

Future teacher in the Mathematics Club: contributions of collaborative study on teacher learning¹

Futuros professores no Clube de Matemática:
contribuições do estudo compartilhado na aprendizagem para a docência

Futuros profesores en el Club de Matemáticas: aportaciones del estudio
colaborativo sobre el aprendizaje a la formación docente

Andresa Kasparý Zwirtes²

Anemari Roesler Luersen Vieira Lopes³

ABSTRACT

This article presents reflections arising from research on the initial training of future mathematics teachers, conducted as part of a training project based on the sharing of learning activities. The objective is to identify the meanings articulated by four future teachers as they collaboratively developed study activities, understood as potentially promoting learning for teaching. The research is grounded in the principles of Historical-Cultural Theory and Teaching-Oriented Activity, adopted as theoretical-analytical frameworks for interpreting the training processes. The data were collected over the course of thirteen training sessions and analyzed qualitatively through the selection of episodes, defined as axes of analysis that highlight significant shifts in the attribution of meanings and in the organization of teaching. The results indicate that the act of studying can promote learning for teaching when the meanings attributed by future teachers are linked to the acquisition of knowledge and the actions carried out, coming to be understood as a tool for the organization of teaching.

Keywords: Initial teacher education; Organization of mathematics teaching; Sharing.

RESUMO

Este artigo apresenta reflexões decorrentes de uma pesquisa sobre formação inicial de futuros professores que ensinarão matemática, desenvolvida em um projeto formativo pautado no compartilhamento de ações. O objetivo é reconhecer os sentidos enunciados por quatro futuros professores ao desenvolverem ações de estudo, de forma compartilhada, compreendidas como potencialmente promotoras da aprendizagem para a docência. A investigação fundamenta-se nos princípios da Teoria Histórico-Cultural e da Atividade Orientadora de Ensino, assumidos como referências teórico-analíticas para a interpretação dos processos formativos. Os dados foram produzidos ao longo de treze encontros formativos e analisados qualitativamente por meio da

¹ Translated by Luciane de Lima Paim, E-mail: luasreviformatrad@gmail.com.

² Master's degree in Education from the Graduate Program in Education at the Universidade Federal de Santa Maria (UFSM). RS – Brasil. ORCID: <https://orcid.org/0000-0003-3180-3896>; Email: andresakaspary7@gmail.com.

³ Postdoctoral researcher in Education at the Universidade de São Paulo (USP). Professor in the Graduate Program in Education and the Graduate Program in Mathematics Education and Physics Teaching at the Universidade Federal de Santa Maria (UFSM). RS – Brasil. ORCID: <https://orcid.org/0000-0002-4636-9618>; E-mail: anemari.lopes@gmail.com.

seleção de episódios, definidos como eixos de análise que evidenciam movimentos significativos na atribuição de sentidos e na organização do ensino. Os resultados indicam que a ação de estudo pode favorecer a aprendizagem para a docência quando os sentidos atribuídos pelos futuros professores se vinculam à apropriação de conhecimentos e às ações desenvolvidas, passando a ser compreendido como instrumento para a organização do ensino.

Palavras-chave: Formação inicial de professores; Organização do ensino de Matemática; Compartilhamento.

RESUMEN

Este artículo presenta una serie de reflexiones derivadas de una investigación sobre la formación inicial de futuros profesores de matemáticas, llevada a cabo en el marco de un proyecto formativo basado en el intercambio de prácticas. El objetivo es reconocer los significados expresados por cuatro futuros docentes al desarrollar acciones de estudio, de forma compartida, entendidas como potencialmente promotoras del aprendizaje para la docencia. La investigación se basa en los principios de la Teoría Histórico-Cultural y de la Actividad Orientadora de la Enseñanza, asumidos como referencias teórico-analíticas para la interpretación de los procesos formativos. Los datos se recopilaban a lo largo de trece sesiones formativas y se analizaron cualitativamente mediante la selección de episodios, definidos como ejes de análisis que evidencian movimientos significativos en la atribución de significados y en la organización de la enseñanza. Los resultados indican que la acción de estudio puede favorecer el aprendizaje para la docencia cuando los significados atribuidos por los futuros docentes se vinculan a la apropiación de conocimientos y a las acciones desarrolladas, pasando a entenderse como un instrumento para la organización de la enseñanza.

Palabras clave: Formación inicial del profesorado; Organización de la enseñanza de las matemáticas; Intercambio.

1 Introduction

Initial teacher education has been widely discussed in the field of education, especially regarding the relationship between theory and practice. This process is expected to ensure that future teachers acquire the knowledge necessary to intentionally design actions aimed at student development in their teaching practice. However, training teachers who can meet this goal requires not only exposure to practical situations but also theoretical study and objective conditions that foster reflection on the organization of teaching.

From this perspective, we understand that when conducted collaboratively, research can serve as a unique space for conceptual development and for critically examining teaching practice. By sharing reflections, concerns, and proposals related to teaching and learning, future teachers not only deepen their theoretical knowledge but also rethink the organization of teaching.

It is within this context that the present research is situated. It was conducted within the Graduate Program in Education at the Universidade Federal de Santa Maria (UFSM) and developed in conjunction with the Mathematics Club (CluMat) project, an initiative linked to the Study and Research Group on Mathematics Education (GEPEMat). CluMat is structured as a space based on the sharing of study, planning, development, and evaluation of mathematics teaching activities focused on the early years of elementary school, bringing together coordinating teachers, elementary school teachers, graduate students, and undergraduate education students.

Based on the assumption that the intentionality and collective nature of the project's activities can foster professional development (GEPAPe, 2024), this article aims to explore the meanings articulated by four future teachers as they collaboratively develop study activities, understood as potentially promoting learning for teaching. Thus, the research included the participation of one student from the Bachelor's program in Geography (G1), two female students, and one male student from the Bachelor's program in Mathematics (M1, M2, and M3).

The data were collected from thirteen meetings, recorded via audio recordings that were later transcribed, field notes, and reflective sessions. Data analysis was guided by the principles of Historical-Cultural Theory (HCT) and Teaching-Oriented Activity (TOA), seeking to interpret the processes of attributing meanings to the study activity within the educational context under investigation.

The article is organized as follows: first, we present the theoretical contributions that underpin the research; next, we describe the methodological approaches adopted; subsequently, we discuss the data analysis; and, finally, we present some concluding remarks.

2 Some notes on Historical-Cultural Theory and Teaching-Oriented Activity

CluMat at the Universidade Federal de Santa Maria, the context in which the present research is being conducted, draws its theoretical and methodological framework from the Teaching-Oriented Activity (TOA), proposed by Moura (1997, 2002), which is

rooted in Historical-Cultural Theory (HCT) based on the writings of Lev Semionovich Vygotsky⁴ (1896–1934) and Alexei Nikolaevich Leontiev (1903–1979).

HCT focuses on the study of human development and understands evolution not only in terms of hereditary characteristics but also in terms of two dimensions responsible for this process: the historical and the social. Vygotsky (2018) proposes that it is only through the establishment of social relationships that human beings develop the characteristics resulting from the methodical evolution of all humanity.

Building on Vygotsky's ideas, Leontiev (1978, 2010, 2021) developed what is known as Activity Theory. For him, activity is defined as those processes psychologically characterized by “that toward which the process, as a whole, is directed (its object), always coinciding with the goal that motivates the subject to perform this activity, that is, the motive” (LEONTIEV, 2010, p. 68). Leontiev emphasizes that not all processes can be classified as activity; only those that, arising from the relationship between humans and the world, seek to satisfy a specific need.

Drawing on the studies of Vygotsky and Leontiev, Moura (1997, p. 4) proposes the Teaching-Oriented Activity, explaining that it is a “teaching activity that respects the different levels of individuals and defines an educational objective as a collective problem.” It encompasses in its organization “a need (appropriation of culture), a real motive (appropriation of historically accumulated knowledge), objectives (teaching and learning), and proposes actions that take into account the objective conditions of the school institution” (MOURA *et al.*, 2016, p. 110).

Within the scope of CluMat, TOA is adopted as a theoretical and methodological principle, and during the organization of teaching carried out by teachers and future teachers, the following are taken into consideration: the historical synthesis of the concept, the situation triggering learning, the synthesis of the collective solution, and the assessment. The historical synthesis of the concept refers to the historical process of human development that arises in response to objective needs in the quest to resolve situations, and that gives rise to knowledge. Thus, when organizing instruction, the study of the concept to be addressed is taken as a reference.

⁴ The author's name is spelled in various ways (Vygotsky, Vygotski, Vigotsky, Vigotski, or Vigotskii); therefore, when referring to his work, the spelling “Vigotski” will be used, and when specifically mentioning a work by the author, the spelling used in that publication will be employed.

Consequently, the learning-triggering situations (LTSs) formulated and developed in CluMat are interconnected with the appropriation of the concept's logical and historical movement by those who organize them, since this directs its objective toward the "need for the student to appropriate knowledge, in a movement that seeks the solution to a problem capable of mobilizing learning" (BOROWSKY, 2020, pp. 514–515).

According to the author (2017), situations that have the potential to trigger learning can be organized using the following resources:

- 1) educational games—which incorporate into their structure the pursuit of the need to internalize the concept, and can be drawn from the students' cultural context and/or adapted from well-known games;
- 2) emerging situations from daily life—issues that arise from relationships established in the daily school routine;
- 3) virtual history of the concept—contains problem situations posed by characters from children's stories, legends, or the history of mathematics itself as a trigger for students' thinking.

Another methodological aspect of TOA is the synthesis of the collective solution, in which students, working together, must find a solution considered mathematically correct for the presented situation. It is during this moment that the teacher monitors the students' process and guides them so that their answers align with those that humanity, throughout history, has determined to be correct and which constitute knowledge.

When organizing teaching situations in CluMat, based on TOA, the aim is to develop proposals that have the potential to trigger learning. However, even when planned from a teaching perspective, these situations do not guarantee their effectiveness as a learning experience. In this sense, the evaluation of the entire process becomes fundamental.

By adopting the Historical-Cultural Theory and the Teaching-Oriented Activity as references, we embrace a conception of teacher education that views the teacher as the subject of pedagogical activity, whose learning is constituted in and through the intentional organization of teaching. From this perspective, training is not limited to individual reflection on lived experiences, but involves participation

in collective actions oriented toward systematic study and the appropriation of the historical knowledge produced. Thus, learning for teaching is understood as a mediated, socially constituted process linked to the transformation of the very activity of teaching.

It is therefore understood that the teacher's primary activity is teaching, which constitutes pedagogical praxis by "enabling the transformation of the school environment through the transformation of individuals—teachers and students" (MOURA *et al.*, 2016, pp. 102–103). In this vein, the TOA functions as an element of dual formation for both the student and the teacher. According to Moura (2000, p. 35), "one changes by exchanging meanings; the other, through the creation of new tools to facilitate learning, revises educational objectives, content, and teaching strategies in a continuous process of evaluating their work."

However, it is understood that the organization of teaching from the perspective of the Teaching Guidance Activity is not a linear or gradual process. The implementation of formative actions aimed at conceptual appropriation is conditioned by the concrete conditions of study, the engagement of the subjects, and the contradictions inherent in educational contexts. In this sense, recognizing these tensions is fundamental to understanding the potentialities and limits of the formative process under investigation.

These theoretical foundations underpin the present investigation. Next, the methodological procedures adopted are explained, highlighting the coherence between the theoretical frameworks and the pathways of data production and analysis.

3 Methodological approaches of the research:

In light of this study's objective, a research project was organized grounded in Vygotsky's Historical-Cultural Theory (HCT). From this theoretical methodological perspective, the aim was to understand the processes of meaning-making produced in social interactions, taking activity in its movement and contradictions as the unit of analysis. According to Freitas (2002, p. 28), this involves "understanding the events under investigation, describing them, and seeking possible relationships, integrating the individual with the social."

The study focused on understanding the processes experienced by future teachers within a study group. The aim was not to generalize the results statistically, but to conduct an in-depth analysis of the qualitative transformations produced in the investigated context.

The research setting involved the four future teachers who were part of the Mathematics Club project at the Universidade Federal de Santa Maria in 2023. The group's composition was guided by the possibility of intensive monitoring of interactions and by the analytical depth required in studies of this nature. Since we conceive, based on HCT, that the emphasis lies on understanding the processes of meaning-making within the activity.

Among the participants were one student in the Geography teaching program and three in Mathematics (two female and one male), identified by the pseudonyms G1, M1, M2, and M3, ensuring anonymity in accordance with the guidelines of the Research Ethics Committee (CEP/061603)⁵. As for the time frame, the activities took place from May to December 2023.

The CluMat activities were planned at the Universidade Federal de Santa Maria and subsequently implemented in a public school within the Santa Maria state school system. However, before carrying out these activities in the school setting, the pre-service teachers participated in a period of systematic study, consisting of 13 weekly sessions held at the Mathematics Education Laboratory. These sessions served as a space for sharing conceptual understanding, where previously assigned texts were discussed, analyzed, and related to the participants' educational experiences, aiming to foster an understanding of the framework guiding the project.

Throughout the 13 training sessions, various themes related to teacher education were addressed, among which the following stand out: learning to teach; reflections on the meaning of the teaching activity; the organization of mathematics instruction for the early years of elementary school; and the meanings in educational practice. These themes were not treated in isolation, but were interconnected, to understand teaching as a historically constituted and socially mediated human activity.

⁵ The research was approved by CEP/061603, under approval number 6,650,759.

The data collection instruments included audio recordings of all meetings, photographic records, the researcher's field diary, and reflective sessions. Reflective sessions are understood here as a tool for teacher training, since "they are implemented to facilitate collaborative processes of reflection on teaching practice among teachers" (IBIAPINA; FERREIRA, 2003, p. 4).

The organization, collection, and analysis of the data were systematized based on the concept of episodes, understood as analytical units capable of revealing the "nature and quality of actions" (MOURA, 2000, p. 60). From this perspective, episodes are not isolated fragments but rather meaningful segments of the activity, consisting of "written or spoken phrases, gestures, and actions that constitute scenes capable of revealing the interdependence among elements of a formative action" (MOURA, 2000, p. 276).

Considering that the objective of the study is to recognize the meanings articulated by four future teachers as they engage in shared learning activities—understood as potentially fostering learning for teaching—the selection of episodes was guided by criteria that prioritized moments when such meanings became explicit. For the presentation and analysis of the data, three episodes were organized that focus on the study conducted by the participants of the CluMat project in the context of initial teacher education. These episodes addressed future teachers' engagement with the theory adopted by CluMat, new insights regarding the organization of teaching provided by the study, and the premise of studying within a space for sharing actions, approached through the theoretical contributions of Vygotsky's HCT and Moura's TOA, detailed in the next section.

4 How the study contributed to teaching and learning

Among the four activities (study, planning, development, and evaluation of teaching activities) carried out by UFSM's CluMat project, the discussions in this article will focus specifically on aspects related to the study process.

It is worth noting that, throughout the study, the four actions did not occur in isolation but were interrelated, gradually forming a cohesive educational unit based on the sharing of actions. Sharing is regarded in CluMat as one of the key aspects to be considered, since it posits that "the activity is the result of collective actions and that the

individual constructs knowledge through interaction with others” (CEDRO; MOURA, 2010, p. 18). Thus, sharing is regarded as an essential condition—that is, the condition that all study-related activities should be carried out jointly with all participants.

This section will discuss the study, with the data organized into three sections: theoretical approaches derived from the study; new ways of conceiving the organization of mathematics instruction; and the contributions of collaboration throughout the study process.

4.2 Section 1 - Approaches to theory through the study

This first section addresses the future teachers’ engagement with the theoretical and methodological assumptions of TOA (MOURA, 1997; MOURA *et al.*, 2010, 2016), facilitated by the act of studying collaboratively with others.

Episode 1

Researcher: What aspects have caught your attention the most regarding what the Club has been studying?

M1: What has caught my attention the most and sparked the greatest interest regarding the studies is the organizational aspect. The activity carried out in the Club isn’t just an activity; it has a context and a goal. There’s also the issue of reworking the activity—if it didn’t go well, you have to rework it so that it’s better, both for the student and for you as a teacher. I think all this organization surrounding the activity is an experience that better equips us to develop this aspect of our training; we don’t just go through the motions—you reflect on your own learning and the student’s learning. From there, you can see what else you can take away from it and what else you need to know in case the student asks a question and needs additional clarification to understand the activity.

M2: What has caught my attention the most during my studies has been the idea of working with virtual stories. I had never had any experience with them before, and I enjoyed it when we planned our own virtual story.

Researcher: And what caught your attention most about the virtual story? ⁶

M2: It would be more of an issue of the level of engagement that the person creating it needs to have when developing a virtual story. Thinking about what to use and how to develop it.

G1: I liked learning about the important role of the teacher in a student’s life and how we can apply that in our daily classroom practice, adapting as needed.

M3: Studying the Teaching-Oriented Activity. It makes math more appealing to students, encouraging them to participate, so that math isn’t so boring and demystifying the idea that math is difficult.

The dialogue among the participants highlights the insights and contributions that the study brought to the reflection on the organization of mathematics instruction, emphasizing, in particular, important principles to be considered when teachers organize the teaching of mathematical knowledge using Teaching-Oriented Activity as a theoretical framework. Furthermore, it is evident that the act of studying while sharing with others allowed them to internalize certain principles of TOA, such as the learning-triggering situation and virtual stories.

It was through the study that M1 was able to express and attribute meanings to the theoretical and methodological framework that guides CluMat's activities, stating that *"the activity carried out at the Club is not just an activity; the activity has a context, it has a goal."* Such meanings align with the concept of activity as expressed in the studied theory, synthesized in what is actually carried out, which demonstrates that the learning process at CluMat contributes to the understanding, internalization, and engagement with the studied theory, as is also evident in M3's statement. Similarly, M3 believes that TOA makes the teaching of mathematical knowledge more attractive to their students by enabling them to engage and actively participate in their own learning process.

The CluMat project understands teaching as the activity of the teacher (or, in this case, the future teacher when placed in a teaching situation) from Leontiev's (1978) perspective, guiding a set of actions within the classroom space. It thus encompasses everything from objectives to content and teaching strategies defined through an intentional collective pedagogical project, in which both students and teachers participate in decision-making, to promote the full development of their students' psychological and social potential.

In G1's statement, there are indications that, through shared study, she begins to connect with the personal meaning attributed to the role of being a teacher, understood as "a relationship that is created in life, in the subject's activity" (LEONTIEV, 1978, p. 97), to the social meaning of this activity, understood as "the form through which a person assimilates generalized and reflected human experience" (LEONTIEV, 1978, p. 94), historically constituted and directly related to the student's development.

In the next episode, we will explore how this study contributes to reflection on new ways of organizing the teaching of mathematical knowledge.

4.2 Episode 2 - New Ways of Conceiving the Organization of Mathematics Instruction

In this episode, the main changes that have occurred since the participants joined the CluMat project are evident in their statements.

Episode 2

Researcher: Since joining the Math Club until now, have you noticed any changes in the way you think about the organization of teaching, whether regarding the teaching of geography or mathematics?

M3: Thinking about a lesson plan where students can interact more, participate, and get involved—and I think problem-based learning makes that possible—getting students to work together and discuss how they arrived at their answers. My lesson planning has changed a lot from what I used to do to what I do today since I joined the Club.

M2: I would also change the lesson plan; I would start with an introduction and then move on to the content. To begin, I would approach the content through a virtual story, following the principles of the Teaching-Oriented Activity.

G1: Regarding the organization of teaching, with geography in mind, I would prepare a more dynamic lesson, not just sticking to readings and answering questions from the textbook. When I'm in the classroom, I'll aim to make lessons more practical, dynamic, and visual, which might ensure better learning for students, helping them understand the content.

M1: I think theory today helps us with this—in thinking about an activity, in organizing an activity in a more engaging way that fosters student development.

Based on the participants' statements, it is observed that the study led the future teachers to (re)think new ways of organizing teaching, expanding their knowledge beyond the approaches they were already familiar with, for both mathematics and geography content. TOA, grounded in the principles of HCT, aims to ensure that its students, while appropriating the knowledge historically produced by humanity, are engaged in active processes as a means of leading them to the full development of higher psychological functions.

Thus, for this to occur, it is necessary for the teacher, when organizing the teaching activity, to seek ways in which the student actively participates in their own learning process, whether as presented in M3, M2, or G1, but especially, as emphasized in M1, *"to develop the students."* It is important to highlight that while

not all learning in itself guarantees development, “a correct organization of the child’s learning leads to mental development, activates a whole group of developmental processes, and this activation could not occur without learning” (VYGOTSKY, 2005, p. 40).

In this vein, Lopes (2009) argues that it is the teacher’s responsibility to plan actions that, when carried out as activities, enable students to internalize knowledge. However, teaching must be intentionally organized for this purpose; otherwise, the activity will not materialize. Thus, just as the organization of teaching must be based on intentionality, the same must apply to the act of studying in the context of initial teacher education, which, through interaction and exchange with others, can facilitate the attribution of meanings to the text being read that are related to their own experiences and actions.

Another aspect to highlight regarding the participants’ statements concerns the remarks of G1, who, although a student in the Geography Teacher Education program, and although the study conducted in the CluMat project focused largely on mathematics—with some initiatives aimed at working with geography content—was able to reflect on the organization of teaching within her own educational context. This situation reveals that the way the study is conducted is not directed at the specificity of the subject area to be taught, but rather at a general mode of organization.

Having understood the study’s contributions to the organization of teaching, we move on to the final episode of discussions, addressing the relationship between studying and sharing with others.

4.3 Episode 3 - Contributions of sharing throughout the study process

In this final episode, we analyze the study sessions conducted with other participants in the CluMat project.

Episode 3

Researcher: What differences (whether positive or negative) do you identify in these study sessions of ours, given that they are conducted collaboratively with your peers?

M2: As a positive aspect, I highlight the opportunity to exchange and share experiences about how the reading went with colleagues during the study sessions.

M3: We in mathematics need this aspect of sharing with colleagues, because we in mathematics do not work with elementary school classes. So, if we don't have this experience with other students and with other people, like you, who are in education, the Project II Coordinator, who works more with these issues of teaching children—even though she has a degree in math, she's already had experience with children. We go there with no experience at all, and since we don't know how to handle a child, we aren't prepared; we don't have that in our undergraduate program—that exchange of experiences. With the Club staff, that diversity is one of the things I find very positive for us.

M1: I agree with what Lucas and Joana said; for me, the Club has no negative aspects, only positive ones. Sharing these activities contributes significantly. It was actually what we've already discussed—the idea of being better prepared to enter the classroom, regardless of whether you're working with younger students or older ones. For example, the game I developed for my Final Course Project was based on the theory we studied in the Club. It was something I was able to use with both younger students and high schoolers. Once you've grasped the core of the theory, you can adapt your materials for all grade levels. So I think it makes a big difference for us, as future teachers, to have the ability to work more effectively with students.

G1: The contact that I think the undergraduate program doesn't provide much of is with the school. You'll eventually have that contact, but it's almost at the very end of your degree, when you're about to graduate, through internships—and then you'll arrive unprepared and won't know how to react. So we've already been preparing beforehand; we'll already have a rough idea, talking with each other and sharing our ideas.

The participants' statements reveal a focus much more directed toward sharing and practical interactions in the school context than on the content studied *per se*. This can be explained by the nature and organizational structure of the program, where future teachers and other members establish connections not only with what is explicit in the text but also with their own experiences, based on what is addressed in the theory.

Although sharing is assumed as a premise of CluMat, it cannot be limited to the requirement of carrying out actions, such as, for example, studying together with other participants. Interaction is an essential element, as can be observed in the exchange of ideas about the text itself, as well as the connections between this exchange and the experiences and practices carried out in the classroom. These associations become fundamental, given that they allow the future teacher, "by sharing experiences and reflections with other future teachers, to facilitate the discussion and analysis of their

narratives, thereby fostering an understanding of their concerns regarding teaching and learning, among other aspects” (RAMOS *et al.*, 2016, p. 49).

The statements from M3, M2, and M1 highlight the diversity of CluMat participants, which ranges from undergraduate students in Geography and Mathematics to graduate students in Education, Mathematics Education, and Physics Education, as well as K-12 teachers and project coordinators from higher education institutions. Promoting a diverse learning environment ultimately enriches discussions and reflections regarding the study, as it fosters the exchange of ideas, knowledge, experiences, and learning among individuals from different levels and fields of study.

It is argued that this educational diversity brought by CluMat contributes especially to the training of future teachers, who, by interacting with teachers already in the field, find the opportunity to learn and acquire new knowledge related to school practice linked to theory, as discussed in G1. In light of this, Lopes *et al.* (2016, p. 25) highlight the importance of:

[...] different individuals—with different knowledge —interacting in a way that allows for the sharing of actions, their meanings, and significance, can be decisive in improving the quality of what they develop. Since education is a collective process, it is through sharing that the teacher has the opportunity to acquire new knowledge, for although the actions may be those of each individual carrying out a given activity, learning does not occur in what each of them does in isolation, but in the interaction between individuals or between individuals and objects. Thus, it is necessary that actions be carried out by everyone, but that each person has not only the opportunity but also the commitment to participate.

Based on the HCT, it is understood that human development occurs through interaction with other individuals. In this process, upon entering life in society, each individual must learn to be human, since what nature provides at birth is insufficient for them to live in society; it is necessary for them to acquire the knowledge and skills produced throughout the historical development of human society (LEONTIEV, 1978).

The same applies to the teacher training process: for individuals to become teachers, they must interact with teachers currently working in classrooms, students in Basic Education, and future teachers at the same stage of training. In light of this, we present some final considerations.

Final Considerations

Returning to the initial objective of this study, which was to identify the meanings articulated by four future teachers as they engaged in collaborative study activities—understood as potentially fostering learning for teaching—we offer the following reflections. Our analysis was organized around three episodes that addressed the following aspects: approaches to theory through study; new ways of conceiving the organization of mathematics teaching; and contributions of sharing throughout the study process.

In the first episode, we observe the future teachers' engagement with TOA, the theoretical principle adopted in the project. The study on theoretical and methodological foundations allowed future teachers to reflect on the organization of teaching, attributing meanings related to the purpose of the actions developed in the project, which stem from an intentionality aimed at student participation and development in the learning process.

Regarding the second episode, it is observed that the initial studies conducted at CluMat contributed to the teacher candidates' consideration of new ways to organize the teaching of mathematics and geography. Furthermore, it is also identified that the meanings attributed to the studies are centered on the learning of the knowledge to be taught and the form of instructional organization.

Finally, in the last episode, it is observed that the future teachers attributed a positive connotation not only to the study itself but especially to its form of organization, attributing to it a role as a catalyst for reflection. Conducted collaboratively with other participants, this format allowed them not only to discuss the ideas in the text but also to make connections between the study and the experiences they had in the school context.

Analysis of the research data indicates that future teachers attribute a positive meaning to the act of studying while sharing with others, which constitutes an important factor for learning, experiences, and lived experiences. This allows us to infer that when the meanings attributed to shared study are related to the acquisition of knowledge, the actions undertaken, and the possibilities for collective reflection, this study can be understood as a tool for organizing teaching and, therefore, as a catalyst for teacher learning.

The research activities carried out within the CluMat project aim to foster sharing as a means of exchanging knowledge—not only regarding the content to be taught, but also as an opportunity to encourage future teachers to engage in critical reflection on the school practices they have experienced throughout their careers in K-12 education. It is through their life stories, experiences, and lived realities, in a dynamic process of sharing, that the future teacher (re)constructs themselves by appropriating knowledge related to teaching.

References

BOROWSKY, H. G. *Os movimentos de formação docente no projeto orientador de atividade*. 2017. 242 f. Tese (Doutorado em Educação) – Universidade Federal de Santa Maria, Santa Maria, 2017.

BOROWSKY, H. G. A Atividade Orientadora de Ensino como princípio do Clube de Matemática: caminhos para a formação docente. *Obutchénie*, Uberlândia, v. 4, n. 2, p. 509-533, maio/ago. 2020. Disponível em: <https://doi.org/10.14393/OBv4n2.a2020-57494>. Acesso em: 08 set. 2024.

CEDRO, W. L.; MOURA, M. O. O clube de matemática: um espaço para a formação inicial de professores que ensinam matemática. *Perspectivas da Educação Matemática*, Campo Grande, v. 3, n. 5, p. 9-22, jan./jun. 2010. Disponível em: <https://periodicos.ufms.br/index.php/pedmat/article/view/2769>. Acesso em: 07 set. 2024.

FREITAS, M. T. A. A abordagem sócio-histórica como orientadora da pesquisa qualitativa. *Cadernos de Pesquisa*, São Paulo, n. 116, p. 21-39, jul. 2002. Disponível em: <https://doi.org/10.1590/S0100-15742002000200002>. Acesso em: 12 set. 2024.

GRUPO DE ESTUDOS E PESQUISAS SOBRE A ATIVIDADE PEDAGÓGICA (Org.). *Atividade orientadora de ensino e contribuições para a educação escolar*. São Paulo: FEUSP, 2024. Disponível em: <https://drive.google.com/file/d/1dgxNQwCdJp4sQk7AuaOdAQFDuRP7am28/view>. Acessado em: 05 set. 2024.

IBIAPINA, I. M. L. M.; FERREIRA, M. S. Reflexão crítica: uma ferramenta para a formação docente. *Linguagens, Educação e Sociedade*, Teresina, n. 9, p. 73-80, jan./dez. 2003. Disponível em: <https://periodicos.ufpi.br/index.php/lingedusoc/article/view/1601>. Acessado em: 16 set. 2024.

LEONTIEV, A. N. *Atividade, consciência, personalidade*. Tradução: Priscila Marques. Bauru: Mireveja, 2021.

LEONTIEV, A. N. *O desenvolvimento do psiquismo*. Lisboa: Horizonte Universitário, 1978.

LEONTIEV, A. N. Uma contribuição à teoria do desenvolvimento da psique infantil. In: VIGOTSKI, L. S.; LURIA, A. R.; LEONTIEV, A. N. *Linguagem, desenvolvimento e aprendizagem*. 11. ed. São Paulo: Ícone, 2010. p. 59-102.

LOPES, A. R. L. V. *Aprendizagem da docência em matemática: o Clube de Matemática como espaço de formação inicial de professores*. Passo Fundo: Ed. Universidade de Passo Fundo, 2009.

LOPES, A. R. L. V. *et al.* Trabalho coletivo e organização do ensino de matemática: princípios e práticas. *Zetetiké*, Campinas, v. 24, n. 45, p. 13-28, 2016. Disponível em: <https://doi.org/10.20396/zet.v24i45.8646526>. Acessado em: 18 set. 2024.

MOURA, M. O. A atividade de ensino como ação formadora. In: CASTRO, A. D.; CARVALHO, A. M. P. (Orgs.). *Ensinar a ensinar: didática para a escola fundamental e média*. São Paulo: Pioneira Thompson Learning, 2002. p. 143-162.

MOURA, M. O. A atividade de ensino como unidade formadora. *Bolema*, Rio Claro, v. 11, n. 12, p. 1-14, 1997. Disponível em: <https://www.periodicos.rc.biblioteca.unesp.br/index.php/bolema/article/view/10647>. Acessado em: 11 set. 2024.

MOURA, M. O. *O educador matemático na coletividade de formação: uma experiência com a escola pública*. 2000. Tese (Livre Docência em Metodologia do Ensino de Matemática) - Universidade de São Paulo, São Paulo, 2000. Disponível em: <https://repositorio.usp.br/item/001174195>. Acesso em: 10 set. 2024.

MOURA, M. O. *et al.* A atividade orientadora de ensino como unidade entre ensino e aprendizagem. In: MOURA, M. O. (Org.). *A atividade pedagógica na teoria histórico-cultural*. Campinas: Autores Associados, 2016. p. 93-108.

MOURA, M. O. *et al.* Atividade orientadora de ensino: unidade entre ensino e aprendizagem. *Revista Diálogo Educacional*, Curitiba, v. 10, n. 29, p. 205-229, 2010. Disponível em: <https://doi.org/10.7213/rde.v10i29.3094>. Acesso em: 10 set. 2024.

RAMOS, T. S. *et al.* Constructos em narrativas do ser e do se fazer docente. *Educação em Ciência e Matemáticas*, Belém, v. 13, n. 25, p. 46-61, jul./dez. 2016. Disponível em: <http://dx.doi.org/10.18542/amazrecm.v13i25.3268>. Acesso em: 09 set. 2024.

VIGOTSKI, L. S. *Sete aulas de L.S. Vigotski sobre os fundamentos da pedagogia*. Rio de Janeiro: E - Papers, 2018.

VYGOTSKY, L. S. Aprendizagem e desenvolvimento intelectual na idade escolar. In: LEONTIEV, A. N. *et al.* *Psicologia e pedagogia: bases psicológicas da aprendizagem e do desenvolvimento*. São Paulo: Centauro, 2005. p. 25-42.

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