

Logical-historical movement of concepts: fundamentals, teaching and research ¹

Movimento lógico-histórico dos conceitos: fundamentos, ensino e pesquisas

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ABSTRACT

This text aims to present the first dossier: “Logical-historical movement of concepts: fundamentals, teaching and research” composed of texts by researchers from different areas of knowledge, such as Education, Mathematics Education, and Psychology. The articles show how researchers have been appropriating the logical-historical movement as they carry out their investigations. It appears that the logical-historical dialectical pair has been configured from a form of thought to an Ontological, Didactics, Teaching Methodology and Research Methodology perspective in teacher training.

Keywords: Teacher education; Research in Mathematics Education; Didactics.

RESUMO

Esse texto tem como objetivo apresentar o primeiro dossiê: “Movimento lógico-histórico dos conceitos: fundamentos, ensino e pesquisas” composto por textos de pesquisadores de diferentes áreas do conhecimento, tais como Educação, Educação Matemática e Psicologia. Os artigos mostram como os pesquisadores vêm se apropriando do movimento lógico-histórico na medida em que elaboram suas investigações. Constata-se que o par dialético lógico-histórico vem se configurando desde forma de pensamento até perspectiva Ontológica, Didática, Metodologia de Ensino e Metodologia de Pesquisa na formação de professores.

Palavras-chave: Formação de professores; Pesquisas em Educação Matemática; Didática.

1 Introdução

Research on the logical-historical movement is present in several areas of knowledge such as Philosophy, Human Sciences, Science and Mathematics

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Teaching and Education, and Mathematics Education. The systematic literature review, carried out by Sousa (2022) on the Digital Bank of Theses and Dissertations (BDTD) and on the CAPES Journal Portal, highlights works published between 2015 and 2020 that addressed the logical-historical movement or developmental teaching with a focus on application of a methodological proposal for teaching some mathematical object, totaling 26 works analyzed from a total of 101 works selected among theses, dissertations, and articles.

The aforementioned author underlines that, in the 1980s, one of the pioneering works in the area of mathematics education on the relationship between the logical and the historical as dialectical categories was defended by Duarte, in 1987. This Master's thesis focused on the pedagogical exercise of Elementary Mathematics within the author's educational practice, developed in the adult education program PAF-UFSCar (Employee Literacy Program), which taught literacy to UFSCar workers and was aimed at political commitment to the working class. This work emphasized the need to seek, according to Jardinetti, (1988, n.p.):

drawing attention to the fact that many educators, when committing themselves to an education that contributes to social transformations within the specificity of pedagogical practice through a dialectical interpretation, forget to deepen the *philosophical and methodological categories of dialectics*, characterizing their manifestations and intentionally directing them towards educational practice (our highlights, our translation).

From this, the author relates the historical-logical with the issue of teaching the number system and the four elementary arithmetic operations, presenting it as a process that takes place in a logical way, reproducing the essential aspects of the historical process of the content covered, with the objective that students have a vision of their social reality also as a process of creating a new reality.

In conjunction with this work, other studies, such as those presented in this dossier, demonstrate the need for studies on the logical-historical as essential

categories in a movement that unites theory and practice in the production and understanding of knowledge, according to the assumptions by Rosental and Straks (1960) and notably as guides in the teaching-learning process.

In particular, the logical-historical movement of concepts falls within the scope of this dossier and brings debates that have been conducted by researchers from various teaching and research institutions on the intentional use of the relationship between the logical and the historical in the dynamic educational process of *transmission and assimilation* coherent with the objectives of human constitution (humanization) through the appropriation of scientific and cultural knowledge historically produced by humanity, based on the development of theoretical thinking of students, teachers, and those involved in the educational process.

The strength of the research productions is revealed in the pleasant surprise and joy we had in organizing and delivering, based on the contribution of articles, two dossiers. The first dossier is titled “Logical-historical movement of concepts: fundamentals, teaching and research”. The second one is titled “Logical-historical movement of concepts: teacher education, teaching and research”.

The two dossiers aim to disseminate studies and research from different areas of knowledge, including Education, Mathematics Education, and Psychology, which consider the logical-historical movement of concepts in teaching-learning-development processes based on a materialist dialectical approach with foundations in cultural-historical- theory.

In this sense, following the scope of the magazine, the dossiers focus on studies and research aimed at: 1) didactics (general and specific), 2) pedagogical psychology, 3) historiographies, 4) teacher education, 5) teaching practices in different teaching segments, 6) historical aspects of the concepts covered in the different teaching segments, 7) conceptual nexuses of content covered in different areas of knowledge and teaching segments, 8) triggering learning situations covered in different areas of knowledge and teaching segments, and 9) epistemological and methodological foundations in this approach.

From reading the 22 articles that make up the two dossiers, we may have some answers to the questions that have been asked by researchers and teachers over the *last thirty-six years*. In fact, from the first research we know of, defended in Brazil by Duarte in 1987, until Kieslarck's research, in 2023 (SPACEK, 2023).

1) How can children, teenagers, and adults appropriate the concept of logical-historical movement?

2) In what way has the logical-historical dialectical pair attended Basic Education, Higher Education, Teacher Education and theoretically based triggering teaching situations that are being elaborated by teachers and researchers and that have been present in classrooms, of different levels of education?

3) From what approaches has the logical-historical movement developed with a focus on the production of knowledge and practices and the needs that the complexification of needs highlight by society?

4) What are the possibilities for the logical-historical movement to be taken from the perspective of a historical-bibliographical methodology or even in the theoretical organization of moments of investigation; what is its deepening for new research?

These questions, among others that will certainly be elaborated after reading the articles, show the vigorous dialogue between the constituent elements of the logical-historical. According to Sousa *et al.* (2014):

Concepts of: totality, reality, praxis, movement, influence, interdependence, mutability, immutability, moments of permanence, relativity, logics, history, process of knowledge and thought; and the categories: concrete and abstract, concept, judgment, and deduction studied in Kopnin (1961[1978]) and Kosik (1963[2002]), with regard to the materialist theory of knowledge (p. 85, our translation).

The articles reveal that the logical and historical, defined by Rosental and Straks in 1960 as one of the categories of dialectical and historical materialism and by Kopnin, in the 1970s, as a dialectical unity that underlies the concept of form of thought, has been expanded to the extent that, as researchers and

professionals from different areas of knowledge, including Psychology, Education, and Mathematics Education, they have come to understand the thesis that:

The unity between the logical and the historical helps to solve the problem of the construction of science, its internal structure, the system of its categories. This unity is basic in defining the own concept of thought form (KOPNIN, 1978, p. 186, our translation).

From their studies, different researchers, including Brazilians, came to understand that there is no denying that the unity of the logical and the historical allows scholars from any field of science to “constantly encounter the question of how to approach the study of the object, where to begin the reproduction of its history in thought” (p. 184, our translation).

At the same time, while carrying out their research, they can show us that “the representation of the historical by the logical, the reproduction of the essence of the object, the history of its formation and development are carried out in the different forms of movement of thought” (KOPNIN, 1978, p. 187, our translation).

In other words, when teachers, future teachers, and, consequently, students study scientific knowledge under the aegis of the logical-historical movement, they begin to argue that there is a constant movement between the logical and the historical that allows us to come into contact with the genesis of the object to be studied, whether this object is an area of certain knowledge, a content or a concept to be dealt with in the classroom, which may be materialized in triggering learning situations.

It must also be considered that there are researchers who agree with Kopnin (1978) that the logical-historical movement can be considered a research method, since “the unity between the logical and the historical is an indispensable methodological premise in solving the problems of the interrelationship of knowledge and the structure of the object and knowledge of history and its development” (p. 186). For this reason, they support teacher education actions, since, like researchers, teachers need to constantly appropriate their object of study, which is teaching. We are defending that the logical-

historical movement may be configured either as Mathematics Didactics or as Teaching Methodology.

In this context, the logical-historical movement may be understood as Mathematics Didactics and Teaching Methodology. Here, history is neither linear nor factual, the universal laws of movement, fluency, and interdependence prevail, which are characteristics for the apprehension of objective reality and make up the nature of scientific thinking.

It is for this reason that it is necessary to consider the studies by Rosental & Straks (1960, p. 325) which indicate that “when in any science the logical and the historical are divorced, the movement stops and proves incapable of satisfying the needs and the demands of life in development” (our translation).

Life is inserted into two philosophical and distinct aspects of reality, which we are inserted into, but which are interconnected because they are logical and historical. We are referring to fluency and interdependence, because, as Rosental & Straks (1960, p. 331) state, “from the unity of the historical and the logical, the interdependence between both categories and the process of knowledge of effective reality may also be deduced” (our translation).

Both fluency and interdependence are present in both dossiers. However, for didactic reasons, this first dossier's main objective is to present readers with the theoretical and methodological foundations of the logical-historical movement, as well as possible perspectives that promote the teaching-learning-development processes of concepts related to school content, culminating in teacher education, focusing on the organization of teaching.

In other words, in this first dossier, readers will be able to appropriate concepts and nexuses that allowed researchers and teachers to expand the logical-historical dialectical category beyond the form of thought.

2 About the articles that make up the first dossier

In the first text, the Roberto Perides Moisés, when writing the article “Science and its three stories”, propose that we carry out an initial debate, which they call a *critical review*, on what we have *understood by Logical-historical*

Movement. He warn us that, in this state of the art, there is a need to question our certainties and understandings. Not even the concepts of number, numeral, and algorithm should escape this review.

The second article, “Ontological approach to the relationship between the logical and the historical regarding the process of knowledge” is the title that Iuri Kieslarck Spacek (IFSC), Vidalcir Ortigara (UNESC) and Ademir Damazio, gave to the article that presents an *alternative* that deals with the *relationship between the historical and the logical*. They adopt as a reference a *historical-social ontology* based on the studies by Lukács (2010, 2012, 2013, 2017). They also state that: *the relationship between the logical and the historical is considered fundamental for organizing a teaching sequence that is not reduced to a logical chain stripped of historical content, nor merely to a historical exposition, but constitutes a logical-historical sequence*.

“The logical-historical movement in theses and dissertations: a content analysis”, is the third article in the dossier, written by Marisa da Silva Dias (UNESP), Joice Caroline Fermino (UNESP), and Veridina Turcati (UNESP). Based on the mapping of theses and dissertations, it invites us to discover how the logical-historical movement came to be presented in studies that were developed from 1987 to 2020. The authors highlight the role of the logical-historical movement in Mathematics Education and that, in this context, *the most frequent function of the logical-historical movement is the historicized approach to the mathematical concept*. It is possible to observe the existing interconnections between the data studied by the authors and those analyzed by Sousa (2022), when the focus is on the area of Mathematics Education.

The fourth article, entitled: “A theoretical and methodological possibility for research on teaching: organization through the logical and historical category” was written by Anderson Gosmatti (UFPR) and Maria Lucia Panossian (UTFPR). The authors present us with *a discussion about the logical and historical category and its relationship with the research analysis unit, the Pedagogical Activity based on the Activity Theory*. They consider the *logical and historical category as an instrument of thought*.

The text “The organization of mathematics teaching in a historical-cultural perspective: considerations about the object of teaching activity for the development of theoretical thinking”, title of the fifth article that makes up the dossier, was written by José Antônio Araújo Andrade (UFLA), Conrado Jensen Teixeira (UFLA), and Welbert Vinícius de Souza Sansão (UFRB). Using conceptual maps, it presents us with a synthesis of the studies carried out by the *Research Group on pedagogical practices guided by Historical-Cultural Theory (PPTHC)*. With regard to the *organization of teaching*, it proposes *a philosophical discussion about the epistemology of knowledge, through the logical-historical dialectical unit as a methodology to investigate the essence of mathematical concepts*.

“The nature of mathematical knowledge and the historical dimension of the concept in the organization of teaching for meaningful learning” is the sixth article of the dossier and was written by Ana Paula Gladcheff (USP) and Neusa Maria Marques de Souza (UFMS). The authors present us with their *studies on the conceptual nexuses of the concept of measurement, which are defined as a link between concepts and which are fixed by the logical-historical movement of the concept, as well as a triggering learning situation developed with students from Early Childhood Education. They highlight the historical dimension of the concept as a necessary condition for organizing mathematics teaching in a meaningful way, as well as the relevance of the teacher's role as mentor of processes intentionally organized and mediated by culturally produced instruments*.

The seventh text is an essay written by Marta Sueli de Faria Sforini (UEM), Cleder Mariano Belieri (UNIFATECIE), and Carlos Roberto Beleti Júnior (UFPR) named: “Implications of analyzing teaching content in its logical-historical aspect for the definition of didactic actions”. It presents us with reflections on *how the analysis of the logical-historical movement of the content to be taught theoretically instrumentalizes the teacher in defining teaching actions aimed at developing students' theoretical thinking*. The authors argue that *the analysis of the logical-historical movement allows us*

to identify what is central to understanding the conceptual system of the teaching object, as well as recognizing the various objects and phenomena that may gain intelligibility through their appropriation. These fundamentals are presented in two distinct analyses: between the content *changes in the physical state of water* in a given teaching material and *changes in the physical state of water* in the *logical-historical aspect*.

Of the eleven articles that make up the first dossier, four of them are directly related to teacher education research. The methodological elements with principles of educational research linked to the Cultural-Historical Theory and Activity Theory stand out.

Thus, the eighth article, written by Isauro Beltrán Núñez (UFRN), Betania Leite Ramalho (UFRN), and Luiz Fernando Pereira (UFRN), presents us with reflections on the “Diagnosis of professional teaching thinking as a guiding activity. Contributions of P. Ya. Galperin’s theoretical system”. When studying the professional development of teachers, the authors *consider the dialectic between the historical and the logical, important categories that reflect the process of temporal and logical development of the object of study to reach its current level*.

“Mathematics Club and Teacher Education for Elementary Education I: Weaving Possibilities” is the title of the ninth article, written by Maria Marta da Silva (UEGO) and Manoel Oriosvaldo de Moura (USP). The authors indicate that the training experiment *with* teachers may be understood as a *methodological path* of research. In this context, *the teachers understand the Club as a training environment in which the teaching and learning of the object of knowledge may be organized based on the structure of the Teaching-Orienteering Activity, through the valorization of the logical-historical movement of concepts*.

Still in the context of initial teacher education, the tenth article, named “Logical-historical movement of the concept and organization of teaching: contributions to the training of teachers who will teach mathematics”, by Maiara Luisa Klein (UFSM), Anemari Roesler Luersen Vieira Lopes (UFSM), and Simone Pozebon (UFSM), presents us with

reflections on *the study of the logical-historical movement of the concept as a driver of discussions about the teaching of mathematics, resulting from a sharing space between students of the Degree courses in Special Education, Mathematics, and Pedagogy*. From the analysis of a scene that meets the objective outlined, *it may be seen that becoming a teacher who will teach mathematics requires study activity regarding the logical-historical movement of constituting the concepts to be taught, which may result in new meanings assigned to training and enable the organization of teaching aimed at the students' development*. There is here *the defense of the logical-historical movement of the concept as a didactic perspective for teaching Mathematics*.

“Development of algebraic thinking in Early Childhood Education teachers in the context of continuing education” is the title of the eleventh article, written by Fernanda Cristina Ferreira Santos (UNIFESP) and Vanessa Dias Moretti (UNIFESP). Here, *the methodological aspects were based on dialectical and historical materialism and data production took place through a formative experiment organized based on the Teaching-Orienteering Activity, with Triggering Learning Situations that considered the logical-historical movement of algebra, with a view to approaching the essence of algebra and algebraic conceptual nexuses*. The authors also present *scenes from the formative movement of one of the teachers participating in the experiment, allowing the identification of possible overcomings in the way the teacher defines what algebra is, in addition to her understanding of fluency, variation of magnitudes, variable, and field of variation, in a movement from the general to the particular, that is, the search for general rules that resolve particular situations*. They argue that, *with the impossibility of reproducing history in its entirety, the logical-historical movement makes it possible to highlight the essential elements of the concept, thus essential to the development of theoretical thinking*.

3 Final Considerations

The first dossier: “Logical-historical movement of concepts: fundamentals, teaching and research” is made up of texts elaborated by researchers from different areas and universities.

They arise from studies and research that are based on the Cultural-Historical Theory and the Activity Theory, both based on Dialectical and Historical Materialism.

As researchers appropriate the logical-historical dialectical pair, they begin to expand it in the sense of seeking and indicating paths that may give movement to the thinking of those who teach and learn.

In other words, the logical-historical movement may help us rethink the processes of teaching-learning-development of curricula, conceptual nexuses of content dealt with at different levels of education, in teacher education, in the elaboration of triggering learning situations, and in the configuration of research methodologies, as well as contributing to theoretical reformulations related to both Didactics and Teaching Methodology.

Movimiento lógico-histórico de los conceptos: fundamentos, enseñanza y investigación

RESUMEN

Este texto tiene como objetivo presentar el primer dossier: “Movimiento lógico-histórico de los conceptos: fundamentos, enseñanza y investigación” compuesto por textos de investigadores de diferentes áreas del conocimiento, como Educación, Educación Matemática y Psicología. Los artículos muestran cómo los investigadores se han ido apropiando del movimiento lógico-histórico a medida que realizan sus investigaciones. Parece que el binomio dialéctico lógico-histórico se ha configurado desde una forma de pensamiento hacia una perspectiva Ontológica, Didáctica, Metodología de la Enseñanza y Metodología de la Investigación en la formación docente.

Palabras clave: Formación docente; Investigación en Educación Matemática; Didáctica.

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