Obutchénie
Revista de Didática e Psicologia Pedagógica

DOI: http://doi.org/10.14393/OBv8.e2024-31

Logical-Historical Movement of Concepts: Teacher Training, teaching and research[1]

Movimento lógico-histórico dos conceitos: formação de professores, ensino e pesquisas

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ABSTRACT
The purpose of this article is to present the second dossier about the "Logical-historical Movement of Concepts: teacher training, teaching and research". Most of the authors explore the logical-historical movement of mathematical concepts in their articles, to arrange the teaching and promote continuing teacher training processes that go beyond traditional teaching methods. Therefore, the necessity to rescue historical bases of mathematical knowledge is perceived and in some instances the suppositions of the Teaching Guiding Activity are adopted for developing teaching situations for students or for the training process of teachers who approach situations that trigger learning.

Keywords: Teaching organization; Teacher Training; Mathematics Teaching; Logical-historical.

RESUMO
O objetivo do texto é apresentar o segundo dossiê sobre o "Movimento lógico-histórico dos conceitos: formação de professores, ensino e pesquisas". Em sua maioria, os autores em seus artigos exploram o movimento lógico-histórico de conceitos matemáticos para organizar o ensino e/ou promover processos de formação continuada de professores que superem as formas de ensino da didática tradicional. Para tanto, percebe-se a necessidade de resgatar bases históricas do conhecimento matemático e em alguns casos são adotados os pressupostos da Atividade Orientadora de Ensino, para elaboração de situações de ensino para estudantes ou para o processo de formativo de professores que se aproximem de situações desencadeadoras de aprendizagem.

Palavras-chave: Organização do ensino; Formação de Professores; Ensino de Matemática; Lógico-histórico.

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DOI: http://doi.org/10.14393/OBv8.e2024-31

1 Introduction

This article presents the second dossier that gathers articles about the logical-historical movement within the episteme of historical-dialectical materialism. There are two dossies that intended to disseminate studies and research, the first one titled "Logical-historical movement of concepts: fundamentals, teaching and research" and the second one "Logical-Historical Movement of Concepts: teacher training, teaching and research", both comprise articles that fall into at least one of the following themes: 1) didactics (general and specific); 2) pedagogical psychology; 3) historiographies; 4) teacher training; 5) teaching practices in the different areas of education; 6) the historical aspects of the concepts dealt with in the different teaching segments; 7) the conceptual links between the content covered in the areas of knowledge and teaching segments; 8) the learning situations dealt with in the different areas of knowledge and teaching segments and 9) the epistemological and methodological foundations of this approach.

This second dossier gathers articles that reveal approaches to the logical and historical movement in the organization of teaching and teacher training. By means of reading these articles it is possible to recognize the theoretical and epistemological understandings of the logical-historical movement and the ways in which researchers and teachers approach it in the process of organizing teaching.

As in the first dossier published, the articles provide some answers to theoretical and practical questions. In addition to the issues already presented in the first dossier, we add:

1) What are the possible ways of studying the logical-historical movement of different concepts during the teacher training process?

2) What earnings can be obtained for the student learning from pedagogical practices organized in such a way as to consider the logical-historical movement of concepts?

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It should be considered that as a philosophical category from a dialectical perspective, logical-historical study as a form of thought makes it possible to express knowledge of the universal properties and connections of reality and is indispensable for human development in relation to solutions for practical tasks that arise socially (CHEPTULIN, 1982).

Knowing and interpreting the historical movement of events (objective reality) according to the movement of thought (logic) in different times, spaces and social contexts becomes fundamental for the development of the process of human's knowledge of reality and thus needs to be maintained in the process of organizing education and training for future generations.

It is through the study of the logical-historical movement of concepts that human beings can get access to an understanding of objects and phenomena in their essence. However, this essence does not reveal itself if the relationship between humans and the objects and phenomena of reality is merely utilitarian (KOSIK, 1976) or based on appearance, perceptible elements expressed in language superficially.

How can teaching and the teacher training process be organized in such a way as to consider access to knowledge that expresses the transformations and changes of objects and phenomena, considering the conceptual links and interdependent relationships within a system?

To enable this movement, some of the articles in this dossier reinforce the necessity to address the logical-historical movement with the ways of organizing teaching (for example, the Teaching Guiding Activity) for the development of theoretical thinking, from a Davydovian perspective, which considers the content of theoretical thinking as "the domain of objectively interrelated phenomena that constitute an integral system" (DAVYDOV, 1982, p.306). It is from this perspective that the logical-historical movement can be considered as an element of Didactics and also of Teaching Methodology, thus becoming a didactic perspective for teaching.

Most of the articles in this dossier are focused on teacher training processes and the organization of teaching with a focus on mathematical thinking or related

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themes such as computational thinking. According to Sousa (2018), "...the history of mathematical concepts only makes sense in the classroom when teachers and students understand the movement of abstractions of thought that have constituted the formalizations we study" (p. 58).

The investigated practices and the developed and introduced syntheses in the articles are intended to overcome the traditional didactic processes crystallized in our schools, which ignore the historical movement and the needs from which mathematical concepts were developed and systematized.

So, you are invited to read the articles that make up this dossier and the possibility of understanding and insights that will inspire you to think about ways of organizing teaching that consider the logical-historical movement of concepts not only in the area of mathematics, but also in other areas. The following item contains a concise presentation of each of the articles.

2 Regarding the research comprising the dossier

In the article *The logical-historical movement of the concept of computational thinking,* the authors Eloisa Rosotti Navarro, Maria do Carmo de Sousa and Emerson Rolkouski carry out a logical-historical study of the concept of computational thinking based on the main Brazilian scientific production databases. The article points out that this concept transcends computer programming language and, in Mathematics Education, is discussed in relation to problem solving and algebraic and algorithmic thinking. In a general way, the study interweaves mental operations such as mathematical logic, abstraction, generalization, formalization of patterns and regularities, and the creation of models in the constitution of this concept.

The article *The historical movement of the contributions of Grassmann's extension theory to Linear Algebra* written by Julia Santana Garcia, Aline Mota de Mesquita Assis and Márcio Dias de Lima, comes from a bibliographical survey and discusses the logical-historical movement in the methodology and development of Linear Algebra. It describes the relations between the production and dissemination of knowledge associated with Grassmann's training and his

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professional work, the paradigms of mathematical knowledge production at the time and the parameters for taking decisions in academic circles. In the logical and historical movement of the concepts surrounding Linear Algebra, the authors describe Grassmann's contributions, posthumously recognized mainly by Peano's work, which highlights the concepts elaborated more philosophically by Grassmann, but in a formalized language. The article details the concepts of vectors, vector space, linear dependence and independence, bases, dimension and linear transformation through the categories of essence, fluency of algebraic concepts, theoretical thinking, internal and external nexus in the movement between the logical and the historical in the historiographical productions of Grassmann and Peano, which are reflected in the most current works of Linear Algebra used in Higher Education.

Wilson Francisco de Rocha Lima develops a didactic sequence for developing the concept of polyhedrons, based on historiographical studies, in which the relationships established between geometric solids and constellations are exposed, as well as the historical, social and epistemological contexts in the formation of thought. Within this movement, the author highlights the influences of the different scientific paradigms experienced by geometric objects, until arriving at the so-called Euler Relation, whose thinking is directed towards the regularities of certain attributes, without leaving out the contributions to the emergence of Topology later.

Camila Fernanda Biolcatti Viviani's article, by proposing a discussion on the intentional organization of teaching based on developmental didactics and the Guided Teaching Activity, and on learning under Historical-Cultural Psychology as a guiding theory to understand the learning necessary for child development, invites the reader to reflect on: How can Early Childhood Education be conceived under the logical-historical movement? Defending the development of theoretical thinking from Early Childhood Education, the author discusses the purposes of pedagogical activity and introduces, considering the Guiding Teaching Activity, a situation that leads to the learning of measurements using a story from children's literature.

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Kindergarten is also explored by Patrícia Pereira in *The relationship between form and content of the conceptual nexus of counting in online classes for children in the first year of elementary schoo*l. The author analyzes lessons from the Media Center for Early Childhood Education produced by the São Paulo State Department of Education during the period of social isolation due to the pandemic caused by the COVID-19 virus. The article introduces the relationship between form and content in the conceptual nexus of counting, based on the logical-historical movement. In addition, the author examines the approach to this concept in video lessons, based on the teaching activity as a promoter of the development of theoretical thinking which, in turn, is formed by the conceptual nexuses of the concept.

In his article, Alan Kardec Carvalho Sarmento reflects on the concept of measurement under the episteme of formal logic and the logic of historical and dialectical materialism. The author explores the logical-historical movement of thought on measurement based on some historiographies that show intertwined social, economic and political relations, understood at different times by different civilizations. In this journey, he emphasizes the ephah unit of measurement that appears in the Mosaic pentateuch, the scales in Egyptian mythology, the conflicts between civilizations over the control of measurements, the impact of measurements on agricultural civilizations and their scientificity.

Bruno Tizzo Borba and Fabiana Fiorezi de Marco also present a study on measures but focused on the teaching of perimeter and area. The main focus is the role of the concept's internal links in the logical-historical movement and the approach to the need to control the variation in the amount of arable land after flooding by the River Nile. This problem required human thought to find a solution involving mathematical concepts and practical method. The historical background to units of measurement presented, especially length, goes through anthropometric units, socio-political interests, attempts to standardize and create a metric system, without leaving out the discussion of justice in relation to falsifying a measure. To conclude, the authors outline how their studies led to the creation of a teaching situation.

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Lukas Adriel Francisco Alves and Maria Marta da Silva discuss the logical-historical movement in mathematics teacher training. The Mathematics Club is the place where teachers in initial training study and discuss historiographies, plan the organization of teaching, develop teaching activities with students and evaluate actions and results. Research into the formation and development of mathematical concepts is reflected in teaching organizations and, dialectically, in the training of future teachers. The article details two episodes that describe the work, assumptions and training activities.

The Math Club as a space for teacher training is also addressed by Organdi Mongin Rovetta, Sandra Aparecida Fraga da Silva and Dilza Côco in *A logical-historical movement of geometry and formative actions in a Math Club*. The logical-historical movement's contribution is mainly related to the study of concepts with the purpose of appropriating theoretical knowledge and developing theoretical thinking. The training activities are organically articulated with the teaching activity, emphasized as the main one in the pedagogical work, and based on the Historical-Cultural Theory, Activity Theory and Teaching Guiding Activity. The studies of geometry by the Club's participants cover the observation of nature by human beings and their action on it, sensory geometry and the relationship with the arts, as well as formal and scientific geometry in the context of human development, both for solving practical and theoretical problems.

The article written by Ramón F. Ferreiro Gravié introduces a method for writing the definition of concepts. Besides explaining the function of concepts in human thought, the author defends the idea that defining concepts helps to understand the essence and depth of what is being studied or researched. He describes the structure of the technique in three pillars: specifying the determinant, listing the attributes and expressing complements.

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3 Final considerations

The organization of this dossier, which deals with the "Logical-Historical Movement of Concepts: teaching and research – teacher training and organization of education," contains articles from researchers that have adopted the theme of logical-historical in their investigative processes, articulated with teaching processes.

In this way, they contribute with deeper studies about the logical-historical movement of constitution of concepts as well as linear algebra, based on the historiographical productions of Grassman and Peano; and the concepts of measurement constituted over different times and spaces.

The reading of the articles also reveals possibilities for organizing teaching from a logical-historical perspective at different levels of education, with proposals being presented from kindergarten onwards.

The situation that fosters learning, from the perspective of the Teaching Guiding Activity, which considers the conceptual links derived from the study of the logical-historical movement, presents itself as a possibility for the organization of teaching in research.

The development of theoretical thoughts based on the organization of teaching in the logical-historical movement is also revealed as a result of the research presented as part of this dossier.

The Math Club as a space for teacher training is presented in two of the articles as a possibility for the study and collective planning of teaching situations from a logical-historical perspective.

In summary, the results of the research associated with teaching processes in the articles presented in this dossier reveal some of the possibilities for comprehending the logical-historical movement of concepts in the process of organizing teaching and teacher training, with the purpose of developing forms of theoretical thinking in students and teachers.

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Movimiento lógico-histórico de conceptos: formación de profesores, enseñanza y investigación

RESUMEN
El objetivo del texto es presentar el segundo dossier sobre el "Movimiento lógico-histórico de los conceptos: formación de profesores, enseñanza y investigación". La mayoría de los autores exploran en sus artículos el movimiento lógico-histórico de conceptos matemáticos para organizar la enseñanza y/o promover procesos de formación continua docente que vayan más allá de los métodos de enseñanza tradicionales. Para ello, surge la necesidad de rescatar bases históricas del conocimiento matemático y en algunos casos se adoptan los supuestos de la Actividad Orientadora Docente, para la elaboración de situaciones de enseñanza para estudiantes o para el proceso de formación de docentes que abordan situaciones desencadenantes del aprendizaje.

Palabras clave: Organización de la enseñanza; Formación de professores; Enseñanza de Matemáticas; Lógico-histórico.

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Received in June 2024
Approved in July 2024