphere of personal motivation, common to thinking and to all human activity. (p. 75)

In this perspective, when defending the thesis that the development of theoretical thinking *may* begin in childhood, depending on the way teaching is organized, we equally defend teaching in which: contents are organized as a *hierarchical system of knowledge*; an arbitrary and conscious process occurs (voluntary action); what is not immediate, visible, and direct is taught (beyond the limits of individual experience), and the social meaning becomes personally significant, as proposed by Rubinstein (1979) and Vygotsky (2009).

7. FINAL CONSIDERATIONS

In this article, we defend the idea that the beginning of the development of theoretical thinking may occur from early childhood education, depending on the way teaching is organized in this stage of basic education. In order to make such a defense, we discussed some ideas present in Cultural-historical theory, such as scientific concepts, spontaneous concepts, empirical thinking, and theoretical thinking. Moreover, we also analyzed a pedagogical activity organized in the light of the Teaching-Orienteering Activity proposal and carried it out with a group of 5-year-old children in preschool. The analysis showed that children at this age might begin the process of appropriating a theoretical concept – in the discussed case, the concept of grouping – depending on the way teaching is organized.

Thus, we can return to an initial question, namely: how do certain pedagogical actions allow to raise the movement of theoretical thinking of the subjects who take part in the pedagogical activity? When we present the *quality of the problem* proposed in the teaching, whose core is summarized in the question of *how to control a very large amount of animals that Ulysses has to take care of without carrying so many stones?* We seek to show the mobilization and direction of children's thinking to consider the *ends* and *means* in the process of solving this problem, which, like the social experience of humanity, takes for itself the possibility of controlling large quantities and is synthesized in the mathematical signification of *one that is worth many* and *many that are worth one*.

As discussed in the analysis of *The Journey of Ulysses*, a teaching situation must make explicit the *human problem* arisen in social practice, and that is synthesized in a concept. This teaching must take the understanding of this problem as an integral part of the understanding of the concept that corresponds to it. Teaching that, having as its starting point the conceptual nexuses of such a concept, proposes actions in which these nexuses are being revealed *to* and *by* the subjects, first in their material actions and, later, more and more, in their words, is potentially capable of contribut-

ing to promoting the development of the theoretical thinking of the subjects involved in the Pedagogical Activity.

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KSZTAŁTOWANIE MYŚLENIA TEORETYCZNEGO U DZIECI PRZEDSZKOLNYCH W PERSPEKTYWIE KULTURALNO-HISTORYCZNEJ

STRESZCZENIE: W niniejszym artykule omówiono proces rozwoju myślenia teoretycznego poprzez pracę w szkole w odniesieniu do podstaw teoretycznych i metodologicznych teorii kulturowo-historycznej. Analiza działania pedagogicznego przeprowadzonego w oparciu o grupę dzieci w wieku przedszkolnym, zorganizowanego zgodnie z propozycją działań dydaktyczno-orientacyjnych (Teaching-Orienteering Activity), miała na celu zwrócenie uwagi na mediacje pedagogiczne, które są uważane za niezbędne do umieszczenia koncepcji teoretycznych jako centralnej treści działalności dydaktycznej nauczyciela. Badania miały na celu wykazanie i obronę tezy, że myślenie teoretyczne można wprowadzać już od edukacji wczesnoszkolnej, gdy w dydaktyce prowadzone są działania, w których wiedza teoretyczna, będąca wyrazem jedności między produktem a procesem logiczno-historycznego ruchu wypracowywania pojęć, jest umieszczana jako centralny element aktywności podmiotów.

ABSTRAKT: Myślenie teoretyczne; Działalność pedagogiczna; Edukacja dziecka.