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History, actions, and achievements of the mathematics laboratory of the University of Passo Fundo (RS)

História, ações e realizações do laboratório de matemática da Universidade de Passo Fundo (RS)

Historia, acciones y logros del laboratorio de matemáticas de la Universidad de Passo Fundo (RS)

Histoire, actions et réalisations du laboratoire de mathématiques de l'Université de Passo Fundo (RS)

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Abstract

This article focuses on the theme of mathematics laboratories, in particular, the laboratory of University of Passo Fundo (UPF) , pointing out its history and actions developed. The following report was based on information and data contained in documents, minutes, and other elements of the laboratory's collection, which characterizes a bibliographic research, based on authors such as Kaleff (2004), Lorenzato (2006), and Libâneo (2011). It aims to systematize the UPF Mathematics Laboratory's (LabMat) trajectory to learn about its history of constitution, present the major contributions to teaching and learning processes throughout its existence, and indicative the need for a continuous possibility of actions and practices restructuring. With this study, the importance of the LabMat in the regional educational context is noticed, in face of initiatives throughout its existence, such as the development of the dynamic methodology, the organization of the National and Regional Journeys of Mathematics Education, the support provided to UPF undergraduate courses, essentially to mathematics, and also regarding to the continuous education of teachers, which were carried out with the aim of helping to improve the quality of the subject. At the end of the text, it is possible to intuit that

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the laboratory under study, in view of its dynamics in past actions, can and needs to be resized for the new challenges faced by mathematics education in the post-pandemic context.

Keywords: Mathematics laboratories, Mathematics education, Teacher education, Mathematics education journeys.

Resumo

O presente artigo traz a temática dos laboratórios de matemática, especialmente o da Universidade de Passo Fundo (UPF), apontando sua história e as ações desenvolvidas. O relato que segue teve como referência informações e dados contidos em documentos, atas e demais elementos do acervo deste laboratório, o que caracteriza um levantamento bibliográfico, encontrando sustentação teórica em autores como Kaleff (2004), Lorenzato (2006) e Libâneo (2011). Tem como objetivo sistematizar a trajetória do Laboratório de Matemática (LabMat) da UPF, com o intuito de conhecer a sua história de constituição, apresentar suas principais contribuições para os processos de ensino e de aprendizagem ao longo de sua existência e trazer indicativos da necessidade de uma contínua possibilidade de reestruturação de ações e práticas. Com este estudo, percebe-se a importância do LabMat no contexto educacional regional, frente às iniciativas ao longo de sua existência, como o desenvolvimento da metodologia dinamizante, a organização das Jornadas Nacional e Regional de Educação Matemática, o apoio prestado aos cursos de graduação da UPF, essencialmente ao de matemática, e a organização de formação continuada de professores, que foram executadas com o intuito de auxiliar na melhoria da qualidade do ensino da disciplina. Ao término do texto, é possível intuir que o laboratório em estudo, frente a sua dinamicidade em ações passadas, pode e precisa ser redimensionado para os novos desafios da educação matemática no contexto pós-pandemia.

Palavras-chave: Laboratórios de Matemática, Educação Matemática, Formação de Professores, Jornadas de Educação Matemática.

Resumem

Este artículo trae el tema de los laboratorios de matemáticas, especialmente el de la Universidad de Passo Fundo (UPF), señalando su historia y las acciones desarrolladas. El informe que sigue se basó en informaciones y datos contenidos en documentos, actas y otros elementos de la colección de este laboratorio, que caracteriza a una investigación bibliográfica basada en autores como Kaleff (2004), Lorenzato (2006) y Libâneo (2011). Se pretende sistematizar la trayectoria del Laboratorio de Matemáticas (LabMat) de la UPF, con el fin de conocer su historia de constitución, presentar sus principales aportes a los procesos de enseñanza y

aprendizaje a lo largo de su existencia y también indicativos de la necesidad de una continua posibilidad de reestructuración de acciones y prácticas. Con este estudio, es posible percibir la importancia de LabMat en el contexto educativo regional, en vista de las iniciativas a lo largo de su existencia, como el desarrollo de la metodología dinámica, la organización de las Jornadas Nacionales y Regionales de Educación Matemática, el apoyo prestado a los cursos de graduación de la UPF, esencialmente matemáticas, y también en lo que respecta a la formación continua del profesorado, que se ejecutaron con el fin de ayudar a mejorar la calidad de la enseñanza de la disciplina. Al final del texto, es posible intuir que el laboratorio en estudio, en vista de su dinamismo en acciones pasadas, puede y necesita ser redimensionado para los nuevos desafíos de la educación matemática en el contexto post pandemia.

Palabras clave: Laboratorios de Matemáticas, Educación Matemática, Formación del Profesorado, Jornadas de Educación Matemática.

Résumé

Le présent article étudie le thème des Laboratoires de Mathématiques, en particulier celui de l'Université de Passo Fundo (UPF), et souligne son histoire et les actions développées. Le rapport suivant a été basé sur des informations et des données tirées dans des documents, des procès-verbaux et d'autres éléments de la collection dudit Laboratoire, qui illustre une recherche bibliographique et trouve son soutien théorique parmi des auteurs tels que Kaleff (2004), Lorenzato (2006) et Libâneo (2011). Cet article vise à systématiser la trajectoire du Laboratoire de Mathématiques (LabMat) de l'UPF, afin de connaître l'histoire de sa constitution, d'exposer les principaux apports aux processus d'enseignement et d'apprentissage promus par celui-ci tout au long de son existence et également, de présenter des indicatifs de la nécessité d'une possibilité de restructurer ses actions et ses pratiques. Avec cette étude, il est possible de constater l'importance du LabMat dans le contexte éducatif régional, en tenant compte des initiatives introduites tout au long de son existence, telles que le développement de la Méthodologie Dynamisante, l'organisation des Journées Nationales et Régionales de l'Enseignement des Mathématiques, le soutien apporté aux cours de premier cycle de l'UPF, essentiellement en Mathématiques, et aussi en ce qui concerne la formation soutenue des enseignants, qui ont été menées dans le but de contribuer à améliorer la qualité de l'enseignement de la matière. À la fin du texte, il est possible de reconnaître que le Laboratoire à l'étude, compte tenu de son approche dynamique dans le passé, peut et doit être remodelé à la lumière des nouveaux défis de l'enseignement des mathématiques dans le contexte postpandémique.

Mots-clés: Laboratoires de Mathématiques, Enseignement des Mathématiques, Formation des professeurs, Journées de l'Enseignement des Mathématiques.

History, actions, and achievements of the mathematics laboratory of the University of Passo Fundo (RS)

Mathematics laboratories can be characterized as spaces where it is possible to study mathematics using different didactic resources and teaching methodologies. In other words, they are not just conventional classrooms. They can be favorable environments for mathematics teaching and learning and can be used to solve students' doubts about concepts if we think about elementary and high school levels. On the other hand, they are spaces where researchers and students can create and develop experimental activities, produce various resources, and do research activities. They may help improve pedagogical practices and a differentiated approach to mathematical concepts compared to conventional practices.

In line with these ideas, authors such as Kaleff (2004), Lorenzato (2006), and Libâneo (2011) point out that mathematics laboratories can be spaces of great potential in teacher education. The justification for this is that they make it possible to experience practices related to future teaching practice and contribute to the feasibility of new teaching methodologies for mathematical content in basic education –in this case, also in terms of continuing education processes.

Given the above, this work is the result of the interest in recovering, at first, the history of the Mathematics Laboratory of the University of Passo Fundo (UPF), following and deepening the study developed by Prof Ana Maria Reckziegel Teixeira's master's degree thesis "The symphony of numbers: Maria Fialho Crusius – a life dedicated to mathematics education at UPF" (2000), which addresses the life of Maria Fialho Crusius, founder of the laboratory, and her relationship with the theme of mathematics education.

This interest in tracing a resumption of the history of the laboratory, adding to this intention the actions performed in the mathematics laboratory, is supported by aspirations from the author, who interned from 2019 to 2021 in the laboratory under study. During this time, he actively participated in its actions, such as the weekly planning and study meetings, organization of the Jornada Nacional e Jornada Regional de Educação Matemática [National and Regional Journeys on Mathematics Education], university tutoring activities, and the exchange of knowledge and experiences with the research and extension projects of the UPF, as well as other relevant administrative activities and interaction with the local community.

Thus, the author's experiences indicate his intention to systematize evidence of the history of this space, emphasizing its significance in the regional educational context, which is demonstrated by the numerous activities developed there because, since its establishment in

1966, the Mathematics Laboratory of the UPF has been characterized as an environment for teaching and learning mathematics.

Therefore, to contribute to rescuing the history of this important space of the UPF and the area of mathematics education, in addition to reinforcing the importance of the continuity of its actions, the following question will guide the development of this work: "How was (and how is) the Mathematics Laboratory of the University of Passo Fundo constituted, and how does it contribute to the mathematics education area?"

This laboratory is used so that researchers and undergraduate students can contribute to studies and research in mathematics education, seeking methodological strategies to improve the teaching quality and for the initial and continuing education of teachers in the area based on the production of didactic resources. It also supports mathematics and pedagogy courses, essentially for methodological subjects. In addition, the laboratory team offers tutoring to academics, assists in extension projects, and is responsible for organizing the Jornadas de Educação Mathematica [Journeys on Mathematics Education], events of national scope.

Given the above, this work aims to systematize the history of the UPF Mathematics Laboratory through research in documents and materials located there. With this, we aim to know its constitution and consider its main contributions to the teaching and learning processes of the subjects of its actions and the community and how it continues to be (re)structured.

Based on these objectives, we carried out an exploratory research, which, according to Gil (2007), is carried out to provide a deepening of ideas, making the research problem more explicit and trying to answer it from different approaches. For research, this author points out different procedures, such as: "(a) bibliographic survey; (b) interviews with people who had practical experiences with the researched problem; and (c) analysis of examples that stimulate understanding" (GIL, 2007, p. 41). Given the specifics of this work, we chose to conduct a bibliographic survey in the laboratory by collecting documents and records of its trajectory since its creation in 1966. Through this process, we aimed to gather data to structure our research and complement our literature review on the subject[3]. The data obtained will be presented during this study.

Therefore, this work is structured into three topics. In the first, we present some conceptions of a theoretical nature, with reflections on the mathematics laboratory, its relationship with the area of mathematics education, and the possible influences on the teaching

[3] In the search for theoretical references, it should be noted that recent literature (books, articles, abstracts) aligned with the objectives of this work was not found.

and learning processes in the area. The second topic addresses the process of reconstituting the history of the UPF LabMat, with a description of the actions, with emphasis on teacher initial and continuing education, the implementation of the "dynamizing methodology" (*metodologia dinamizante*), the organization and realization of the Jornadas de Educação Matemática and the advisory services and regional educational consultancies provided by the laboratory team. In the final considerations, the third topic, we ponder over the researched theme and indicate future actions that may be developed by the UPF LabMat and other possible questions for future research.

Some conceptions of mathematics laboratories (ML)

There is an increasing consensus that teaching is a challenging task for teachers, and learning, essentially in mathematics, also challenges students. As mechanical and discouraging activities are often employed in this subject–which makes learning fragile– we believe it is necessary to rethink the teaching action of this component, in order to re-signify it in the educational context, in agreement with Groenwald, Silva, and Mora (2004).

Considering the mathematics teacher, Lorenzato (2006) understands the importance of having an appropriate place to carry out professional practice aiming at learning, since a good teaching performance is also linked to the work environment and the tools made possible. In this way, it is possible to structure classes based on these instruments, aiming to establish learning objectives and achieve them with the execution of these classes.

In several professions, such as architecture and engineering, what is planned is generally put into practice literally. However, this is not the education case, in which planning can be changed at the time of practice based on each student's specificities. This is justified by students' creativity, who question, articulate ideas, and generate discussions, often making teachers change their planning so that they can achieve the proposed objectives for the class. Therefore, we agree with Lorenzato (2006) when we state that mathematics laboratories are essential for teaching mathematics in basic education, as they can help teachers to achieve their objectives satisfactorily and be flexible in teaching when necessary.

Maschietto and Trouche (2010) bring a reflection by the French mathematician Borel (1871-1956) uttered at the *Musée Pédagogique* Conference, held in Paris early last century, showing that the concern with mathematics laboratories is not recent:

> To lead children, teachers, and society as a whole to have a more accurate notion of what mathematics is and its actual role in modern life, we must do more and create

> actual mathematics laboratories. I think this issue is very important and should be studied more seriously. (Borel, 1904 as cited in Maschietto; Trouche, 2010, p. 39)

In this way, we understand the importance of MLs in mathematics teaching and learning processes. They can be characterized against some conceptions, which were systematized by Lorenzato (2006), such as:

- A place for depositing resources needed for classes, such as books, manipulative materials, games, calculators, and computers, among others;
- A space for teachers' organization and planning, sharing practices, and rendering students advice when they face doubts or challenging pedagogical situations;
- Environment for creating and experimenting with pedagogical practices, with or without the use of physical resources, which can improve teaching activities.

In summary, "it must be the center of the school's mathematical life; more than a deposit, classroom, library, or museum [...] it is the place in the school where teachers are committed to making mathematics more understandable to students" (Lorenzato, 2006, p. 7). The author also says that the math lab is an environment for the student to learn to learn and, thus, to think mathematically.

Considering the school realities and educational trends, we realize that the implementation of a mathematics laboratory in a school, for example, needs to be an aspiration of a group of teachers –not necessarily just mathematics– and students, with the support of the other individuals of the school routine. Thus, from collective action, it is possible to contribute significantly to mathematical learning since, as Lorenzato (2006) states, "it is difficult for the teacher to build the Laboratório de Ensino de Matemática - LEM [Math Teaching Laboratory] alone and, even more, to maintain it".

Nevertheless, in line with the author's ideas above, Ewbank (1971) presents two conceptions of the laboratory. The first, very close to what Lorenzato (2006) says, contemplates the ML as a learning space and an environment for experimentation and practical activities in mathematics, which is also pointed out by Kaleff (2004). The second conception states that the laboratory can be understood as a triggering of actions. "This last use of the term, as a process and a procedure, is the most important because not every school can have a mathematics laboratory, but every school or every teacher can use this teaching method" (EWBANK, 1971, p. 559). Thus, the laboratory can also be understood as a teaching methodology.

In turn, Libâneo (2011) shows that the mathematics laboratory, as part of the initial teacher education, allows relating theory to practice and pedagogical practices for teaching content at elementary and high school levels, deepened in the subjects of mathematics degree

courses. Turrioni (2004) affirms that the laboratory can help undergraduates develop skills such as inquiry, search for knowledge, cooperation, and critical reasoning, all essential elements for a teaching career.

That said, its importance is justified by the fact that it enables the personal development of prospective teachers, presenting a renewal of didactic strategies, dissociating the subject from the idea of memorizing formulas and rules towards the ideas of thinking and doing mathematics, as Turrioni (2004) states. Furthermore, the author affirms:

> The LEM allows the student to understand learning as an individual achievement since, more important than the renewal of contents is always the renewal of methods and techniques and, consequently, the achievement of a new mentality and attitudes. It also allows the pre-service teacher to have the opportunity to work in a group, when both inter-individual and collective exchanges occur. (p. 64)

In this context, we understand that using the mathematics laboratory creates a favorable and meaningful environment for learning. From this perspective, Ewbank (1971) conceives the ML as a bridge between the real world and the mathematical world, enabling academics, prospective teachers, to reframe their understanding of mathematics and their expectations for the future in the classroom. Lorenzato (2006), agreeing with the author, also points out that it is possible that, in this space, the student learns to look for answers autonomously, being active in learning mathematical knowledge.

Thus, we understand that the undergraduate student, a prospective mathematics teacher, throughout their higher education, has access to similar spaces to be inserted in this reality and to know how to use it in the various concepts presented, given its importance as an instrument to facilitate the learning of this subject. Having evidenced the contributions of the MLs in the educational process, we also recognize that it is possible, with the engagement of teachers and students, to implement them in each one's educational territory.

A historical rescue of the Mathematics Laboratory of the University of Passo Fundo

Over time, mathematics teaching underwent changes in the face of specificities and instructions under the legislation of each era. It is worth mentioning that mathematics was not always thought of as a single subject: sometimes, the branches of mathematics –arithmetic, algebra, and geometry– were taught individually, as pointed out by Valente (1999) and Lacerda, Cabanha, and Maltempi (2013), which generated discussions and reformist proposals.

One of them, the Francisco Campos Reform, which took place in the 1930s, sought to introduce New School ideals[4] in mathematics teaching in Brazil, as Fiorentini (1994) and Teixeira (2000) point out. Specifically, this proposition sought to break with a classical approach, emphasizing the teaching of theorems and definitions, through repetitive exercises – which can be characterized as "fixation exercises"– and without relating the contents addressed to everyday situations, nor to other areas of mathematics, which can be understood, in short, as memorizing rules and formulas.

In this sense, the Reform, which sought to modernize school mathematics (Valente, 2006), had been discussed at the Quarto Congresso Internacional de Matemática[5], held in 1908 [Fourth International Congress of Mathematicians], as stated by Soares, Dassie, and Rocha (2004). The latter analyzes that the Reform received –for being considered an innovative proposal– numerous criticisms from society in general, fearful of the possibility of a drop in the quality of mathematics teaching. Father Arlindo Vieira commented that the Reform chose scientific teaching to the detriment of classic teaching, which was deemed unacceptable because, unlike Brazil, Portugal, France, Belgium, and Italy adopted classical studies. To Father Vieira, "[...] there is always a respectable elite that maintains the beautiful letters and sciences at a level that we are far from reaching and will never reach, while our teaching continues to be what it has been until today" (1934, np).

On the other hand, when analyzing the reforms in the teaching of mathematics, Vianna observes:

> What was tried to be instituted in relation to mathematics, since 1928, was not a simple reform of programs, but, above all, a profound reform of methods. However, the reform was not understood that way, in general. It was so disfigured that, for the vast majority, teaching remained in the initial intuitive phase, having degenerated, when it should have reached the formal phase, into a veritable heap of practical rules and formulas. (1937, p. 51)

At the same time, the first Montessorian schools began to be implemented in Brazil – so called because they followed Maria Montessori's methods. They were also based on the ideals of the New School. Röhrs (2010) presents that Maria Montessori's pedagogy consisted

[4] In Portuguese, escolanovista, related to the New School Movement. This is a movement that gained great momentum practically all over the world at the end of the 19th century and in the first decades of the 20th century. Its driving idea consisted of the premise of the need to reform the school in order to reform society (PEREIRA, 2010). It sought to break with the "traditional" school, providing situations in which the student could Experiment and thus build knowledge (Vidal, 2000).

[5] In this Congress, held in Rome, there was a sharing of mathematics teaching practices in different countries, with the aim of internationalizing and modernizing it.

of learning through love –and not through fear, as traditional methods advocated– considering that a suitable environment for learning was essential, as guided by the New School ideals. As stated by Vasconcelos (1996), considering these same principles, the propagation of Piagetian ideas began[6] in Brazil in this period.

In 1942, the Gustavo Capanema Reform effectively united the subject of mathematics with its branches: algebra, arithmetic, and geometry. Gustavo Capanema Reform was not well accepted by some groups, such as military professors, who believed that simultaneous –and not consecutive– teaching of these contents was a mistake, as pointed out by Soares, Dassie, and Rocha (2004). In addition, the 1942 Reform changed the structure of teaching in Brazil, raising discussions about the actual implementation of simultaneous teaching, presented by the Francisco Campos Reform, and about the reorganization of the minimum mathematics content in each course (middle school, classical, and scientific).

After this period, mathematics teaching of mathematics appropriated the ideals of the Modern Mathematics Movement, which sought to re-signify teaching practice to improve its quality, as previously observed in other countries around the world. According to Kline (1976), this movement was still traditional mathematics but approached in a new way.

Regarding the results of this movement, D'Ambrósio (1998) understands that:

> If Modern Mathematics did not produce the intended results, the movement served to demystify much of what was done in mathematics teaching and to change –undoubtedly for the better– the style of classes and tests and to introduce many new things, especially the modern language of sets. Sure, there were exaggerations and incompetence, as with all innovations. But the jump was highly positive. This happened, with these same characteristics, all over the world. (pp. 57-59)

There were other attempts at reforms after the Capanema Reform was implemented since there were still discussions and criticisms of the changes already carried out. In this scenario, even when the ideas of the Modern Mathematics Movement began to circulate, the proposals of the New School and Piagetian ideas were also discussed, as well as Montessorian pedagogy. According to such ideas, we can see how dynamic and slow it is to think about mathematics teaching and learning and, effectively, to put changes of any nature into practice.

From this diversified context in relation to the different teaching concepts and content to be taught in this subject, in 1966, a group of professors, led by Maria Fialho Crusius, began to meet to study, on their own initiative, issues connected somehow with different themes

[6] Ideas based on Jean Piaget, who believed, among other things, that the child's relationship with the physical and social world promotes their cognitive development.

related to mathematics, seeking didactic strategies to contribute to students' learning. In addition to Prof Maria Fialho Crusius, the group was composed of professors Carmen Hessel Peixoto Gomes, Helena Andreis Lorenzatto, Lourdes Selma Sacchett, Mary Caetano Costa, Naira Rezende, and Ocsana Sônia Danyluk. In 1975, the group was formalized as "Mathematics Laboratory." However, it was only on March 30, 1979, that it was approved as an organ of the Institute of Exact Sciences and Geosciences of the University (ICEG), and until today it functions as an integral part of the Mathematics Course at that institution[7].

Considering the context of modern mathematics –and the studies of Professor Maria Fialho Crusius, based on Piaget's constructivist[8] current– the laboratory team sought to experiment with new teaching strategies based on the elaboration of suggestions for study paths and activities to be applied in schools. Prof Maria Fialho Crusius called it "dynamizing methodology" [*metodologia dinamizante*] (Crusius, 1984).

Teixeira (2000) claims that this methodology was active and dynamic –there was no room for immobility– and students were the main characters in the construction of their own knowledge (in a constructivist-interactionist educational perspective, starting from the concrete to the abstract). In this sense, Fiorentini (1994) argues that "[...] constructivism, and we are only talking about Piagetians here – sees mathematics as a human construction constituted by abstract structures and relations and real or possible magnitudes; therefore, this current prioritizes the process more than knowledge" (p. 54).

Regarding the concerns related to the development of this teaching strategy and also considering the mathematical contents that should be studied, Teixeira (2000) adds:

> The mathematics thought of at the academy was the same, but there was a great concern in making it pleasant, facilitating, in such a way that the students no longer saw it as a "bogeyman". The content itself did not change, it was present; the difference was in the methodology. (p. 26)

Even though it was considered a challenge for some of the members of the laboratory team –since it was a novelty in the educational context– the dynamizing methodology began to be implemented in schools in Passo Fundo in the late 1970s. To this end, the objective was

[7] In documents located in the laboratory, there is divergence of dates. In this work, we chose to follow the same chronology adopted by Teixeira (2000).

[8] "The constructivist version [...] intends to show that the teaching-learning process is a social process in which knowledge is the result of the student's personal construction. And it is important to realize that the teacher is an important mediator in this construction. They are mediating agents between the student and society and the student." (Fossile, 2010).

to re-signify mathematics teaching in the 1st and 2nd *graus* (the terminology at the time; nowadays, basic education) and improve the teaching quality.

In this way, the line of research at the ML differed from those known until then: it followed Piaget's criteria for mental development[9] and, therefore, was innovative in Brazil, as Teixeira (2000) mentions. Thus, the dynamizing methodology was elaborated based on Piagetian conceptions. In the words of Crusius (1984):

> In general lines, the methodology consists, above all, of not giving anything ready, in making the students, according to their level of development (pre-school, 1st, 2nd, or 3rd *grau* students), carry out activities starting from the action. First in games or movements of the body itself; then, through action on the most diverse concrete materials; through action already internalized and reversible, i.e., starting from the operation carried out on the situations experienced or to be experienced; and, finally, starting from the operations carried out on propositions and propositions of propositions. With this, students are expected to reproduce, by elaboration of intelligence, the history of the processes of formation of concepts, starting from their fundamental origins, to reach abstraction, generalization, systematization, and the ability to consciously operationalize them. With this, we expect to gradually develop [in students] critical reasoning. (p. 13)

However, while other researchers – such as the Grupo de Estudos sobre Educação, Metodologia de Pesquisa e Ação - Geempa [Group of Studies on Education, Research Methodology, and Action], from Porto Alegre – developed the active methodology, Danyluk (2012) shows that the group of professors at LabMat sought to implement the dynamizing methodology in Passo Fundo, being sponsored by the Fundação de Amparo à Pesquisa do Rio Grande do Sul - Fapergs [Research Support Foundation of Rio Grande do Sul]. The author comments that from these discussions, the term *mathematics education* emerged, which, until that time, was unknown or little used in the university environment.

As a result, in addition to classroom interventions in public schools, LabMat member professors also received invitations to participate in events on mathematics education and to teach at the university itself to apply the dynamizing methodology, which is reported by one of them in Teixeira (2000). The invitations came with the intention that the new methodology could solve problems, such as school retention rates, lack of basic mathematical notions and difficulties constructing concepts. The group also worked in higher education courses in administration, agronomy, economics, engineering, mathematics, and chemistry at the UPF. About higher education, professor Carmen Hessel Peixoto Gomes, in a statement regarding the teaching of mathematics found in Teixeira (2000), asserts: "One thing that can be seen is that

[9] The description of these stages of mental development can be found in Teixeira (2000, p. 28).

the undergraduate has already gone through elementary school and high school and, as he/she is at university, we are not going to teach those contents in the same way; there must be a different approach" (p. 32). Such considerations show the impact of the dynamizing methodology since its conception by LabMat.

Later, some professors from the LabMat group were invited to participate in the Ação Conjunta para Melhoria do Ensino de Ciências e Matemática no Rio Grande do Sul (RS) [Joint Action for the Improvement of Science and Mathematics Teaching in Rio Grande do Sul], which became known as Rede Acomecim, from 1994 to 1997. The project's proposal in relation to teacher education was aligned with those of the laboratory, and, besides continuing the actions already carried out there, it could be integrated into several groups from different RS higher education institutions. In addition, it would enable the consolidation of advisory and consultancy centers and study centers, promoting teacher continuing education and the sharing of logical methods[10] and alternative materials. In this way, it would promote the improvement of degree courses at the participating institutions based on the assessments of graduates in meetings of the Rede Acomecim.

Allying with these ideas, based on studies from the LabMat group, one of its members, Ocsana Sônia Danyluk, established, in the scientific environment, the term "mathematical literacy." This can be understood as the acts of reading and writing mathematically in the first years of schooling because "Being literate in mathematics is understanding what you read and write, understanding the first notions of arithmetic, geometry, and logic ", as argued by Danyluk (2015, p. 19). She adds:

> The group thought like this: it was necessary to change the teaching of mathematics, starting with the teacher's attitude; there must be a mathematics teaching in which people think better. The mathematics laboratory served to study mathematics exercises and think about what was being done. In this aspect, we contribute, in practice, with the teaching of mathematics via the laboratory. Currently, in congresses, forums, and mathematics conferences, as well as in books, the current use of the term mathematical literacy. This term was first used in my master's degree thesis. The term literacy was used in the Portuguese language area. Fortunately, today, we see that literacy has become detached from that old idea that literacy was reading, writing, and counting. (Danyluk, 2012, p. 27)

Notwithstanding such considerations, due to actions in mathematics education, UPF's LabMat received visits from professors from universities in Rio Grande do Sul and São Paulo to be inspired by it and create their own laboratories in their respective institutions. Danyluk

[10] There is no explanation in the localized documentation of what these logical methods would be.

(2012) adds that "[...] Maria [Fialho Crusius] was a pioneer in the state in the creation of teaching laboratories, as well as in mathematics education" (p. 28).

Considering the conceptions of the LabMat teachers' team regarding changes in the teaching of mathematics in Brazil to experiment and disseminate the dynamizing methodology, and the lack of public policies in force at the time that encouraged the continuing education of teachers, the space was initially characterized as a place for study and research groups of professors of mathematics and pedagogy courses at the UPF, and for the organization of events and lectures. Over time, in addition to this concern with mathematics teaching, the LabMat also became a space where undergraduate students could experiment and reflect on the studies carried out in their studies and future classroom practice and socialize perceptions and anxieties.

Based on this, it is clear that the practices carried out by the professors members of the LabMat were, until then, fully aligned with the main objectives of that body, namely:

> - seek alternative solutions to improve the quality of mathematics education; - propose directional models suitable for the student's level of development, respecting their dignity as human beings; - seek to sensitize teachers of any level of education, in the sense that they experiment with methodologies that may contribute to improving the quality of educational work, aiming at the good of the student and the community in which they work; - streamline a dynamizing methodology that, following in the footsteps of natural science, seeks to provide students with instruments that allow them to build the Unit of the Mathematical Building. (Crusius, 1984)

Currently, the UPF Mathematics Laboratory is structured as a space for reflection and articulation between theory and practice, for the creation and production of didactic-pedagogical resources and different teaching technologies, with its own regulations. Therefore, it assumes the leading role in searching theoretical-methodological strategies that help develop mathematics education and establish links between the university and the community, contributing to the processes of mathematics teacher initial and continuing education in the region.

In this sense, through the subjects of the Mathematics Course, the LabMat team seeks to help prospective teachers develop logical-mathematical thinking and critical reasoning, providing methodological subsidies for structuring the practical dimension of prospective teachers based on experimentation with different pedagogical practices. On the other hand, regarding continuing education, it allows LabMat professors to visit schools and hold conversations and lectures with public school teachers. It can also encourage study trips from schools in the region to the laboratory space –the latter being in great demand for basic

education in recent years. Also, LabMat promotes advisory and consulting services to the Departments of Education and basic education schools regarding the understanding and execution of educational reforms, such as the implementation of the National Curricular Parameters (PCNs) and the National Common Curricular Base (BNCC) and the current high school reform.

Bearing in mind that these actions are aimed at the processes of initial and continuing education of professionals in the area of mathematics education, the laboratory is also a space used by academics in research projects and university extension of the course. Through studies on theoretical deepening and different teaching methodologies, strategies are also developed, which are systematized in the form of pedagogical workshops and applied in the schools participating in the projects and, in many cases, in the subjects Laboratory of Mathematics Teaching I to VI of the Mathematics Course, based on the premises of the university regarding the curricularization of the extension[11].

Also, the LabMat environment has already been used for studies and meetings by members of the Programa Institucional de Bolsas de Iniciação à Docência [Institutional Program for Teaching Initiation Scholarships] (Pibid/Subproject: Mathematics), contributing to the development of actions in the space. In this sense, many of the program's activities were monitored and coordinated by LabMat professors. Many intervention actions were designed based on the contributions arising from the study of the group that composed it at the time.

In addition, as it is a learning environment, LabMat offers academic tutoring for subjects in the area of mathematics to members of UPF undergraduate courses and extra-class tutoring for students from schools participating in the projects, as requested by students. Associated with the Setor de Atenção ao Estudante[12] [Student Care Sector], LabMat has stood out in recent years in the area of inclusive education, supporting students with special educational needs (SEN) at the institution, through tutoring, as well as in the construction of inclusive teaching resource to assist in students' learning.

Furthermore, the LabMat team organizes the Jornadas de Educação Matemática – JEM [Journeys on Mathematics Education], where complex topics involving the teaching and learning of mathematics are discussed. Those events are characterized as a space for reflection

[11]The National Education Plan (2014-2023), in line with Resolution N. 7 of the National Education Council (CNE/MEC), of December 18, 2018, mandates a minimum percentage in the workload of higher education courses for extension activities. The extension curricularization is justified by the importance of bringing the university closer to the challenges of society, essentially basic education and social and political movements, since extension should not be understood only as an "appendix" of the educational process.

[12] More information can be found at: <www.upf.br/saes>.

and sharing of pedagogical experiences related to the area of mathematics education, just as they contribute to decision-making of a pedagogical and research nature, in accordance with the educational aspirations of modern society, seeking to improving the quality of teaching, specifically mathematics.

The first edition of the Jornadas, still in the regional scope, was held between August 31 and September 4, 1981, with the name I Semana Regional de Educação Matemática [1st Reginal Week on Mathematics Education]. After that, some members of the LabMat team participated in a panel on mathematics professors in degree courses, in 1980, in Porto Alegre. This and other events organized by the team contributed to the dissemination of the dynamizing methodology.

On this aspect, Teixeira (2000) attests:

> The realization of the Semana Regional de Educação Matemática [Regional Week of Mathematics Education] (31/08 to 04/09) at the UPF in 1981 was something unusual, either because of the execution of the event or because of the methodological choice or even because it was held in the state countryside, not in the capital, and also because it was held at a private university that is still little known [...] This fact proves the laboratory's uniqueness in promoting regional meetings named Encontros de Educação Matemática [Mathematics Education Meetings], as this denomination was recent and "owned" by few researchers in Brazil. (p. 36)

In this first Jornada, the discussions were conducted by LabMat professors, focusing on the theme of geometry teaching. In the second edition of the Jornada, held in 1982, discussions on the same topic continued, also addressing the use of textbooks in view of the reality of each school.

Considering the teacher education characteristics of the period, most of the participants in the event taught mathematics and science subjects. Therefore, many demanded that the LabMat team bring science-related themes to the forefront at the Jornada. Thus, in 1983, the I Simpósio Sul-Brasileiro do Ensino de Ciências - SSBEC [1st South-Brazilian Science Teaching Symposium] was held from July 27 to 29, together with the III Jornada Regional de Educação Matemática [3rd Regional Journey of Mathematics Education], at the UPF premises. These events discussed the teaching of science in schools in rural areas and on the outskirts of cities.

In 1984, the IV Jornada Regional de Educação Matemática [4th Regional Journey of Mathematics Education] happened from September 3 to 6. In this event, the theme of trends in mathematics education in Brazil and the world was addressed, emphasizing technology.

In the following years, other editions of the Jornada Regional were held to foster reflections and debate on mathematics education and disseminate the dynamizing methodology.

In 1992, the I Encontro Estadual de Educação Matemática [1st State Meeting of Mathematics Education] took place, organized by the first Regional Board of the Brazilian Society of Mathematics Education (Sociedade Brasileira de Educação Matemática - SBEM), composed of some of the professors of UPF's LabMat. This board was sworn in on April 26, 1991, during the VIII Jornada Regional de Educação Matemática [VIII Regional Journey of Mathematics Education].

Considering the importance of the Jornadas Regionais, the social commitment to mathematics education, and in honor of the National Day of Mathematics, on May 6, 2006, the commemorative year of the twenty-fifth anniversary of the event above, the LabMat team launched the first Jornada Nacional de Educação Matemática [National Journey of Mathematics Education]. Since then, every two years, new editions of the event have taken place, promoting the socialization of pedagogical practices and academic studies and possible interventions in the classroom so that, based on reflections on current teaching practices, teachers' actions are improved today and in the future. In Table 1, we present the data referring to the national editions of the Journeys.

Table 1.

Systematization of data referring to the National Journeys of Mathematics Education, organized by the Mathematics Laboratory of the University of Passo Fundo[13] (Prepared by the author)

Edition of the events	**Date of completion**	**Theme of the edition**
I National Journey and XIV Regional Journey on Mathematics Education	May 3 to 5, 2006	Mathematics Education: New Challenges! Old Practices?
II National Journey and XV Regional Journey on Mathematics Education	May 3 to 5, 2008	Mathematics Education today

[13] More information, such as the schedule and electronic proceedings of each edition, can be found at: <upf.br/jem>.

III National Journey and XVI Regional Journey on Mathematics Education	May 4 to 6, 2010	Mathematics Education: trends, challenges, and perspectives
IV National Journey and XVII Regional Journey on Mathematics Education	May 6 to 9, 2012	The complexity of the contemporary classroom
V National Journey and XVIII Regional Journey on Mathematics Education	May 5 to 7, 2014	Mathematics Education: What and why teach it? Why learn it?
VI National Journey and XIX Regional Journey on Mathematics Education	May 4 to 6, 2016	What are the directions of mathematics education?
VII National Journey and XX Regional Journey on Mathematics Education	April 2 to 4, 2018	Mathematics education and interdisciplinarity: Dialogues, experiences, and possible practices
VIII National Journey and XXI Regional Journey on Mathematics Education	September 30 to October 2, 2020 (*online*)	Mathematics education: Identity in times of change

Maintaining the pertinence of the themes dealt with in the Journeys until then, perceiving the changes in national curriculum guidelines –with the publication of the National Common Curricular Base (BNCC) (BRASIL, 2017) and the implementation of formative itineraries in high school– researchers, in those events, also intended to analyze the curricular organization of school mathematics, essentially in the Fórum das Licenciaturas em Matemática [Forum of Degrees in Mathematics], an event integrated to the Journeys since 2010.

That year, there was a session of educational dialogues called "Degree in Mathematics: Realities, challenges, and perspectives," which promoted discussions about mathematics teachers' education in Brazil. In 2012, a round table was organized: "Degree in Mathematics: The complexity of the contemporary classroom". As of 2014, such activities led to the emergence of the Fórum das Licenciaturas em Matemática [Forum of Degrees in Mathematics], still part of the Jornadas. Only in 2020, it was launched as a parallel event to the Jornadas.

Specifically, in the edition held in 2020, the organizing team had to rethink the events due to the restrictions imposed by the Covid-19 pandemic. Considering this context, the VIII Jornada Nacional was held virtually, with synchronous and asynchronous activities and participation in the group of national and international speakers. We understand that this format of events allowed other frontiers for debates around mathematics education today – even more so when associated with the fact that the classroom, at the time, was compulsorily remodeled for the virtual environment, which influenced the transformation of teaching practices and the need to reflect on them emerged.

The national scope –and even international, considering the last experience– of the events and the results of the internal evaluations show that they constitute an opportunity for teachers to debate and reflect with their peers, disclosing pedagogical actions carried out in the classroom, and enabling them to benefit from continuing education.

Based on the above, the importance of the various actions carried out by the UPF's LabMat team is proven, whether in teacher education or scientific dissemination. We also noticed that the way the LabMat was constituted, first, from a study group and, later, as an organ of ICEG, allowed the professor-members to develop actions to contribute to help coin in the academic environment currently recognized terms such as "mathematics education" and "mathematics literacy". It is pertinent to say that the current LabMat team is no longer made up of pioneering professors but of a new group of professors from the Mathematics Course at the University of Passo Fundo.

Final considerations

Considering the author's trajectory, it is evident that, despite already having some knowledge of some of the elements presented in this work, he was unaware of many others, and was able to identify them and deepen them with this study. It is also clear that there are still elements to be explored and characterized and questions to be asked and, if possible, answered. Therefore, evidence of new research to be carried out based on this work and the bibliographic material located is registered, in addition to analyses of the material mentioned above and the oral research with the founding professors of LabMat and their current constituents.

In general, throughout its existence, we see that the Mathematics Laboratory of the University of Passo Fundo presented innovative and potential ideas in the field of mathematics education with the aim of transforming teaching practices. Thus, we understand that LabMat

has the mission of experimenting with differentiated teaching methodologies, such as the dynamizing methodology, which, in its proposal, had elements to contribute to improving teaching and learning processes in mathematics. This initiative by the team that constituted the LabMat probably directly influenced the theoretical maturity of this area in the instances in which it participated.

The importance of mathematics laboratories in the construction of mathematical knowledge for basic education students is also highlighted, given the characteristics of the space. However, we know that not all schools have MLs in their structure. We must emphasize that there is no theoretical data to make comparisons possible and state whether LabMat directly influenced the construction of other mathematics laboratories in schools in the region.

However, LabMat contributed to the processes of initial and continuing teacher education in the community covered by the UPF, even though government policy for those actions was not usual in its first years of operation. In other words, the space is used as a learning environment for the methodological subjects of the Mathematics Course of the UPF, allowing academics to experiment and reflect on mathematics teaching practices, which may contribute to their future professional performance.

In addition, the actions of LabMat confirm its commitment to the mathematics teachers' education and the community, providing support, collaboration, advice, and consultancy to basic education teachers, such as participation in the Rede Acomecim. Concerning recent educational reforms, such as the implementation of the BNCC and the New High School, the LabMat team participated directly in discussions, debates, events, and advisory services, presenting the established legal guidelines and suggesting ways of implementation to the Departments of Education and school teachers. Thus, we understand that this space is contributing –much– to education in the region covered by the University of Passo Fundo.

To promote its continuing education actions, LabMat also promotes didactic-scientific events. Specifically, the Jornadas Nacional e Regional de Educação Matemática allows the actions of the laboratory to reach beyond the region from the themes discussed at the events. Therefore, the need for continuity of their achievements is perceived, as well as the possibility of re-dimensioning them in the new socio-educational context.

However, considering the aspirations of education in the post-pandemic, and in line with a new educational scenario, we see how important it is for the LabMat to be rethought, in the sense of also using the potential of the virtual environment to resize its future actions. In this context, the collection of concrete materials of the LabMat must be rethought so that the

participants can also reach virtual scenarios and do justice to this new characteristic the lab can assume to continue contributing to the mathematics teaching.

Of course, LabMat still raises elements to be researched, such as the Rede Acomecim and the life story of teacher-founder Maria Fialho Crusius[14] and the other members at the time of its creation. In addition, it is possible to deepen the study and dissemination of the material produced on the dynamizing methodology. As for the Jornadas de Educação Matemática, they can be discussed and analyzed in more detail, allowing future studies and presenting elements not evidenced in this work.

So, what topics are perceived as necessary to be discussed in the next events idealized by the LabMat? How can these activities be carried out considering the importance of experiences and sharing knowledge in the face-to-face format and the flexibility and greater scope of the virtual format? How to associate the LabMat, university extension and the inclusion dynamics of the UPF? What actions could be developed in the face of the new context of the institution's internationalization and experience with technologies, that is, can the Jornada be thought of internationally? These and many other possible questions show how fruitful the actions developed by the LabMat are, and how much they encourage further studies, research, and reflections.

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[14] A first step towards this was, in 2022, the naming of that space as the Maria Fialho Crusius Mathematics Laboratory.

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