

THE MATH CLUB AS A SPACE FOR LEARNING AND TEACHING  
MATHEMATICS

*O CLUBE DE MATEMÁTICA COMO ESPAÇO DE APRENDER E ENSINAR  
MATEMÁTICA*

*EL CLUB DE MATEMÁTICAS COMO ESPACIO PARA APRENDER Y ENSEÑAR  
MATEMÁTICAS*



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**ABSTRACT:** The challenge of teaching mathematics so that everyone can learn has led teachers and researchers to reflect on possibilities for overcoming it. This article aims to discuss aspects that can contribute to the process of teaching and learning mathematics from the organization of teaching from the perspective of the Mathematics Club. The Mathematics Club includes students, teachers and future teachers in organizing actions aimed at public school students. Groups from several Brazilian institutions have used it and here we present data from research carried out in one of them, theoretically and methodologically supported by the Historical-Cultural perspective. The results indicate the training potential of the analyzed organization in relation to planning based on the logical-historical movement of the concept; the interaction between students mediated by language; assessment aimed at reorganizing actions; and understanding collective spaces as a possibility for development for everyone participants.

**KEYWORDS:** Math Club. Organization of teaching. Teaching. Learning.

**RESUMO:** O desafio de ensinar matemática de modo a que todos aprendam tem levado professores e pesquisadores a refletirem sobre possibilidades de superá-lo. O presente artigo objetiva discutir sobre aspectos que podem contribuir para o processo de ensino e aprendizagem da matemática a partir da organização do ensino na perspectiva do Clube de Matemática. O Clube de Matemática envolve alunos, professores e futuros professores na organização de ações voltadas para estudantes de escolas públicas. Grupos de várias instituições brasileiras o têm adotado, sendo que aqui se apresentam dados de uma pesquisa desenvolvida em uma delas, apoiada teórica e metodologicamente na perspectiva Histórico-Cultural. Os resultados indicam o potencial formativo da organização analisada em relação ao planejamento pautado no movimento lógico-histórico do conceito; da interação entre os estudantes mediada pela linguagem; da avaliação orientada para a reorganização das ações; e da compreensão de espaços coletivos como possibilidade de desenvolvimento de todos os participantes.

**PALAVRAS-CHAVE:** Clube de Matemática. Organização do Ensino. Ensino. Aprendizagem.

**RESUMEN:** El reto de enseñar matemáticas para que todos puedan aprender, ha llevado a docentes e investigadores a reflexionar sobre las posibilidades de superarlo. Este artículo tiene como objetivo discutir acerca de aspectos que pueden contribuir al proceso de enseñanza y aprendizaje de las matemáticas a partir de la organización de la enseñanza en perspectiva del Club de Matemáticas. El Club de Matemáticas involucra a estudiantes, docentes y futuros docentes en la organización de acciones dirigidas a estudiantes de escuelas públicas. Grupos de diversas instituciones brasileñas lo han adoptado, siendo que aquí se presentan datos de investigaciones realizadas en una de ellas, sustentada teórica y metodológicamente en la perspectiva Histórico-Cultural. Los resultados indican el potencial formativo de la organización analizada con relación a la planificación basado en el movimiento lógico-histórico del concepto; la interacción entre estudiantes mediada por el lenguaje; evaluación orientada a la reorganización de acciones; y entender los espacios colectivos como una posibilidad de desarrollo para todos los participantes.

**PALABRAS CLAVE:** Club de Matemáticas. Organización de la enseñanza. Enseñanza. Aprendizaje.

## Introduction

How to teach so that all students learn? The search for answers to this question has led to the expansion of discussions with the aim of trying to understand which approaches can overcome this challenge, in particular, those that potentially advance in relation to what has traditionally been used in teaching and that can impact learning. This is an issue that permeates teaching in the most different areas of knowledge and, at times, has represented greater difficulties for teachers who teach mathematics.

The possibility that there are some aspects that contribute to this teaching task, which is based on the didactic assumption that it is possible to organize teaching processes that can be more efficient than others (Moura, 2001), supported by the idea of Vygotsy (2005) that good teaching promotes development, guides the discussions in this article, which refers to a space we call the Mathematics Club (CluMat).

The presentation here of this organized space takes a different approach from what is traditionally known. Normally, when we refer to a club, we get the idea of a place where people who have an aptitude or affinity with mathematics come together and which involves actions such as competitions, contests or scavenger hunts with students who excel in this subject. We understand the importance of these clubs and consider them to enhance what they propose and to improve the knowledge of those who have a closer relationship with mathematics. However, preserving the essence of a club, as a group of people who come together, our perspective goes in the direction of involving all students in the Basic Education class in which it is developed, whether they have difficulties or not, based on the assumption that learning takes place in the interaction between these subjects with different knowledge. Furthermore, it can also be a teaching learning space for teachers and future teachers.

Based on the assumptions of the Historical-Cultural Theory, mainly the writings of Vygotsky (1896-1934) and, more specifically, the Activity Theory, of Leontiev (1903-1979) and the Teaching Guiding Activity (AOE), de Moura (2001, 2017), we bring the Mathematics Club to the discussion as a project that involves students, teachers and future teachers of Basic Education and Higher Education in the organization of actions carried out with students from public schools. This organization, under the theoretical approach described, began in 1998 at the Faculty of Education of the University of São Paulo (USP), intensified from 2011 when it was part of an interinstitutional project financed by the Coordination for the Improvement of Higher Education Personnel (CAPES), within the scope of the Education Observatory (OBEDUC) and, since then, groups of institutions from different Brazilian regions have

continued CluMat as an interaction project between university and school<sup>4</sup>. Among these we can mention: Federal Institute of Espírito Santo (IFES), State University of Goiás (UEG), Federal University of Goiás (UFG), Federal University of Santa Maria (UFSM), Federal University of São Paulo (UNIFESP), Federal University of Uberlândia (UFU), and Federal University of Rio Grande do Norte (UFRN).

In general, even though each of these institutions has specific dynamics, they are all based on the same principles and have as a guiding assumption for teaching the intentional organization of teaching, materialized in the planning, development and evaluation of targeted mathematics teaching actions to Basic Education students. Although subjects can appropriate cultural elements in the most different interactions, in a non-systematic way, it is in the process of school education, through the intentionality of the teacher, who aims at learning, and school knowledge, they will have access to culture more elaborate.

With the intention of understanding this issue, this article aims to discuss aspects that can contribute to the process of teaching and learning mathematics, based on the organization of teaching from the perspective of the Mathematics Club. It is based on data from a survey carried out within the scope of the Mathematics Club of one of the institutions mentioned (Cunha, 2023), which explains the understanding of the teachers and future teachers involved. It begins with notes referring to some theoretical elements with the aim of placing the reader where we are talking about; Next, the methodological directions of the research are presented, followed by a discussion of the data and final considerations about the study.

### **Theoretical orientations and the organization of Mathematics Clubs**

The ways in which we constitute ourselves as men and women – social beings – is a topic of discussion in various sciences, such as anthropology, psychology, sociology and education. In the context of this work, understanding the humanization process helps us reflect on the way we develop. In this movement of transmission and improvement of cultural riches, humanity was constituted and, to the same extent that the subject appropriates the historical acquisition of humanity, he forms his own history.

For Leontiev (1978, p. 238, our translation), “what in animals results from biological inheritance, results in the subject of an assimilation, that is, a process of hominization of the

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<sup>4</sup>It is currently part of the project “Pedagogical Activity in the Training of Teachers who Teach Mathematics based on partnerships between higher education institutions and Basic Education schools in different Brazilian regions”, financed by the so-called CNPq/MCTI/FNDCT.

child's psyche". He highlights that the development of human generations is not incorporated in man at birth, nor in his natural dispositions. The historical acquisition of humanity is in the world that surrounds it, in the great human cultural works. And it is by appropriating them, throughout his life, that he begins to have truly human properties and faculties. Leontiev (1978, p. 283, our translation) understands that this process places us "on the shoulders of previous generations and elevates us far above the animal world".

In this sense, science, seen as the development of human culture, for Caraça (1951, p. XIII), becomes a great chapter of human social life, as a "living organism, impregnated with the human condition, with its strengths and its weaknesses and subordinated to the great needs of man in his struggle for understanding and liberation". And it is in this movement of satisfying the typically human needs for discoveries and creating new needs that humanity begins to develop general knowledge, including that which constitutes mathematics.

Moura (2000, p. 3, our translation), when discussing the historical evolution of mathematics, emphasizes that the creation of mathematical knowledge in the wake of development occurs "sometimes in front, pulling the creative imagination, sometimes behind, systematizing what was invented so that others could seize symbolic tools", and, in the meantime of this movement, man is motivated by the need to control the quantities and forms of nature to find solutions to problems that can give him material and psychological comfort.

The process of producing mathematical knowledge thus has a double movement: on the one hand it is generated as a need to solve a problem and on the other, it serves as an instrument to produce meanings that will later serve as new tools for new problems generated in the dynamics of life. human interaction with physical and symbolic nature. In one sentence, we say: mathematics impacts reality (Moura, 2000, p. 4, our translation).

This impact of mathematics with reality occurs with new tools in interaction with physical and symbolic nature, which contribute to humanity remaining alive and comfortable. Mathematics, in this way, serves a social objective and, according to Moura (2000), is derived from a need that comes from the collective with which the individual learns new syntheses that are generated when solving problems.

It is through education that the subject will be able to appropriate the historical development of human skills and the cultural heritage of humanity, relating them to the phenomena of the surrounding world through other men. In the words of Moura, Sforini and Araújo (2011, p. 40, our translation): "making it possible for these cultural assets to be

appropriated by all subjects is the educational purpose. This purpose puts us before the challenge of finding teaching methods that promote this appropriation”.

Since its inception, the Mathematics Club has sought to base and plan teaching, so that teachers and students can be active subjects. The premise of the proposal was to reveal “the role of interactions in the process of meaning of what they aim to achieve: the formation of theoretical thinking through the appropriation of scientific knowledge” (Moura, 2021, p. 3, our translation).

The paths of teacher training are similar to the humanization process: to become a teacher, the subject appropriates the historical-cultural movements that permeated the constitution of teaching work. In other words, it is in the relationship with others that the teacher appropriates the cultural meaning of his work, thus generating meaning for his teaching activity.

When considering that initial teacher training is not limited to the classroom of a degree course, but takes on a broader dimension, at CluMat we aim to conceive it as a historical-cultural process that can bring elements that allow for a more complex and deeper, with teaching work as its central axis and involving training processes, characterized as a collective educational project, based on pedagogical activity.

Believing that your work as an educator is of great importance in the training of a student requires communion with a set of collective actions that will enhance individual actions to achieve a training project. Isolated actions give little consistency and visibility to the results of educational activities. Thus, the collective objective is less clear to the teacher. When this is not established, individual components and deeply selfish ways of acting solely for one's own benefit remain. What gives the meaning of humanization is the project that organizes references for the teacher to build his project, with the objective of the product he seeks for the group and, consequently, for him as well (Moura, 2000, p. 45, our translation).

When the collective educational project becomes part of the teacher's life plan, he carries it out, assuming it before the group. Thus, the subject in training begins to guide his individual actions based on problem situations that are common to the subjects of the group, the objectives and the achievement of common results.

In this sense, for Moura, Sforini and Lopes (2017), it is essential, in the teacher training process, to create situations in which there is a need to share actions, as, in this way, subjects have the opportunity to develop specific forms of cooperation, which may allow him to reach an adequate level in cognitive actions through the appropriation and awareness of the significant process of collective production of scientific knowledge.

It is in the community that the professional actions that determine the educator's level of training are guided. Training is established through interaction with peers and is driven by a personal and collective motive. According to Moura (2000), the personal motive is related to the set of knowledge and expectations about life and the directions that are believed to be valid for undertaking teaching work, whereas collective motives are given by agreements that are established between those who constitute the school as a group.

Both teachers in initial and ongoing training participate in CluMat, who share different moments that involve the organization of mathematics teaching, based on the assumption that, in interaction with others, learning, which goes from the intrapsychic (social) plane to the intrapsychic (individual), are incorporated into the individual teaching practices of each subject. This process is portrayed here through an investigation presented below.

### **Methodological guidelines**

As already specified, the research was theoretically and methodologically based on the Historical-Cultural Theory and, more specifically, on the Activity Theory and Teaching Guiding Activity. Considering these assumptions, it materializes as an activity, which presupposes that there are two central points to be objectified: what we are going to know – based on the need-motive-object relationship – and how we will do it (Araujo; Moraes, 2017).

These two aspects constitute the two dimensions of research: the guiding one, which leads and guides the construction of the executing dimension, considering the relationship between method and object; and the executor who drives its development. The latter has the following operations: the apprehension of reality with the planning, immersion and monitoring of the training experiment; production of data, based on procedures – audio and video recording, reflective session, field diary, reflective discussions, memory of meetings and questionnaire; and the analysis and presentation of data, based on the unit of analysis (Vigotski, 2009) revealed and structured in axes of analysis, exposed through scenes (Moura, 2000).

This movement had as its context the Mathematics Club of the Federal University of Rio Grande do Norte (UFRN), which is developed as an extension project, one of the pillars of the institution, and aims to carry out procedural and continuous actions of a social and educational nature in the quest to establish a partnership between society and the university. This pillar develops inseparably in research and teaching, which is why CluMat is an Activity

Guiding Project, contributing to the achievement of what we understand to be the mission of the public university.

We focus on understanding the formative path of a teaching organization, proposing situations that trigger student learning, in a specific and unique context, in this case, the Mathematics Club. Thus, we had as research participants: two teachers with a degree in Pedagogy; a teacher with a degree in Mathematics; two teachers with a degree in Pedagogy; a teacher with a degree in Pedagogy and a Master's degree in Education; and a teacher with a degree in Mathematics and a PhD in Science and Mathematics Teaching, presented during the work with fictitious names, which pay homage to important women in the history of Brazil.

Based on Vygotski (2009), we understand that the Unit of Analysis makes it possible to perceive the phenomenon in movement, recomposing it in order to reconstitute its entirety. From this perspective, in the study presented here, teaching learning in CluMat was revealed as the Unit of Analysis, consisting of three axes of analysis: planning and reflecting: the organization of teaching in motion; developing teaching situations: the activity of teachers in training in action; evaluating to plan and reorganize: rethinking the appropriation of knowledge. Based on these axes, our discussion is structured below.

### **Organization of teaching: the Mathematics Club on the scene**

Teaching action presupposes mobilizing the teacher's need to reflect: what human do we want to form in school education? What content should students learn? How should the student be cognitively at the end of the pedagogical learning process? What are the objectives of the pedagogical process? All of these, as well as other reflections, permeate teaching work, materialized in teaching, understood here as the main activity (Leontiev, 2021), and in the teacher, as it is in the intentionality of their organization that the educational objectives for student learning are achieved.

### **Planning and reflecting: organizing teaching on the move**

For the undergraduates who participated in this study, CluMat was the first moment in which they became involved with pedagogical actions in the school context and felt the need to plan. Considering the theoretical and methodological assumptions that underlie it, planning is configured as the guide of pedagogical practice, since it is when, collectively, the objectives are defined, and the actions and operations are structured to achieve them, in a way to reflect on



the pedagogical objectives to carry out the educational activity. In our organization, after defining the mathematical content to be worked on and setting the objectives, the next step was to create a problem to be presented to the students, in order to trigger learning and put them into activity.

But, how can we look for this movement in the elaboration of the problem? The research participants highlighted the need to understand the logical-historical movement of the concept to be worked on, as we observed in Scene 1, Table 1.

**Table 1 - Scene 1: Understanding the logical-historical movement**

<p><b>Construction of the scene:</b> understanding that the triggering problem is considered as the element that mobilizes in students the need to appropriate the concept and that this movement must reveal the same thing that humanity has experienced, we reflect: what was the process of understanding the genesis of the concept and turn it into a learning-triggering problem?</p>
<p><b>Martha:</b> <i>Complex.</i></p> <p><b>Maria da Penha:</b> <i>We need to understand the genesis [of the concept]</i></p> <p><b>Researcher:</b> <i>And transform it into the triggering problem .</i></p> <p><b>Ana Miranda:</b> <i>This is the biggest challenge.</i></p> <p><b>Marta:</b> <i>I read somewhere that in this issue [the triggering problem] needs to explicitly contain the logical-historical movement. Somehow, we need to have this way of getting children into this movement. So, that's why the biggest responsibility is precisely this. Hence all this complexity. So, I think this is the moment that demands the most heads, it's like exploding.</i></p> <p><b>Maria da penha:</b> <i>And then, it involves reading, because to know the genesis of the concept you have to read, which is not so easy, because it is about the history of mathematics, so we don't find many texts. Do we still find it here [at CluMat] ? But imagine who is outside? I had never thought about this, imagine this difficulty in the process of reading and understanding the genesis and even more complex is this movement of placing the genesis of the concept within the problem .</i></p> <p><b>Martha:</b> <i>I really remember Maria da Penha talking about how we prepared the triggering question for bowling. Remember that we were like: "No, wait", we decided on other things to do and were like "ok, but what is the question going to be? What will the issue be?"</i></p> <p><b>Coordinator:</b> <i>Bowling? It's common, everyone plays bowling. But why are we choosing the bowling game?</i></p> <p><b>Martha:</b> <i>How are we going to do ...</i></p> <p><b>Coordinator:</b> <i>How are we going to ask a question that mobilizes knowledge in a game that they have certainly already played?</i></p>

Source: Data produced for the research (2023)

Understanding that knowing the logical-historical movement of the concept (Kopnin, 1978) to be taught is necessary for planning was for the club members, at the same time, a learning experience and a challenge, as it constituted a complex task as pointed out in the various demonstrations by Marta, Maria da Penha and Ana Miranda. Based on the assumptions of Historical-Cultural Theory, mathematics is a cultural product and, as a symbolic tool, arises in response to the instrumental and integrative needs of human beings in certain social contexts (Moura; Sforni; Lopes, 2017). As a result of this, as school content, it was constituted from a path that is logical and historical, and the social experiences of humanity are objectified in their meanings, as highlighted in the speech of the teacher in training Marta.

In historical development, different solutions were found for common problems, concepts were overcome and others were constructed by different civilizations, meeting different needs, making theoretical concepts as we know them today reflect a path that needs to be considered in the organization of teaching. Understanding this was a challenge for teachers for two reasons. The first, because this movement contrasts with what has been traditionally taught in Basic Education teaching systems, in which, for example, the use of the textbook as the only instrument is valued, in addition to presenting the contents as a logical and linear in the search so that, at the end of this cycle, students have developed skills, as recommended by the National Common Curricular Base (BNCC). The second, because genesis is considered as an essence in the organization of teaching (Moura, 2021), as it implies the need to understand the logical and historical movement, as this allows teachers to also capture possible difficulties, when following contradictions and productions that existed until reaching the final synthesis, in the search for establishing pedagogical strategies. Leontiev (1978, p. 268, our translation) states that

To appropriate the objects or phenomena that are the product of historical development, it is necessary to develop in relation to them an activity that reproduces, through its form, the essential traits of the incarnated activity, accumulated in the object.

However, is this movement of the essential traits of activity, systematized in logical and historical movement, understood in any way? Maria da Penha, in her speech, makes us think about the organization of teaching, taking into account this logical-historical movement, which constituted a new way of thinking about the mathematical concept. This fact brings indications that CluMat presents itself not only as a learning space, in which, based on studies and theoretical foundations, led to the need to understand the genesis of the concept, but also as a possibility of having access to texts theories for this to happen.

This process, which requires study and reading, as pointed out by Maria da Penha, is not a simple task, as it is not limited to identifying an element in the history of mathematics. It is, above all, about understanding the social and cultural process of the concept, based on the historical movement of humanity. Thus, understanding the genesis of the concept is a complex task, as we seek to understand the social and cultural aspects of humanity in history. After all, as Kopnin (1978, p. 183-184, our translation) tells us

Historical means the process of change of the object, the stages of its emergence and development. The historical acts as an object of thought, the

reflection of the historical, as content. Thought aims to reproduce the real historical process in all its objectivity, complexity and contradiction. The logical is the means through which thought carries out this task, but it is a reflection of the historical in theoretical form, that is, it is the reproduction of the essence of the object and the history of its development in the system of abstractions. The historical is primary in relation to the logical, logic reflects the main periods of history.

This movement of understanding the genesis of the concept of the historical reflected in the logical, which we propose in the actions of the formative experiment, reveals, considering the statements of the research participants, evidence that planning guided by the principles of the Mathematics Club, based on the unity between the logical and historical concept, can mobilize changes in the understanding of the mathematical concept. These changes can occur from the understanding of knowledge as a social and cultural product, which permeates a movement in a given context and society with different impasses and solutions, which were discussed and reflected upon, as Marta points out.

We can see that the search for understanding the genesis of the concept mobilized the participants to question, reflect and evaluate how to develop a triggering problem that would reveal this movement of humanity. Also, to solve the problem, to think about changes to a common game, transforming it into a teaching resource that puts children on the same path as humanity.

### Developing teaching situations: the activity of teachers in training in action

Thinking about the guiding dimension of the Teaching Guiding Activity, materialized in the executing dimension with the elaboration of teaching situations that trigger learning, how did the club members teach mathematical content? Does the theoretical structure of this way of organizing teaching mobilize and guide this moment of pedagogical practice? In Scene 2, in Table 2, it is possible to perceive the triggering problem, mobilizing learning about mediation in the classroom.

#### Chart 2 - Scene 2: The triggering problem, mobilizing learning about pedagogical mediation

**Construction of the scene:** the teachers in training were reflecting on the importance of the triggering problem for teaching and student learning towards mathematical knowledge after developing teaching planning in interaction with children in the classroom.

**Researcher:** *And there was even a problem, which I don't remember exactly what it was, but we were presenting the problem to the children, so Clara Camarão changed the beginning of the question, just one word, because we were asking in a different way, but they were not moving towards mathematical knowledge. With that, Clara Camarão went and made that twist, with the question that was about the same problem, and changed the initial word.*

**Zila Mamede:** *The way of speaking made it more understandable .*

**Researcher:** *That's right, she changed the beginning to a "how", something like that, but it was very important in the development of the class*

**Zila Mamede:** *And it's natural, because she's the more experienced person who knows the group, who has more experience. So, she already knows how to position herself more than the people who are in this process.*

**Researcher:** *And that comes from the problem, so I think another element is, it's the way, I don't know if everyone agrees, but the way of presenting the mathematical content .*

**Coordinator:** *So, the other element is the mediation of the teachers, right? Because the teachers are pulling.*

**Clara Camarão:** *Regarding the right questions and the children building that thought, what you wanted is to propose the production of knowledge with them. That was really good and I said wow, your questions are very important. I also learned here [at CluMat] with you, because we understand how important it is for a child's learning to question and not give a ready-made answer. Because we have a habit of doing "expository and dialogued classes", but this dialogue is in the corner, it is more expository. We expose, expose, expose the content and where is the dialogue? So, this dialogue that you have is extremely important and I policed myself, I said: "look, I need to do it too", these questions to really encourage the child to want to know, want to learn so that they can build learning with them.*

**Zila Mamede:** *And the main thing, guys, we get them to be active.*

**Maria da Penha:** *Protagonism, right?*

**Zila Mamede:** *It's like the teacher said, we don't get there by giving them answers. We make them look for the answer.*

**Ana Miranda:** *And respecting the class profile, always remembering this. Because there was no point in us also choosing a way. "Ah, so they are children, so the best story would be virtual" great, but it lacks the series direction. So, it is essential.*

Source: Data produced for the research (2023)

A teaching situation from the perspective we discuss here can be constructed using different methodological resources, but they all have in common the need to propose a problem that triggers the appropriation of knowledge with children. And, beyond the problem, lies the teacher's mediation, when presenting it to the student, as expressed in the researcher's words.

The dialogue shown in the scene explains the concern with finding an adequate way to present the problem, so that everyone understands it, because, as Zila Mamede highlights, "*the way of speaking made it more understandable*". For Vigotski (2009), language is an essentially human symbolic system common to all social groups. It has two functions: on a social level, it provides communication between subjects and, on an internal level, it enables generalizing thinking. This is how it allows the subject to appropriate historical-cultural elaborations, which, in this movement, becomes humanized. Therefore, if words are a way of communicating with others and organizing thoughts, their use reveals itself as learning: it is necessary to understand and analyze which word to use in this process. Therefore, the concern with the elaboration of the question is fair.

In this movement of reflecting on the importance of the triggering problem, Clara Camarão highlights learning in CluMat: "*[...] But this part of you asking these questions to children is very important. I also learned here [at CluMat] with you, because we realize how important it is for a child's learning to question and not give a ready-made answer [...]*". With

this speech from the teacher in training, we can see that, when observing the appropriation of knowledge with the children through the triggering problem, she realized the importance of questioning, of placing the child in this dialogue movement, also highlighting that *“this dialogue that you what they do is extremely important and I monitored myself, I said: “look, I need to do it too”, these questions to really encourage the child to want to know, to want to learn so that they can build their learning with them”*.

We can note that observing the actions developed with the children when solving the triggering problem instigated in Clara Camarão the need to change the production of questions, so that they, in this movement, mobilize in the children the desire to learn and develop actions aimed at the concept. When she states that she felt motivated to change the organization of teaching, when experiencing a situation being carried out with the children, this happened because the very structure of this situation stimulated the development of the classes, since its solution put the children in the same movement that humanity was involved in solving problems and mobilized the need to collectively build solutions to problems (Moura, 2021).

Still in Scene 10, Zila Mamede highlights learning from the most experienced school teacher, saying that *“and it is natural, because she is the most experienced person who knows the class, who has the most experience.”*, with this we can see the importance to learn from others, especially those with more experience. Thus, it is possible to affirm that the Mathematics Club for the club members was a place of significance for teaching activity, by identifying in the other's words meanings that led them to understand what it means to be a teacher.

Finally, the participants understood that, in the development of teaching actions, the aim is for students to be active in the process of appropriating knowledge, because, as *Zila Mamede states, “We don't get there by giving them answers. We make them look for the answer.”* In other words, they are expected to engage in learning activities when the reason and object coincide (Leontiev, 2021), and attribute meaning loaded with social meaning, making this process mobilizing new qualities in relation to learned mathematical concepts.

### **Assessing to plan and reorganize: rethinking knowledge appropriation**

Considering the assumptions of the Teaching Guiding Activity, which mobilizes the proposition of a situation that triggers learning, how important is it to evaluate when thinking about the organization of teaching? This movement is permeated, especially, by the teacher's conception of assessment. Based on the Historical-Cultural Theory, and especially on the

assumptions of the AOE, the assessment is not only a moment to verify the students' learning, but, above all, it intends to enable the teacher to understand the paths that he should propose in the organization and reorganization of teaching and in the development of the class. Hence the relevance of this moment, to direct and guide the teacher in the actions proposed in his activity. It is about this aspect that the teachers in training reflect in Scene 3, in Table 3. After all, why is it necessary to reorganize planning?

### Chart 3 - Scene 3: Why do we need to rethink planning?

<p><b>Construction of the scene:</b> the teachers in training were discussing the importance of evaluation in the movement of planning the pedagogical activity</p> <p><b>Zila Mamede:</b> <i>It's true, in every meeting the girls went to school, at the beginning of the meeting they had to "report how it was" and at that moment we were already reflecting on what had worked and what hadn't worked so we could start planning for next week .</i></p> <p><b>Nisia Floresta:</b> <i>When we are in graduate school, we have this panic, how are we going to readapt what we have already planned? We sometimes say: "ah, this is as if it were an erroneous act, let's put it that way, as if it were our fault", but I think that it is exactly from the mistakes that we will be more reflective than what we hadn't made a mistake. So, understanding the role of this teaching-guiding activity in children's daily lives is very relevant. Like our construction as a teacher and as a student, right? Because sometimes we are in a class and sometimes we don't understand the subject and that is frustrating, imagine for children. So, rethinking our practice is very relevant to our constitution as a teacher, as a human being, as a student too, because I am both a teacher and a student. So, it's very pertinent, very important, it's not a flaw, it's exactly, it's... how can I say it?</i></p> <p><b>Coordinator:</b> <i>A process .</i></p> <p><b>Nisia Floresta:</b> <i>Exactly! A constructive process, our being a teacher.</i></p>
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Source: Data produced for the research (2023)

Based on the assumption that both those involved in the educational process - the teacher and the student - are active subjects (Moura, 2017), we justify our conception that assessment does not only concern student learning, but also involves the elements which were developed by the teacher in the classroom. Considering this issue, in CluMat, the evaluation of each class was the starting point of each planning moment. Thus, Professor *Zila Mamede* highlights "at the beginning of the meeting it was "reporting how it was" and at that moment we were already reflecting on what had worked and what hadn't worked so we could start planning for the next week".

We can show that teacher *Zila Mamede* understood that, with the teachers' reports and observations, it was possible to: reflect and observe what had worked or not, and this moment guided the planning of the next teaching actions. Therefore, it can be understood that the assessment is a guide in the search for the appropriation of theoretical knowledge, as it enabled the teachers in training to build a teaching organization, in order to direct them towards the

appropriation of theoretical knowledge. Therefore, assessment can be the mediator between the student's learning activity and the teacher's teaching activity,

[...] enabling the regulation of pedagogical activity, in the sense of directing and guiding the teaching and learning process through the adaptation, if necessary, of this activity, in order to ensure the appropriation of theoretical knowledge. Given this, assessment is conceived in the relationship of interdependence between teaching and learning actions [...] (Moraes, 2008, p. 239, our translation).

Assessment, therefore, must be a moment of reflection, based on the actions that were established in the organization of teaching and developed during pedagogical practice. The teacher, when evaluating this movement, should not only focus on the error, but understand it as mobilizing the need for changes and establish new qualities so that theoretical knowledge is appropriate. Hence the importance of understanding Nisia Floresta, when expressing the change in quality in her conception, which is very significant for the teacher in training to establish a new path in the organization of teaching.

In addition to reviewing, analyzing, observing and systematizing how the teaching organization movement was put into action in the classroom, we can also see another conception highlighted by Zila Mamede, how this learning reverberated in her training: “[...]So, us rethinking our practice is very relevant to our constitution as a teacher, as a human being, as a student too, because I am both a teacher and a student”. Thus, for the teacher in training, evaluating to rethink her practice mobilized changes in the constitution of being a teacher.

The process of becoming a teacher is a process of humanization, that is, the teacher needs to interact with elements that involve their activity, in order to give meaning to it (Moura; Sforzi; Lopes; 2017). Therefore, the moment of evaluation not only allowed the teachers in training to interact with elements that involve their profession, but also to experience this process of teaching humanization.

### **Some considerations about the study**

When we proposed to address teaching in mathematics, in this article we discussed aspects that can contribute to the process of teaching and learning mathematics from the organization of teaching from the perspective of the Mathematics Club. Having Teacher Learning at CluMat as the unit of analysis, we sought to reveal our phenomenon through scenes that portrayed dialogues between its participants, based on our guiding assumption, which is

the intentional organization of teaching materialized in the planning, development and evaluation of teaching actions developed in this context.

By directing our attention to planning and reflections, understanding the organization of teaching as a movement, we highlight the importance of knowing the logical-historical movement of the concept to be worked on, being this instrument to elaborate problems that can trigger students' learning. This implies the need for the teacher to study, to be supported by the understanding of knowledge as a social and cultural product, and which is part of the humanization process, since, from our theoretical perspective, the human becomes human, when appropriates historically elaborated culture.

In relation to the development of teaching situations, which allows us to look at the activity of teachers and future teachers in action, the interaction between subjects proved to be a relevant component, as language was highlighted as a factor that enabled the understanding of one was shared with the other. Thus, if it is through understanding the problem that the student will be able to share and communicate their ideas in relation to mathematical knowledge, the way in which the teacher constructs the question and presents it in the classroom may or may not direct him to look for answers to solve it. the problem. Therefore, language mobilizes the student's learning activity.

Furthermore, we identified that evaluation to plan and reorganize is a necessary movement as a possibility to rethink the appropriation of knowledge. However, this must be guided, so that, when carried out, it allows those who apply it not only to reflect on what happened, but also to support new actions in pedagogical practice. Organizing teaching impacts the quality of the situations that will be organized so that everyone can develop.

Finally, when it comes to learning spaces, such as CluMat, understood as a Activity Guidance Project, organized based on the intentional organization of teaching and involving different subjects with different knowledge, we consider the Vygotskian idea that the development of psychic functions occurs from the social to the individual level. This premise has us helped to see the collective as one organization what makes it possible to enhance the development of the maximum capabilities of all subjects involved.



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