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UNDERSTANDING MATHEMATICAL LANGUAGE IN CLASSROOM ACTIVITIES, AS A RESOURCE TO IMPROVE LEARNING BASED ON THE THEORY OF SEMIOTIC REPRESENTATION

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Summary
This article brings to light the discussion about the difficulty in understanding mathematical language by elementary school students, as a learning resource for success in activities and for the appropriation of knowledge based on the concept of semiotic review presented by Raymond Duval. The research aims to investigate the importance of understanding mathematical language in classroom activities.class, as a resource to improve learning based on the theory of semiotic representation. One of the major problems highlighted in elementary school concerns the difficulties in learning Mathematics, many of them due to students' lack of assimilation of the formulas and symbols that make up their language.considering the semiotic system the register of representation as an important factor to meet the functions related to cognition based on the representation and conversion of this language.In this sense, the investigation contributes to discussions related to the difficulties presented by students in relation to understanding mathematical language and success in carrying out activities corresponding to the content proposed by the curriculum syllabus for elementary education. This is a literature review based on an exploratory descriptive methodology, with a qualitative approach related to the topic, based on research carried out on the main scientific research sites such as Google Scholar and SciElo..Mathematical language comprises a process of translation or conversion from natural language to a formalized language, specific to that discipline. This characteristic constitutes, in many cases, obstacles to the process of appropriating concepts necessary for learning.
Keywords: Language. Mathematics. Elementary School.

ABSTRACT
This article brings to light the discussion about the difficulty in understanding mathematical language by elementary school students, as a learning resource for success in activities and for the appropriation of knowledge based on the concept of semiotic review presented by Raymond Duval. The research aims to investigate the importance of understanding mathematical language in classroom activities, as a resource to improve learning based on the theory of semiotic representation. One of the major problems highlighted in elementary education concerns the difficulties in learning Mathematics, many of them due to a lack of assimilation on the part of students of the formulas and symbols that make up their language, considering the semiotic system, the register of representation , as an important factor in meeting the functions related to cognition from the representation and conversion of this language. In this sense, the investigation contributes to discussions related to the difficulties presented by students in relation to understanding mathematical language and success in carrying out activities corresponding to the content proposed by the curriculum syllabus for elementary education. This is a literature review using an exploratory descriptive methodology, with a qualitative approach related to the topic, based on research carried out on the main scientific research sites such as Google Scholar and SciElo. Mathematical language comprises a process of translation or conversion from natural language to a formalized language, specific to that discipline. This characteristic constitutes, in many cases, obstacles to the process of appropriating concepts necessary for learning.

Keywords: Language. Mathematics. Elementary School.

1. Introduction

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The present study arose from the anguish that professionals who work in teaching mathematics feel when seeing the difficulties that their students encounter regarding reading and the appropriation of symbols and icons related to mathematical representation and their correspondence with formal language as a preponderant factor for the understanding and execution of activities present in the mathematical context culminating in learning and understanding for the realization of knowledge. Understanding mathematical symbols has always been one of the biggest obstacles to student performance for many students and from then on they suffer consequences due to not understanding with ease and quality what they are expected to understand.

It is common that many of these people are unable to decode the reading of a formula with unknowns and often fail to carry out a simple activity because they do not make the necessary effort, such as, for example, the act of solving a calculation equation and developing the reasoning sequence. mathematical logic based on the readings carried out and the understanding of what is really expected at the end of the operation.

These factors often become traumatic for the mathematical understanding and reading that are necessary to carry out the activities and lead to a precarious experience of the interpretative process, which contributes to deficiencies in the accuracy of reasoning due to not understanding the that is read or thought, which we can briefly call textual interpretation.

In this sense, this article is guided by the discussion about the difficulty in understanding mathematical language by elementary school students, as well as the importance of maintaining a good understanding of this language for success in activities and for the appropriation of knowledge, considering how The basis for this reflection is the concept of semiotic review presented by Raymond Duval.

The desire to investigate the causes of problems related to the appropriation of knowledge in relation to reading and interpretation that contribute to the meaning of mathematical language and that it is pertinent to search for solutions to minimize the losses resulting from these in the search for perfection and improvement the quality of the work to be carried out.

It is necessary to move forward in search of the reading that one expects to have, the understanding of what one wants to understand and the perfect and efficient communication that one wants to establish between the reader and the object of knowledge, or even through the appropriation of knowledge pertinent to this interaction. Faced with such situations and seeking to find ways to minimize such situations in the context that we carried out the aforementioned study based on the concept of semiotic review presented by Raymond Duval.

Understanding mathematical language

Determine the importance of the meaning of mathematical language as a way of better understanding texts and contexts related to learning in elementary school, a factor that creates a gap in their training and in several cases a distance from contact with teaching and learning activities.

This distance, often generated by the lack of understanding of what is expected in a mathematical sentence and how to interpret the opportunities of being at school, also favored the inversion of values and needs and what should be learned with each grade/year passed. to be forgotten or considered unnecessary or of little importance. This happens primarily with the habit of daily reading and reflecting on what you read.

In this sense, it is clear that many students have a high degree of difficulty in understanding mathematical statements, which generates distortion in the execution of activities and in the presentation of results, which makes them susceptible to further withdrawals and poor training.

The discussion about the difficulty of understanding mathematical language, as well as the importance of maintaining a good understanding of this language for success in activities, culminates in the necessity for the appropriation of knowledge based on the concept of semiotic review presented by Raymond Duval, with the aim of increasing the understanding of mathematical language as a process of translation or conversion from natural language to a formalized language, specific to this discipline.

This characteristic constitutes, in many cases, obstacles to the process of appropriating concepts necessary for learning.

In Mathematics, a semiotic system is considered a register of representation if it meets three fundamental activities of cognition: the formation of a representation that is identifiable, the treatment of this representation and the conversion, because:

> Communicate mathematically, that is, describe, represent and present results accurately and argue about your conjectures, using oral language and establishing relationships between it and different mathematical representations. (PCN-MATEMATICA, 1998, p. 37).

In this sense, the appropriation of this knowledge contributes to discussions related to difficulties in understanding mathematical language and its relationship with academic success that Raymond Duval in his concept of semiotic representation, that according to this author, students have difficulty learning due to the fact that mathematical objects do not have physical existence.

Therefore, it is not enough to just know the language, but it is necessary to appropriate this form of communication, as evidenced bySim-Sim, Silva and Nunes:

> Acquiring and developing language involves much more than learning new words, being able to produce all the sounds of the language or understanding and using grammatical rules. It is a complex and fascinating process in which the child, through interaction with others, (re)constructs, naturally and intuitively, the linguistic system of the community in which they are inserted, ie, appropriates their mother tongue. At the same time as acquiring their mother tongue, the child uses that language to communicate and, simultaneously, learn about the world. (SIM-SIM, SILVA and NUNES, 2008, p. 11).

One of the factors that facilitates the analysis of reflection on the habit of reading the context of sentences and mathematical statements on the part of elementary school students is the difficulties they present when carrying out their interpretative activities and consequently embarking on the process of formalizing knowledge, acquiring the reading skills that are necessary for their full personal and professional development, as this is the main means by which we acquire knowledge, and Mousinho (2008, p. 298), reports that: “language is an important factor for the development and learning. The mother tongue would be an indispensable linguistic basis for reading and writing skills to be established”.

However, most mathematics studies are associated with carrying out calculations and logic, this leads them to act mechanically, already starting in search of a presumed result from deciphering the unknowns and numerical expressions of each exercise, and as Silva (2009, p. 72) mentions, “mathematical language has a set of its own symbols, codified and related according to certain rules”.

These mathematical operations follow a model and most of the time present a large repetition of activities with the same purpose. This means that mechanical action takes over a large part of the activities, and many students do not understand why and how they achieved the result obtained, given that:

> as an activity on symbols and representations, language makes abstract thinking possible, the construction of descriptive and explanatory systems and the ability to change them, reorganize them, replace one with another (BRASIL,1998 p. 20).

In view of the above, we can state that a project organized around understanding the language associated with the mathematical context, enabling a better understanding of the statements and the characteristic elements that make up the different expressions of calculation and reasoning that generate success in learning, as reading aims to a better understanding of the entire process.

This gap between linguistic understanding and statements and formulas is a common fact at all levels of education and modalities and causes serious problems in relation to the appropriation of reading.

theme and its full development to be carried out in a discipline that needs to be understood for learning to become effective, with Silveira (2014, p.48) highlighting that:

> The interpretation of mathematical texts in mathematical language and natural language requires knowledge of mathematical vocabulary that is linked to knowledge of concepts, as well as requiring the practice of following mathematical rules.

By analyzing the factors that lead to reading difficulties, it is possible to take ownership of the language

mathematics as a way of better understanding meanings that in turn are translated or expressed through certain symbols, signs, language, graphics, figures, models that create meaningful reproductions that can be called knowledge in a satisfactory way and consistent with the degree of knowledge necessary, in order to use strategies that can fill the gaps in reading comprehension and interpretation. Such symbols must be understood and decoded as knowledge appropriation inseparable from the process of constructing mathematical knowledge. (LORENSATTI, 2009).

According to Lorensatti (2009), understanding and appropriating this language becomes very essential for carrying out activities successfully, which generates success in learning Mathematics, thus, a good association with the Mother Language is necessary, familiarizing it with the universe da Mathematics., highlighting the need to understand the registers of semiotic representation based on Raymond Duval's theory, and which Machado (2003) presents as being of great importance for the study of the complexity of learning in mathematics.

The author also refers to the studies carried out by Duval (2003) on semiotic representation records as one of the best possibilities for success in learning mathematics. Semiotics is the study of signs, which consist of all elements that represent some meaning and meaning for human beings, covering verbal and non-verbal languages.

Materials and methods

The present study's method of execution is a literature review, carried out in the main sources of scientific research in material available on academic study websites, from platforms such as Google Scholar and Scielo. The elaboration of textual production follows the descriptive model whose purpose is to describe the systematic and logical steps that guide all scientific investigation, with the aim of collecting reliable and valid information, to generate new knowledge (NORONHA and PEREIRA, 2000).

In this way, it is understood that the research methodology defines the way of conducting research, being an instrumental concern, as it is related to the ways of doing science; highlighting procedures, tools, and the paths taken. For the development of this study, the research methodology used addresses a qualitative nature.

This is a scientific research work whose purpose is pure methodology based on bibliographic studies, according to Gil (2010, p.29-31) “bibliographic research is prepared based on already published material”. This procedure is conceptualized by Gil (2010, p.37) as “a deep and exhaustive study of one or a few objectives, in a way that allows broad and detailed knowledge”.

The literature review is the research method that seeks to analyze a field of knowledge in search of an answer to a specific question. Therefore, “Literature” covers all relevant material that is written on a specific topic, whether through books, periodical articles, newspaper articles, historical records, government reports, theses and dissertations and other types. NORONHA and PEREIRA (2000).

According to Alves Mazzotti, (2002) the literature review or bibliographic review therefore exalts two primary purposes that can be described as the construction of a scenario for the problem and the analysis of the possibilities present in the literature consulted to design the resolution of the problem. problem presented now.

In the work proposed here, it is clear that the most appropriate literature review is a literature review, which consists of constructing a broad analysis of the literature on the problem, contributing to discussions on research methods and results, as well as reflections on carrying out future studies on the topic.

Results and discussions

It is through relationships through the mastery of language that human beings communicate, understandings, consensuses and all forms of interpretation arise, whether from cultural transmissions or from innovations and new learning. It is then clear that the mother tongue is a fundamental part of the teaching and learning process, especially at school (MACHADO, 2011).

In its various variant means, language uses its code as a form of interaction for human beings, as a lively and dynamic way of communicating with others in the exchange of information, spreading ideas and concepts and thereby formalizing knowledge, which will be appropriated among all the interested.

However, among modern men the understanding of the need to appropriate reading as a preponderant factor of their individual and professional growth must be combined with the need to increase the construction of understanding of different knowledge, especially related to reading and thus breaking with the impediments in communication and reception of messages, based on natural language, this term used by Granel to refer to the usual mother tongue of a people.

> in natural language the meaning attributed to the words used is too broad and, for this reason, these terms generally do not express the necessary rigor of a formalized language, that is, in natural language the meaning of words is much more vague and imprecise; terms such as long, narrow, wide, small, large, very, etc., which are part of natural language to express magnitudes, are not always applied in a formalized language. (GRANELL, 2003, p. 260).

For the teaching of Mathematics, it acts as a basis for the meaning of concepts and ideas, contributing to the understanding of its language and the learning of mathematical knowledge (CÂNDIDO, 2001; MACHADO, 2011). Therefore, it can be said that for this to actually happen, the use of language, in addition to helping a lot with the growth within the human being, becomes a means of developing communication. In this sense, Lorenzato (2010, p. 43), highlights that:

> Mathematics also has its own language that presents itself with its terms, symbols, tables, graphs, among others" which, because it is summarized and precise, has its own expressions, rules, words and symbols.

Thus, in relation to mathematical conceptualization, words take on meanings that are different from those used in everyday life. For example, the phrase reduce to the same denominator is often used in classes on fractions. "Reduce", for most people, in their daily lives, means "making smaller". Therefore, if there is no understanding of the meaning of these words in a mathematical context, it is unlikely that a student will use the term *reduce* with the meaning of converting or exchanging.

Given such importance to language and the way of expressing oneself satisfactorily, we can say All prior knowledge is of great relevance in that it is clear that even when referring to language, there are expressions that take on their own connotation when they are related to mathematical situations, as Machado (2011, p. 83) explains:

> Both Mathematics and Mother Language constitute systems of representation, built from reality and from which the meanings of objects, actions and relationships are constructed. Without them, we would not build ourselves as human beings. (MACHADO 2011, p. 83).

Granell (2003), reports that changes in the way Mathematics is represented go unnoticed by students, who most of the time are unable to match mathematical expressions and signs with their mother tongue, creating difficulties in understanding the meanings.

This set of symbols and rules must be understood by the community that uses it.When it comes to teaching Mathematics, Silva (2009, p. 72) reiterates that "mathematical language has a set of its own symbols, codified and related according to certain rules". Therefore, its structure correlates with the components of written, oral and pictorial language, using natural language as a support language.

Skora, Junior, Stadler(2011, p. 4) highlight the importance of working on mathematical language from the initial grades, so that students understand the use of their mother tongue as a translation of what the question

Mathematics therefore represents theappropriation of this knowledge is inseparable from the construction process of mathematical knowledge, andThe student's use of mathematical language is associated with the need for interpretation of this entire context, as referred to in the National Curricular Parameters for Mathematics in Elementary School II, highlighting the objective of:

> Use different languages — verbal, mathematical, graphic, plastic and body — as a means to produce, express and communicate your ideas, interpret and enjoy cultural productions, in public and private contexts, meeting different intentions and communication situations. (BRAZIL, PCN - MATHEMATICS, 1998, p. 09).

For Granell (1999), changes in the way Mathematics is represented go unnoticed by students, who most of the time are unable to match mathematical expressions and signs with their mother tongue, creating difficulties in understanding the meanings. In teaching Mathematics, the mother tongue acts as a support in the mechanisms that involve orality, reading, writing and translation of meanings, resulting in a parallelism in its functions for understanding, as:

> [...] to characterize the impregnation between Mathematics and the Mother Language, we initially refer to a parallelism in the functions they perform in the system of representation of reality, they complement each other in the goals they pursue, they are irreducible to each other and basic overlaps in teaching both (MACHADO, 2011, p. 95).

All this mathematical symbolism is gradually developed to describe areas of Mathematics, such as arithmetic and algebra, with:

> The development of the algebraic language went through three stages until it became reasonably stable at the time of Isaac Newton, even admitting that to this day we still have different symbols for the same representation. The stages were, the Rhetorical form, the one in which the verbal system is used and logically the written one in the way it is read, which was used in Egypt and Babylon; the Syncopated, which shortened some words, which we can consider as a transition phase between them; and symbolic. (VALENTIM, 2013, p. 06).

The problem related to the development of mathematical language needs to be interpreted in a natural way, in the same way that its representation occurs in such a way that this writing corresponds to the mathematical symbolism used (MALTA, 2004).

Understanding mathematics statements

Semiotics is the study of how human beings are able to interpret elements of communication, both verbal and non-verbal, enabling their understanding and real cognitive development. According to Santaella, (1983, p.2)

> Semiotics is the science that has as its object of investigation all possible languages, that is, its objective is to examine the modes of constitution of any and all phenomena of production of meaning and meaning.

As science is related to the study of all signs, involving all possible languages that express the significance of some element in nature and culture, semiotics can play great relevance in the teaching of Mathematics, asFidalgo and Gradim (2005, p.9) reiterate that:

> What types of signs are used to create messages, what are the formation rules, what codes do the interlocutors have to share with each other so that communication is possible, what are the denotations and connotations of the signs used, what type of use is given to them .

In this way, communication takes place in relation to mathematical symbols and objects, making it possible to appropriate these concepts and structures in a conceptual way in which the mathematical language is understood with all its significance so that communication can occur. However, it is worth remembering that good interpretation and successful understanding depend on the way in which the problems are structured and must contain achieve good cohesion and coherence, with its statement linking its elements in order to present a sequential organization and with the possibility of being interpreted (LORENSATTI, 2009, p. 95).

Therefore, it is understood thatin mathematical language, according toLorensatti (2009)there is a process of "translation" from natural language to a formalized language, specific to this discipline, which according to Granell (2003, p. 261 "is what allows mathematical concepts to be converted into more easily manipulated and calculable objects", a factor of great relevance to enable thestudent involvement with the discourse presented, developing mathematical communication.

Regarding the presentation of mathematical situations to students, Menezes (2000) suggests:

> [...], for the teacher to ask questions and propose activities that challenge students' thinking. It is also believed that, following a student comment, the teacher should regularly ask "why?" or ask him to explain himself (MENEZES,2000, p. 9-10).

This way, when elucidating the problem situation, it is possible to think about the challenges, the resolution of these situations as an exercise, which uses routine solutions to a situation, in which there are repetitions of procedures and strategies (LORENSATTI, 2009).

Raymond Duval and semiotic representation

The theory of registers of semiotic representation developed by Raymond Duval emerged from studies on semiotics applied to mathematics carried out by Charles Peirce and Ferdinand de Saussure, with Moretti & Thiel 2012, p. 385 report that from it it is possible to understand "(...) the different semiotic representations of mathematical objects, which can be, for example, algebraic, fractional or figural".

Thus, learning mathematical objects takes place through conversions between different semiotic registers, and should be one of the priorities of mathematics teaching.

According to Duval (2003; 2012), mathematical activity manifests itself in terms of transformations of semiotic representations, distinguishing them into treatments and conversions. The author also reports that students' main difficulties in understanding are related to the diversity and complexity of these transformations that cannot be suppressed, as they are essential for learning mathematical concepts. For Duval:

> (...) the global understanding of a concept is the conversion activity that allows recognizing the same object in its different representations, and provides coordination between different registers of the same object, as going from one representation register to another is not just changing of treatment, is also to explain the different properties or aspects of the same object (DUVAL, 2003, p.22)

Duval also highlights that the language used in mathematics goes far beyond the correct interpretation of terms that are part of the entire linguistic concept and the etymology of words, as follows:

> (...)for the learning of a concept to occur, it is necessary to coordinate at least two representation registers of the same mathematical object and [...] this coordination is manifested by the speed and spontaneity of the cognitive conversion activity" (DUVAL, 2012, p. 282).

In teaching Mathematics, language acts as a basis for the meaning of concepts and ideas, contributing to the understanding of language and the learning of mathematical knowledge.Based on its representations, a factor that differentiates it from other disciplines, Duval also advises that in order to understand a mathematical concept, the mathematical object and its representations, and in different forms, cannot be confused.

Final considerations

Understanding mathematical language has become a factor in many studies carried out by professionals in the field, and it is clear that true understanding of this language needs to be interpreted in a natural way, as most mathematical symbols are associated with words in the language to establish relations of meaning, which can be defined as a symbolic system that relates to the construction of the sentences defined by the problem.

This difficulty is also present in the classroom when the teacher seeks to explain a language with its own symbols, as a broad view of the representation of language is not established.

However, it is clear that the possibilities and difficulties presented in the communication process which highlight other consequential problems that lead to a lack of association with the symbology of mathematics and the daily achievement of learning and understanding, based on the mathematical context within certain parameters of knowledge realization, which culminate in the appropriation of semiotic concepts.

In this sense, it can be stated that the concepts of language and reading do not go beyond just the act of reading or decoding linguistic signs, phonemes and sounds, or even in the tracing of graphemes,

but rather to the broad relationship between transmissions, contexts, extralinguistic elements, and mainly the understanding of what one wants to transmitmathematical language can be defined as a symbolic system, with its own symbols that are related according to certain rules.

Mathematics has a language that presents itself based on terms, symbols, tables, graphs, which has its own expressions, rules, words and symbols, resulting in the need to establish a semiotic system in which the representation record highlights the understanding of the fundamental activities of cognition representation and conversion.

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