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Mathematical interpretation of the myth, Prestative Bison: A look at Euclid's axiomatics

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ABSTRACT
In this work, I present some reflections on the interpretation of mythical narratives, with an emphasis on reflection and connection with Euclid's axiomatics, since Euclid's contributions generate possibilities for indicators that reflect the unique importance for the History of the development of Mathematics. Just as mythical narratives have a logical and reflective meaning between their lines, Euclid's axiomatics have a logical chain with sequence, meaning and sense, which gives those who face the challenge of change more opportunities to do things differently.

Keywords: Prestative Bison, Euclid's Axiom, Education.

INTRODUCTION

In this work, I present some reflections on the interpretation of mythical narratives, with an emphasis on reflection and connection with Euclid's axiomatics, since Euclid's contributions generate possibilities for indicators that reflect the unique importance for the History of the development of Mathematics. Just as mythical narratives have a logical and reflective meaning between their lines, Euclid's axiomatics have a logical chain with sequence, meaning and sense, which gives those who face the challenge of change more opportunities to do things differently.

From a contemporary perspective, students are not just looking for content or information just to pass the time, but also to keep up to date, form their own opinions and generate questions or arguments to discuss in relevant situations. For this reason, teachers can use these resources as a potential for disseminating knowledge, by respecting socially produced learning and knowledge (MENDES; FARIAS, 2014), as well as to engage students in pedagogical proposals, given that the purpose of everything new is to fill a need prior to its creation, speeding up its use.

From this perspective, the research question that best contemplates these discussions is how to interpret the mythical narrative through the possibility of contextualizing it with a mathematical topic? Therefore, due to the generality of the subject, we will present a learning proposal aimed at reading and interpreting narratives, whose product of understanding can reflect a dynamic of generalization of situations and contexts, expansion of knowledge, involvement and refinement of problematizations of school mathematical themes.

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In order to understand this universe, we begin our discussion by pointing out that Euclid's classic treatise on geometry, entitled *The Elements*, is of unique importance to the history of the development of mathematics, especially geometry, since his work occupies a prominent place in academic research, systematizes the knowledge of geometry, arithmetic and algebra acquired over time, appears with emphasis in the comments and references of many authors and presents as its most important aspect the organization of achievements in an admirable logical-deductive enchantment.

This is because it does not present geometry as a grouping of disconnected data, but develops a logic of demonstration and construction reflected in the written texts that were intended to contribute to reflection on the nature of knowledge. A characteristic feature of Euclid's Elements (2009) is that a small number of proportions and initial definitions are enough to demonstrate all the theorems considered and that geometric knowledge does not depend on experience or sensory evidence.

It presents a rigorous demonstration, has the exercise of construction as the result for a solution to a problem, its definition is like an abbreviation and it is constituted as a method of visual and legitimate reasoning that is not reduced to tools of illustration or images, since mathematics is idealized, imagined or projected from its practical applications. In it, "we learn what creative definitions are and how a conceptual understanding leads to the classification of relevant objects" (EUCLIDES, 2009, p.16). In the context of teaching and learning, it is essential to be clear that the basic elements of Euclid's geometry (points, lines, circles) demonstrate the existence of all the other figures he defines.

Geometric facts are not expressed numerically as they are for us today and each proposition is the result of definitions, axioms and previously proven definitions. For this reason, drawing techniques in geometric constructions were indispensable for giving visuality to materiality, resulting in one of the theoretical foundations of mathematics that is highly relevant, true in practice and remains unchanged. This process of movement, transformation and refinement reinforces that Euclid's innovation should be understood as an icon and an interest, rather than the testimony of a real application.

However, there is no certainty as to whether Euclid wrote the *Elements* for teaching purposes, or to limit himself to a set of mathematical knowledge of the time. What we need to be clear about is that this work, the *Elements*, is not just about Geometry, but there are many situations and contexts related to Arithmetic and Algebra. It comprises the axiomatic system that must satisfy consistency (no contradiction between the postulates), completeness (sufficiency between true or false proofs) and independence (one is not a consequence of the other). This idea is confirmed by VERGANI (2009, p. 44) when he says that "axioms remain supposedly true as long as no contradictions arise from their application".

In fact, what is essential in the art of creating mathematics is the formulation of appropriate definitions that use visible figures to establish arguments, when studying real or natural space, as the end point of a long reflection, from a material or concrete point of view. Therefore, the essence of logical-

cumulative reasoning requires mathematical knowledge that allows abstract concepts to be deepened and made more precise, while at the same time requiring a type of oral transmission for their understanding.

However, mathematical meaning and understanding is only possible thanks to a mixture of varied culture and the interaction of hypotheses and deductions, in such a way as to provoke an identification with what is properly human in what has been represented. As imagination is seen as an act of creation, the imaginary provides ways of projecting and making real the subjects of the unconscious that are not inserted in nature, such as geometric diagrams that are not figures, but materials of geometric science (EUCLIDES, 2009). This is because the mind does not directly mirror the reality of things, but transforms them into images that give us meaning and generate, in our imagination, the symbolic activities that are essential for reflection and the transmission of knowledge about existence.

Thus, based on (VERGANI, 2009, p. 37), we can ratify that "Mathematics are not sciences of certainties, but of coherences that are constantly questioned. They express doubts, desires and human struggles in search of meanings and values".

For a better understanding, we are invited to look through and beyond, seeking an understanding that fills in gaps and completes information. It must be made clear that imagination creates a context whose intellectual apprehension delimits both thinking and imagining, through a process of interpreting reality and/or the product of that interpretation, given that Euclid (2009) presents us with the primordial characteristics of mathematics in a much more general sense. This movement of thinking is provoked because in its essence lies everything that must be pursued in order to access relevant information, enter the world of the human being in depth and make real what is not present.

For this reason, The Elements constitute the creation and offer of an admirable and fascinating mathematics, which, in the face of our minds and a desire for will and action, allows us to generate possibilities for relating, ordering, configuring and signifying, not just with the limiting objective of indicating things, but above all representing things. From this perspective, it also includes inferences, awareness, memory, attention and learning, as it is the highest form of experiencing the meaning of reality in order to broaden our interpretation and overcome paths that are not obvious.

All this because "the world is the totality of facts. And facts cannot be strictly defined, only explained on the basis of what we understand to be the truth or falsity of a proposition" (VERGANI, 2009, p. 40).

It is in this movement that its representation plays an important role in the historicity of mathematical concepts and theories, with the aim of perfecting the thinking that we often have as a starting point for understanding that problems seek new geometric entities from a given set. For all these reasons, the Elements constitute the first and greatest example of a logical system with permanent

recourse to the visualization of concepts, which would become a model sought by other sciences to this day, in a renewal of the role of mathematical intuition, given its complexity in its practical use.

OBJECTIVE

Interpreting mythical narratives as a possibility for discussion and reflection, from a perspective that highlights the understanding of the mathematical notions that can be found in each of them.

METHODOLOGICAL PATH

The interpretation of the mythical narrative was offered to a group of approximately 7 mathematics teachers from the Southeast region, distributed between the municipal and state education networks and with teaching experience in primary and secondary education. The narrative was sent by e-mail and it was agreed that when it was finished they would return it. During the interpretative process, I asked them to do it individually, so that there would be no discussion between colleagues in the field, at the risk of duplication or proximity in the answers, and to set out on paper what had been understood, in each person's interpretative light.

The interpretative exercise carried out was categorical, based on some categories of analysis, which will be detailed and explained below, constituting the universe of narratives (terms, subject matter, objects of knowledge, arithmetic and geometric elements, protagonists, episodes, etc). These are: *protagonists* → the character or individual who has the greatest prominence in the works (main character); *episodes* → sequences of facts presented that enable the narrative to develop; *terms* → words or expressions that allow association with some mathematical content; *subjects* → the elements that constitute the construction of the action and mediation of conflicts so that the story develops.

And also: *Instruments* → sources of knowledge that provide the reader with a process of reflection; *arithmetic elements* → terms that refer to some relationship with the numerical sets whose elements are numbers; *geometric elements* → components that make it possible to relate to the basic elements of geometric figures; *other aspects* → general contexts illustrated by situations and mathematical interpretations structured through accounts of connected events, real or imaginary. Once these categories were clear, they agreed to identify the aspects of each one.

From a contemporary perspective, the flexible logic, reflected in an unlimited boundary between the objective and the subjective, made it possible to explore everyone's critical perception of the wealth of cultural diversity offered by the mythical narrative. This generative capacity exists because contact with it enabled the students to relate the abstract mathematical knowledge discussed and correlate it with that of the physical world, in a process of imagination or re-readings, in the mobilization of knowledge in the narrative.

Throughout the process, we were asked to carry out an interpretative exercise on the activity individually and to formulate the answers according to each person's understanding. We made it clear that there would be no right or wrong answer, but that every result presented would be important for later analysis and formulation of an answer as a result of the collective presentation. In view of this, the teachers were willing and collaborative.

DEVELOPMENT

Based on the idea of Aquino (2002, p. 38), who states that "school is not a place for disseminating information. It is a place for deconstructing information, so that it is possible to interpret what happens around us, before it and beyond it", we handed out the narrative *Myth 465: Hidatsa: the helpful bison* and asked them to explain the aspects identified from each category after reading it and to feel free to present any element that referred to any mathematical thought. The narrative is below:

MYTH 465: HIDATSA: THE HELPFUL BISON

In the past, a small, fat and ugly foreigner had challenged the Mandan in a game. They only lost. Bison-Woman, who lived in the village at the time, explained to them that the gambler was the Sun. As soon as he had collected all the stakes, enemies protected by him would attack the village and kill all its inhabitants. There was only one way to turn the tables: the young men had to invite the gods and give them their wives. Otherwise, the warriors from twelve allied villages, who were already on their way, would exterminate the population. The Bison-Woman not only organized the ceremony, she also got Lua's complicity so that he would bring Sol, luring him with the guarantee that a young, beautiful girl would give herself to him. Sol was not convinced. Twice in succession, Lua described the attractions of a party where people could eat and make love to their heart's content. To no avail. On the third night, advised by Bison-Woman, Lua told Sol that if he didn't make up his mind, the beauty he was destined for would sleep with someone else. So Sol went a little closer to the ceremonial hut and, on the fourth night, entered. The Bison-Woman immediately pulled him in, saying seductive words. She wanted to sleep with him, since he was the greatest of the gods. Sol felt cheated, because the Bison-Woman had already been his lover. However, in these circumstances, it's not allowed to refuse. He agreed, although he didn't like this rerun of an old adventure one bit. The effect of coitus would be as follows: like it or not, Sol's supernatural power would pass to the Indians, who would become his "children", through the "son's wife", who had previously been nothing more than a "daughter-in-law" and would now be called a "granddaughter" (Bowers 1965: 455). As a result, the Bison-Woman obtained the right to demand that he hand over the twelve enemy villages to the Mandan. Sol, devastated because his adopted son was fighting in the opposing camp and he would have to eat him when he was dead, along with all the other dead warriors, had no choice. They placed Sol sitting on the west side of the hut, which is the depreciated side (cf. Mefi), "because Sol embodied bad luck" (id.ibid.: 456, 457).

Table 1 - Myth 465

When he began to eat the plate of meat that was served to him, they ritually beat him, like a downed enemy. Then they set fire to the hut in various places so that the coals would illuminate the universe. The twelve hostile villages arrived, led by the son of the Sun. All the enemies died along with their chief, who was beheaded, with great difficulty, as his backbone was a very hard wooden stick (Cornus sp.). As the chief's head was also that of the hundredth victim, they paid homage to a serpent that lived in the water at the confluence of the Knife River and the Missouri River. Sol came down from heaven to claim the head, but the snake refused to give it up. Sol then set about making a replacement head with a mushroom of the genus Lycoperdon (wolf's bladder) and mugwort for the hair. But he couldn't resurrect the simulacrum and left crying. The Indians had won the match**.**

Source: (LÉVI-STRAUSS, 2004, p. 297-298)

Table 1 - Categories

Categories	**Aspects identified**
Protagonists	
Episodes	
Terms	
Subjects	
Instruments	
Arithmetic Elements	
Geometric elements	
Other aspects	

Source: Author's collection

As protagonists, they identified *Bison woman, the moon and the sun*. The episodes were characterized as being *the warning of the attack on the village and the possibility of the death of all the inhabitants, the organization of the feast ceremony, and combat between opposing bodies.* As for the terms, they highlighted *one, twelve, two (associating quantity), third, fourth, hundredth (relating to order - ordinal number), small (relating to size), moon and sun (associating circular shape), population (number of inhabitants), plate (geometric shape - usually circular or square).* As far as the subjects were concerned, they were *helpful Bison*. With regard to the instruments, they explained *the sequence of possibilities and facts presented through combat between opposing bodies.*

In this sense, they highlighted *quantity, ordinal numbers, the concept of number and size* as arithmetic elements. As for geometric elements, they highlighted *geometric shapes (circle, square) whose relationship can be explored with concepts of area, length and perimeter.* In this context, we can see that if the teacher has a well-planned activity with clear, objective guidelines, he or she can provide a lesson with a greater repertoire of knowledge, seeking to meet the needs of the students and the objectives of the school institutions. According to Araújo (2005, p. 23-24), it allows "the construction of knowledge, in order to contemplate the development of cognitive skills that instigate the student to reflect and understand, as they comprehend, store, manipulate and analyze the information they are able to interpret".

FINAL CONSIDERATIONS

Moving towards an enlightening synthesis, we see the connection between mythical narratives and Euclid's axiomatics as a possibility for contributing to the updating of new learning references. These references are geared towards themes in mathematics that seek new learning related to the ability to absorb new information through the flexibility to adapt to change. Therefore, in order to inspire students within schools and encourage them to feel an integral part of the process, it is important to provide ways to project and make real unconscious subjects that are not inserted in nature with the freedom to be authentic in the teaching-learning process. For this audience, it is essential to free them from repetitive tasks, which can be the starting point for any activity to develop skills and competencies.

In different ways, we realize that just like Euclid's axiomatic rigidity, mythical narratives have an interpretative principle that requires the social and cultural phenomena that emerge from them to be approached with the necessary care, seriousness and scientific depth. To this end, there is a double challenge in this context: to make them aware of being critical in their interpretative analysis, with consistency and reflective depth, and also of the way our potential students interact with them. In order not to lose ground and to make lessons more attractive, it is essential to contextualize issues, encourage reading on a wide variety of subjects, stimulate imagination to be seen as an act of creation and expand discussion as an opportunity to socialize problematizations arising from the reality and context of each student.

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