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ARTICLE

MENTORING IN THE PROFESSIONAL DEVELOPMENT OF MATHEMATICS TEACHERS RELATED TO LESSON PLANNING, INTEGRATING DIGITAL TECHNOLOGIES

SAMUEL DA ROSA FLÔRES[1]
ORCID: https://orcid.org/0000-0001-9630-2481
<samueldflores@universo.univates.br>
MARIA MADALENA DULLIUS[1]
ORCID: https://orcid.org/0000-0003-0971-992X
<madalena@univates.br>

[1] Universidade do Vale do Taquari – Univates. Lajeado, RS, Brasil.

ABSTRACT: This paper refers to mentoring in the professional development of mathematics teachers concerning the planning of their classes with the integration of digital technologies. The research follows a qualitative approach and the context was a practice carried out with two mathematics teachers from primary public school. We had seven meetings, one a week and adapted practices because of COVID-19. The aim was to investigate how the mentoring strategy can influence mathematics teachers in planning their classes with integrated digital technologies. The results of this study showed that it was possible to understand that mentoring helped the teachers in planning classes with integrated technologies. Reflections and discussions contributed to understand the importance of class objectives and the need to get them involved with the planned activities. Furthermore, the teachers realized that they, before mentoring, did not discuss class topics with students, they only taught classes in a transmissive way.

Keywords: Mentoring, professional development, planning, digital technologies.

MENTORING NO DESENVOLVIMENTO PROFISSIONAL DE PROFESSORES DE MATEMÁTICA RELACIONADO AO PLANEJAMENTO DE AULAS, INTEGRANDO TECNOLOGIAS DIGITAIS[1]

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RESUMO: Este artigo refere-se ao *mentoring* no desenvolvimento profissional de professores de matemática em relação ao planejamento de suas aulas com a integração de tecnologias digitais. A pesquisa segue uma abordagem qualitativa e o contexto foi uma prática realizada com duas professoras de matemática da educação básica da rede pública. Realizamos sete encontros, um por semana e adaptamos as práticas em decorrência da pandemia de covid-19. O objetivo foi investigar como a estratégia de *mentoring* pode influenciar professores de matemática no planejamento de suas aulas integradas com as tecnologias digitais. Com base no estudo realizado, foi possível compreender que o *mentoring* auxiliou as professoras no planejamento de aulas integradas com essas tecnologias. As reflexões e discussões possibilitaram perceber a importância dos objetivos das aulas e de vinculá-los às atividades planejadas. Além disso, os professores perceberam que não discutiam os temas das aulas com os alunos, apenas ministravam as aulas de forma transmissiva.

Palavras-chave: *mentoring*, desenvolvimento profissional, planejamento, tecnologias digitais.

MENTORÍA EN EL DESARROLLO PROFESIONAL DE PROFESORES DE MATEMÁTICAS RELACIONADO A LA PLANIFICACIÓN DE CLASES, INTEGRANDO TECNOLOGÍAS DIGITALES

RESUMEN: Este artículo se refiere a la Mentoría en el desarrollo profesional de los profesores de matemáticas en relación a la planificación de sus clases con la integración de tecnologias digitales. La investigación sigue un enfoque cualitativo y el contexto fue una práctica realizada con dos docentes de matemáticas de Educación Básica, de la Red Pública. Realizamos siete encuentros, uno por semana y adaptamos las prácticas debido a la Pandemia del COVID-19. El objetivo fue investigar cómo la estrategia de mentoría puede influir a los docentes de matemáticas en la planificación de sus clases integradas con tecnologías digitales. A partir del estudio realizado se pudo compreender que la mentoría ayudó a los docentes en la planificación de clases integradas con estas tecnologias. Las reflexiones y discusiones permitieron compreender la importancia de tener objetivos de clase y vincularlos com las actividades planificadas. Finalmente, los profesores se dieron cuenta de que, antes de la mentoria, no discutían temas de classe com los estudiantes, solo impartían clases de forma transmisiva.

Palabras clave: Mentoría, desarrollo profesional, planificación, tecnologías digitales.

INTRODUCTION

According to Amado (2015), although the integration of technologies in teaching and learning mathematics is widely recommended, including by the Organization for Economic Cooperation and Development (OECD-*Organização para a Cooperação e Desenvolvimento Econômico*), and with an increase in technological resources in Brazilian schools, there is not the use of such resources in the classroom in the same proportion. There is a need for continuous investment in the pedagogical training of teachers for this purpose.

Teacher training, both initial and continuing, demands an organization that provides educators with access to what is a priority to ensure the maintenance of the quality of the teaching process. According to Even and Ball (2009), all countries face the challenge of preparing and maintaining mathematics teaching that is effective and prepares students for life in society. However, teacher training systems are based on resources already incorporated into the culture, organization, and nature of education, hindering modifications, in particular, digital skills such as Information and Communication Technologies (ICT) like personal computers, smartphones, interactive whiteboards, tablets, and netbooks, among others.

A distinction must be made here between the use and acquisition of digital technologies. Using these technologies is much more demanding than purchasing technological equipment. According to Amado (2015), technologies can significantly expand teaching, but their use needs to be together with good planning. The introduction of technologies into teaching and learning mathematics is quite complex for teachers, and it is the teacher who has the power to transform technological resources into useful tools for student learning. There needs to be constant support and monitoring for teachers in this regard, both those who are just starting their professional careers and those who already have extensive experience.

Therefore, it is not enough to simply want to take a computer or tablet to use as a technological tool in the classroom. It is necessary, above all, to know what one intends to do with the resource. The importance of good lesson planning, scoring objectives, activities to be developed and questions about the proposal are fundamental for the teacher to make good practice with digital technologies, consider Amado and Carreira (2015).

In this context of the need for continued training, the use of digital technologies, and the importance of planning, this research was developed. Pedagogical training meets the need that teachers feel about constant updating, in line with new educational practices and the profile of students, who have indiscriminate access to digital technologies in the environment outside the school, and the teacher cannot be far away from this context, given the countless possibilities that technologies present in the pedagogical flow and new educational methodologies.

The study was carried out to assist teachers in planning mathematics classes to integrate digital technologies into their teaching because as already mentioned, planning is a very important stage in the teaching process. Given the above, the research problem is: how can the mentoring strategy influence mathematics teachers in planning their classes integrated with digital technologies?

Mentoring requires a relationship between at least two people: the mentor/trainer, characterized by the most experienced teacher, and the apprentice/trainee. The effectiveness of the strategy occurs if the mentor manages to create an environment in which the apprentice feels integrated and welcomed, leaving him/her in a position to express his/her questions and doubts. The mentor is required to be sensitive enough to perceive the dosage of his/her action towards the apprentice, sometimes just supporting, sometimes being more incisive, exemplifying a certain procedure or technique.

The teachers who took part in this study were two public elementary and high school teachers, and the professionals were chosen based on a relationship already established with both and the availability and acceptance of planning their mathematics classes with a focus on the integration of technologies. At the beginning, an informal conversation with the teachers was proposed to understand their needs and expectations of the meetings. From this, it was found that technologies are far from the school context, although the institution where they teach has technological resources because they do not feel able to use them, they end up carrying out their practices in a traditional way.

DIGITAL TECHNOLOGIES IN THE EDUCATIONAL CONTEXT

According to the Regional Center for Studies for the Development of the Information Society (CETIC-*Centro Regional de Estudos para o Desenvolvimento da Sociedade da Informação*), in research carried out in Brazil, technologies are increasingly closer and available to the population, even considering the disparities between social classes. The use of the Internet and mobile technologies increases annually among children and adolescents between nine and seventeen years old (BARBOSA; COSTA, 2022).

These data are important, both for researchers and public policymakers due to the implications they can have on the social environment, cognition processes, and the educational context. For example, using a single portable tool, it becomes possible to access different media for study, personal activities, work, and entertainment, at any time, saving time and "bringing" distances closer together.

The idea of shortening distances can be understood as the relationship between the periods lived, the training of educators, and the current educational practice. The modernization of materials and methodologies and the level of access to information enjoyed by students today only reinforces the need for constant updating by the educator to access the "universe" of students, motivating them to build their knowledge through the mediation of the educator as someone closer to their context.

In the case of this study, the mathematics curricular component is addressed with its challenges and possibilities, according to the National Common Curricular Base (BNCC-*Base Nacional Comum Curricular*):

> [...] the teaching of Mathematics aims at a comprehensive understanding of the world and social practices, highlighting that teaching must be contextualized and interdisciplinary, but at the same time, following the development of the ability to abstract, perceive, and use the imagination (BRASIL, 2016, p. 132).

While technological advances make it possible to facilitate daily activities, different types of experiences lead to different structuring of the brain, as highlighted by Prensky (2001). "Digital natives" (PRENSKY, 2001b) have online skills and competencies, they easily acquire basic knowledge that allows them to (un)install applications, explore them, search for music, photograph, film, and share information, whether through communication applications or social networks. The user can generate content and new sources of information, transforming culture based on his/her experiences.

According to Wankel and Blessinger (2012), digital technologies have shown what it means to learn in the contemporary world, improving the vision of learning collectively using immersive technologies so that learning is more enjoyable and interesting to the student. Based on its use, it is suggested to explore software, applications, and different media. This is important for the process of building student learning and provides opportunities for personalizing teaching. When arriving at school, the devices are put away, which means that the content is covered traditionally, producing only training and practice. On the other hand, solutions are beginning to be disseminated that facilitate the development of applications for mobile devices capable of offering virtual laboratory simulations on these platforms (ZERVAS et al., 2014).

The use of technology goes far beyond simply being present in a digital era or being considered a current tool, but also for providing, when well designed and appropriate to the context, the construction of knowledge by students with the educator mediation. Neide and Quartieri (2016, p. 10) state that "if we consider the student's cognitive structure, visualization can promote mathematical learning in several ways". From this, Amado and Carreira (2015) emphasize that:

> As a first consideration, we argue that students learn from the results of their work on relevant and interesting tasks and, above all, from the possibility of sharing and discussing their mathematical ideas with their colleagues and the teacher. Technological resources play an important role during class when students are encouraged to work autonomously, seeking to solve problems and questions that are proposed to them, dealing with ideas and mathematical relationships, thinking, reasoning, applying, and developing concepts (AMADO; CAREER, 2015, p. 14).

Therefore, the authors highlight what Piaget's constructivist theory (1936) defends, where the students are the one who constructs their concepts based on experiences with the environment and:

> The success of students' learning, in this type of class, depends on the implementation of a teaching strategy that presupposes different moments, but in which students' work with mathematical tasks, supported by teaching resources, occupies a central position. This differs from another perspective in which the teacher explains the content and the student then exercises structured questions aimed at the assimilation of rules, procedures, or facts (AMADO; CARREIRA, 2015, p.14).

The simple fact of introducing technology into the classroom does not mean that it will help in the process of building student knowledge, as each activity requires the teacher to plan his/her class well so that the use of the technological resource is effective and is not a superficial and empty class. Dullius and Quartieri (2015) reinforce that planning, setting objectives, choosing materials, selecting tasks, and anticipating questions gain a central dimension in the teacher's practice with technological resources. This is where fundamental questions arise, such as: how can the computer or tablet be used? Is it expected that some learning will result from this use?

MENTORING

Mentoring consists of a strategy in which theoretical training is supported by practice. It presupposes a relationship between at least two people, one being the mentor/trainer and the other apprentice/trainee. The mentor needs to have characteristics that allow him/her to create an environment conducive to the apprentice, in which he/she feels comfortable expressing his/her doubts and questions.

According to Amado (2015), during the mentoring process, a professional with a deep technical and experiential background (mentor) proposes to help another person who has less knowledge and practice time. The mentor is the professional who acts provoking reflections and insights for the growth of another person with less experience and technical arsenal. The idea is for the mentors to share their experiences, learning, overcoming, and technical knowledge to show possibilities for action, problem and conflict resolution, and management, among other objectives. The apprentice will be able to test in practice the suggestions proposed by their mentor to, from there, check if it is a path/strategy that makes sense for them, or if it is a case of adjusting and adapting to achieve the results they want.

Mentoring has many proven results in medical and nursing professionals, for example. There is evidence of the use of mentoring strategies in teacher training in the United States, England, Norway, and Portugal, as Amado (2007) describes. In Brazil, we can mention, for example, the work of Alcântara (2015), which used mentoring to help teachers in the early years of elementary school in using tablets in mathematics classes.

According to Sundli (2007), mentoring can be a way of helping to develop the apprentice's capabilities, increasing their professional and personal potential. Continuing teacher training appears as a fundamental strategy to improve the quality of these professionals, as it aims to help teachers manage the demands of the classroom through knowledge of techniques and skills essential for their work with the students.

Amado (2015) warns of the need for knowledge of the context in which teaching practice is being carried out, and that the mentor must have a solid knowledge of curriculum and classroom management, as well as experience in using technologies with an educational bias. You must encourage the apprentice's creativity, and learn from them, not setting up as a model to be followed but giving them support and allowing them to explore their ideas freely.

Mentoring relationships arise from the interaction between mentor and mentee and, according to Kram (1983, 1985), they unfold into four phases: initiation, cultivation, separation, and redefinition of roles. The initiation phase is the moment of establishing the mentoring relationship based on the initiatives of the mentor or mentee when efforts are made to break down blocks so that identification, empathy, respect, and trust can occur. In the cultivation phase, the mentee learns from the mentor, develops skills, acquires support for their activities, and gains trust. The separation phase of the relationship occurs when the mentee gains independence and reaches a degree of autonomy, being able to carry out their activities without the intensive monitoring of the mentor. At this stage, interactions can happen more spaced out and with shorter orientations. Finally, there is a need to redefine the bond between mentor and mentee, resulting in a reconfiguration of the mentoring relationship, making it more egalitarian, and autonomous, and a bond of friendship may emerge. Mentoring, then, as Amado (2007) explains, favors the construction of an interpersonal approach based on trust and support, providing enrichment of pedagogical practice, and bringing innovation to the classroom environment.

METHODOLOGICAL APPROACH

Regarding the approach to the problem, the research can be classified as qualitative, as it aimed to understand the meaning that the participants attributed to the object of analysis. The focus was to evaluate how the mentoring relationship helped two basic education mathematics teachers in developing plans to integrate digital technologies into their classes. Qualitative research, according to Gerhardt and Silveira (2009), involves descriptive data obtained through the researcher's direct contact with the situation studied and is concerned with portraying the participants' perspectives, that is, qualitative research aims to ascertain the quality of what is being studied. In the present research, the mentor was the researcher, who was, therefore, in direct contact with the situation investigated, and the data were analyzed seeking to portray the perspectives of the two participating teachers.

To develop the research, meetings between the mentor and the participating teachers were held, and, from there, records were made to obtain data. The meetings were recorded, the researcher made notes in a field diary and, in addition, the teachers' productions during the mentoring were used as analysis materials. Therefore, this study was born from the methodological proposal involving the mentoring strategy with teachers and sought to monitor their professional development for planning to integrate technologies into their classes, identifying in practice the application of the suggested changes.

To achieve the objectives of this proposal, seven meetings were held with teachers who participated in activities based on a mentoring relationship, focusing on planning their mathematics classes with the integration of digital technologies. The meetings took place in person at the teachers' homes, as they were holding virtual classes due to the Covid-19 pandemic.

The teachers who participated in this study were two teachers who teach in the ninth year and tenth year of high school (ninth of middle school and first of high school in Brazil) at a state public school in the state of Rio Grande do Sul, in Vale do Taquari. The research was carried out at the end of the second half of 2020 and the beginning of the first half of 2021, in the middle of the pandemic period.

The meetings were held in pairs, as suggested, and requested by the teachers. They encouraged proactivity and the exchange of experiences. Furthermore, the mentor sought to mediate the meetings, valuing the teachers' ideas, promoting exchanges, and seeking to provide an environment in which the educators felt involved, in which everyone was learning, without a holder of knowledge, but rather people willing to evolve during the process.

Initially, an activity by Jesus (2018) on function analysis was used as an example, using the GeoGebra software so that they could realize that certain content can be presented in different ways to students, diversifying the methodologies used and encouraging student interest in the class. From this, plans were created together, according to the teachers' interests in terms of the content they cover in their classes.

The mentoring process aimed to make the teachers feel increasingly confident and independent to carry out these plans and, as a result, develop professionally. Afterward, the importance of good planning was discussed and some software such as GeoGebra, Graphmatica, and Winplot were explored with the teachers so that they could become familiar with them and be able to use them in their classes.

After that, the mentor helped plan classes with the integration of digital technologies according to the needs of each educator. At first, when the teachers did not feel comfortable using the tools without assistance, the mentor made use of the material, helping, and encouraging the teachers' interest in the tools, and demystifying some existing prejudices, until they felt comfortable to develop and apply activities using technologies more concisely.

As a data collection instrument, in addition to filming and recordings, notes were used in a field diary and materials produced from each intervention throughout the planning, which made it possible to analyze the teachers' professional development. To complement the data collection obtained during the mentoring, a semi-structured interview was carried out with each of them to obtain evidence, from their points of view, of how the proposed mentoring model may have contributed to their development during the activities. Gil (1999, p. 120) explains that "the interviewer allows the interviewee to speak freely about the subject, but, when he deviates from the original topic, he makes an effort to return to it". Given this, in this technique, the researcher has to be attentive to the direction of the subject being addressed since the focus of the initial theme cannot be lost.

Data were analyzed based on conversations and information, according to records and exchanges of materials, as well as the final questionnaire. The analysis was descriptive and chronological, as the development of professionals was analyzed and monitored in planning their classes with the integration of technologies, as the descriptive analysis consists of monitoring and describing the step-by-step professional development while being researched.

DATA ANALYSIS

In this article, we chose to present the analysis focusing on the data collected and the plans developed in meetings 1, 2, 5, and 6. However, a total of seven meetings were held, all demonstrating improvements and advances. The choice to present data from the meetings is because they make clear, from the activities, the changes that occurred in the teachers' methodology through understanding the increased complexity of interpretation proposed to students with the use of technologies, and which, according to them, enhance the active construction of knowledge by the student.

First and Second Meetings

The mentoring began with a first meeting where the work proposal was explained and an example of activities by Jesus (2018) was presented, emphasizing that the simple fact of having a technological resource is not so important if the teacher does not have good planning. When the teachers were asked what they expected from joint planning moments to include technologies in their classes, the answers were as follows:

> Look, Samuel, I confess that I'm challenging myself. Technology has never really been my thing in the classroom. I've been working with mathematics since 1995, think about it! I know I'm outdated, but the time we have is too tight to look for a lot of "frills" for students, so we end up not leaving traditional teaching: board and chalk, notebook, and pen. But I believe it will be good for me. Knowledge is always welcome, even more so in times of pandemic that forced me to be better friends with a computer. I believe that today this has encouraged me more to be part of your study (P1).[2]
> You know I'm excited? I'm a little scared, but I'm excited. I want to learn! I've always liked to challenge myself. I just didn't do it anymore because my whole life I worked between 40 and 60 hours. Family to support and then college for my daughter. This takes much time and exhausts us. Only those who are in a classroom, especially in public schools, know how difficult students are and how many new things we cannot take because, sometimes, there is even the issue of financial resources. Of course, today the school even has some equipment, but it's no use, we don't know how to use it. I didn't understand until now what the government's objective was in sending the devices and not preparing us to use them (P2).[3]

According to the teachers' statements, when they answered what they expected from the collaborative planning moments, they were a little afraid but willing to learn. As they reported, technologies were never part of their classes, as they did not feel prepared, as they were not trained to do so.

Amado (2007) defends the use of technologies in the pedagogical context, as well as in the initial training of teachers so that scientific, technological, and pedagogical knowledge is developed in teachers, preparing them for the future practices that they will carry out from then on. The author also highlights that continued training is not enough for the full integration of technologies into pedagogical practices, but mentoring support becomes essential and is strongly linked to success. This support, according to Amado (2015, p. 1016) "must be provided both to teachers at the beginning of their career and throughout continuing education". However, she says that the success of integrating technologies in the classroom is in the hands of teachers and not in the capacity of resources, as it is the teacher who knows. Amado also says that "by placing the onus of the successful use of technologies on the teacher, we are posing a huge challenge to the initial and continuing training of teachers" (2015, p. 1016).

Continuing the dialogue with the teachers, when asked if they had already used any technological resource as a tool to help them when teaching some content, the answers were:

> I have never had contact with a technological tool in the classroom to teach. Only PowerPoint for slide presentations, but from what I understand, this feature does not fit into our proposal, right? After all, we wouldn't have anything to teach with this tool. Just showing (P1).
>
> Once I tried to show a game to my students, but I saw that what I was proposing didn't make much sense. Before taking it to the classroom I was excited, but I don't think I had stopped to think about "what was my objective with that", because it didn't result in anything, just a mess (P2).

From these responses, the teachers had no idea how to make good use of technologies in the classroom, as they realized that attempts to insert technologies in their classes were frustrating, as they had not been planned and much less had clear objectives. Amado and Carreira (2015) highlight:

> How can teachers transform these technologies into pedagogical tools? Now, the concept of technological tools is related to the use we give to technology. It is we, teachers, who turn resources, or not, into pedagogical tools. Therefore, the availability of resources and materials is not a guarantee of better learning; the issue lies in the way they are enhanced and used in the classroom for pedagogical purposes (AMADO; CARREIRA, 2015, p. 13).

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[2] P1 – Teacher 1

[3] P2 – Teacher 2

Dullius and Quartieri (2015, p. 13) make it clear that "it is necessary previously to have clearly defined what you intend to do with the technology. The use of technology in the classroom differs greatly from the use we make daily." It is worth highlighting the importance of good planning so that the proposed activity can be successful.

From this, in the second moment of the meeting, it was proposed by the teachers that the work would start from the "Affine Function" content, where they could streamline their classes, as both reported having the same difficulty with approaching such content. abstract and that technological resources could help them as an important tool in the construction of knowledge. Initially, a lesson plan was developed consisting of three activities, each with its specific objectives and questions about what was intended to be explored with the students. There was a need for interventions to encourage them to reflect on the real meaning of their proposals.

Therefore, in the second meeting, the activities that the teachers had developed were explained, guiding the questions that the teachers had raised for each activity, always emphasizing that the intention was to contribute and never give value judgments on the work carried out. Activity 1 describes the first activity developed by the teachers.

Activity 1 - Behavior of the straight plane, according to the variation of the angular coefficient in the affine function.

The objective of this activity is to help students understand the concept of first-degree function through manipulation and observation with the GeoGebra software, based on the variation of angular and linear coefficients.

Plot the following functions in GeoGebra:

a. $f(x)= x+3$
b. $f(x) = 2x – 4$
c. $f(x) = -x + 3$
d. $f(x) =-2x – 4$

Questions:

1. What is the relationship between the position of the graph in the Cartesian plane and the angular coefficient of each function?
a) ____________________
b) ____________________
c) ____________________
d) ____________________

2. Solve the functions and find their roots.
Analyzing the graph, what is the relationship between the answers found and the graph of each of them?
a) ____________________
b) ____________________
c) ____________________
d) ____________________

3. What is the relationship between the coefficient "b" and the graph of each function?
a) ____________________
b) ____________________
c) ____________________

d) ____________________

The objective to be achieved was clear to the teachers, as the aim was for the students, through GeoGebra, to understand the concept of affine function, based on the variation of the coefficients "a" and "b", in a single activity. However, the objective presented is broad and in addition, the teachers reduced the potential of the approach by considering that only with the construction of the graph would the students be able to conclude what they expected, without the need to instigate them to do so. The questions they proposed were very broad, that is, they allowed answers that would not necessarily help to achieve the proposed objective.

Based on this first construction, a dialogue began with the teachers to help them realize that it was possible to improve the activities and be more focused on achieving the proposed objectives. The dialogue was based on new questions and joint reflections. The reformulated Activity 1 is a new version of the planning, with more details and questions.

Activity 1 reformulated - Behavior of the graph of the function in the plane, according to the variation of the angular coefficient in the affine function.

The objective of this activity is to help students identify an increasing and decreasing related function and relate it to the angular coefficient.

Plot the following functions in GeoGebra:

a. f(x)= x+3
b. f(x) = 2x - 4
c. f(x) = -x + 3
d. f(x) =-2x – 4

Questions:

1. What is the angular coefficient of each function?
a) ____________________
b) ____________________
c) ____________________
d) ____________________

2. In which functions is the angular coefficient positive?

3. In which functions is the angular coefficient negative?

4. What functions represent increasing graphs?

5. In increasing graph functions, what can be seen with the "y" values when the "x" values increase?

6. What functions represent decreasing graphs?

7. In decreasing graph functions, what can be seen with the "y" values when the "x" values increase?

8. What is the relationship between the position of the graph in the Cartesian plane and the angular coefficient of each function?

It is possible to see that Activity 1 was divided into more activities and the questions were restructured so that they covered the objectives highlighted by the teachers. Question 1 presented by the teachers in Activity 1 became Activity 1 reformulated in the new proposal, with more questions. Therefore, at one point in the conversation, the educators were asked about their understanding regarding the differences between the questions they asked and the suggestions for improvement presented in the mentoring project, resulting in the following statements:

> Yes. We don't even have anything to discuss. We were very superficial and objective when questioning the three activities. We acted as if whoever was going to solve it (the students) already knew everything it was about. And it's not like that, the student must build their knowledge according to what we encourage them to do. And, honestly, Samuel, analyzing the tool like this, I see its potential in teaching. Guys, I'm frank in saying: that I realize, today, that I never took a mystery to the students to solve, I always took it to them already solved. Stopping to analyze, I took everything ready and they kind of reproduced it. Kind of like a resolution technique (P1).

> Yes. Without you telling us what had changed, I already realized that we were very straight to the point. And it's not like that, right?! To build knowledge, where the word itself already says "construction", we must encourage students to discover it on their own. Do you realize I never thought I could be taught like this? When we talked or heard about using technology, I didn't think about it that way, with that structure. But it is logical, to ask the student like this, more thoroughly, as is where he will build his concept of what is being worked on (P2).

According to the teachers' responses, it was clear that they easily understood where they fell short when they developed the questions about the activities in a very objective way. The process of the mentoring strategy is this: it is to make the mentee feel free to express their ideas while the mentor, in turn, intervenes, when necessary, in such a way that he can make the teacher in training more calm and fearless of making mistakes. However, all this becomes clear when Amado (2015) says:

> The mentor must be a teacher who is willing to work in partnership with the teacher in training, acting naturally, showing how it is done, if necessary, but avoiding assuming himself as a model to be reproduced. The mentor must seek to encourage the trainee's creativity and not forget that he needs both to feel supported and to have the freedom to explore and make his own experiences (AMADO, 2015, p. 1018).

In Activity 2, in the questions that the teachers proposed, was possible for the students to achieve the objectives they wanted, taking into account the effectiveness of the dialogue and pointing out improvements necessary for the objective to be achieved, demonstrating that there is still a lot to be done in terms of preparing the planning of activities and that the mentoring work is having an effect.

Activity 2 - Behavior of the graph of the function in the plane, according to the variation of the linear coefficient in the affine function.

The objective of this activity is to help students understand the concept of affine function, through observation and manipulation with the GeoGebra software based on the variation of the linear coefficient.

Plot the following functions in GeoGebra:

a. $f(x)= x +2$
b. $f(x) = x -4$
c. $f(x) = x -1$
d. $f(x) = x + 5$

Question:

1. What is the linear coefficient of each function?

a) ____________________

b) ____________________

c) ____________________

d) ____________________

2. Where does each graph intersect the y-axis?

a) ____________________

b) ____________________

c) ____________________

d) ____________________

3. What is the relationship between the linear coefficient and the intercept of the graph on the y-axis?

A certain degree of independence can be seen by the teachers when preparing Activity 2 on the behavior of the graph of the function in the plane, according to the variation of the linear coefficient of the related function, considering its similarity with the one previously prepared. In this way, following the idea of Amado (2015, p. 1017) who says that "mentoring work is considered effective when the mentor can create an environment where the trainee feels accepted and integrated, without fear of asking their questions ", you can see that you are on the right path, as the teachers were feeling comfortable asking questions and fearless of making mistakes and/or not knowing. This is a significant and highly relevant achievement.

Fifth and Sixth Meeting

At the fifth meeting, the teachers showed anxiety, as they were going to present the activities that they developed alone during the planning period. This euphoric moment for the teachers was due to them "feeling like students again", according to (P2). They even mentioned "butterflies in their stomach" (P1), as if they were presenting a project at college.

According to Amado (2015), the role of the mentor in this mentoring perspective is to help and assist future teachers in developing the practical knowledge necessary to teach, including the acquisition of techniques and skills essential for working with students. When the teachers asked them to plan their classes alone, they wanted to free themselves from asking for help all the time and felt more capable and encouraged to plan, following everything that had been built so far. that meeting.

Afterward, the teachers presented the lesson plan they created, where they covered the content of Quadratic Function and developed three activities.

Activity 3 - Behavior of the graph of the function in the plane, according to the variation of the coefficient "a" in the quadratic function.

The objective of this activity is to make students relate the concavity of a quadratic function to the coefficient "a".

Plot the following functions in GeoGebra:

a. $f(x) = x^2 - x - 20$

b. $f(x) = x^2 - 3x - 4$

c. $f(x) = -x^2 + x + 12$

d. $f(x) = -x^2 + 6x - 5$

Questions:

1. What is the angular coefficient of each function?
a) ____________________
b) ____________________
c) ____________________

2. Which coefficients are positive?

3. Which coefficients are negative?

4. What is the relationship between the concavity of the curve in the Cartesian plane and the coefficient "a" of each function?

It was evident that the teachers understood the work proposal, demonstrating that they were able to build an understanding of the development of activities and the proposal on how to make good use of digital technologies when planning, contextualizing with future pedagogical practices, what the motivated us to continue the proposed work, as they presented the achievements achieved so far. The activities demonstrated these advances. After discussion with the teachers, small adjustments were made to the activity proposed by them, as can be seen in the reformulated Activity 3.

Activity 3 reformulated - Behavior of the graph of the function in the plane, according to the variation of the coefficient "a" in the quadratic function.

The objective of this activity is to make students relate the concavity of a quadratic function to the coefficient "a".

Plot the following functions in GeoGebra:
a. $f(x) = x^2 - x - 20$
b. $f(x) = x^2 - 3x - 4$
c. $f(x) = -x^2 + x + 12$
d. $f(x) = -x^2 + 6x - 5$

Questions:

1. Fill in the table below by observing the graphs created in GeoGebra:

Function	Value of coefficient "a"	Value of "a" Positive or Negative?	Graph concavity
$f(x) = x^2 - x - 20$			
$f(x) = x^2 -3 x -4$			
$f(x) = -x^2 + x +12$			
$f(x) = -x^2 +6 x -5$			

2. What is the relationship between the concavity of the curve in the Cartesian plane and the coefficient "a" of each function?

The reformulated Activity 3 allows you to visualize the suggested changes in mentoring. In the activity titled "Behavior of the graph of the function in the plane, according to the variation of the coefficient 'a' in the quadratic function", there are not many changes in the initial idea. It is clear how positive the activities that the teachers developed were, as their understanding of how to make good use of digital technology, in this case, GeoGebra, in the mathematics discipline is evident.

The activities were analyzed, and it was found that there was a need for structural improvements in the lesson plan, considering that the guidelines already presented led to the understanding that it would be possible and viable to add a few more functions. Based on the work proposal of this research, Activity 4 shows what the teachers developed following what had been worked on and discussed during the mentoring meetings.

Activity 4 - Behavior of the graph of the function in the plane, according to the variation of the coefficient "b" in the quadratic function.

The objective of this activity is to help students understand the concept of quadratic function, through observation and manipulation of the GeoGebra software based on the variation of the coefficient b.

Plot the following functions in GeoGebra:

a. $f(x)= x^2+2x+2$
b. $f(x) = x^2 -5x -4$
c. $f(x) = -x^2 +3x -1$
d. $f(x) = -x^2 -5x + 5$

Questions:

1. What is the "b" coefficient of each function?

a) ____________________
b) ____________________
c) ____________________
d) ____________________

2. In which functions is the coefficient "b" negative? In these functions, does the graph intersect the y-axis "going up" or "going down"?

3. In which functions is the coefficient "b" positive? In these functions, does the graph intersect the y-axis "going up" or "going down"?

What would the intercept of the graph look like on the y-axis, when b=0?
Create four quadratic functions with b=0, graph them in GeoGebra, and check if your answer is correct.

In Activity 4, developed by the teachers, practically no changes were necessary, only in the form of writing, which demonstrates how much they evolved within the proposal with the guidance received and how much they evolved during the process.

At the sixth meeting, the teachers were given feedback on their activities, and they were radiant with happiness for having achieved the objectives of the mentoring process, which was provided by initial support, step by step until they felt capable of working alone. To conclude the meeting, it was suggested that the educators develop some more activities and present them at the next meeting, which were even better designed, requiring a few adjustments and changes. More details about the results and activities can be found in the dissertation.

FINAL CONSIDERATIONS

This research aimed to verify the possibility of integrating digital technologies into mathematics classes, based on the planning of activities developed through the mentoring strategy with two basic education teachers from the public school system. The teachers, at the time of the research, did not use digital technologies in their pedagogical practices. The use of technologies in education is much more than simply making use of machines and equipment: technologies should be seen as drivers of learning by allowing interactive and meaningful teaching.

This investigation was developed in seven meetings with two teachers, which were recorded to later assist in data analysis, considering the growth of teachers as digital professionals. In addition to the recordings, diaries were used, as well as some questions during the meetings and lesson plans produced.

The meetings were held in pairs, as suggested, and requested by the teachers. They consisted of moments of very significant exchanges, knowledge, and trust. At the beginning of the meetings, during the first activities developed, the teachers reported that as the pedagogical proposals were carried out, instigating the students' reasoning, and making them create their concepts about the content in question, they realized that in their stories as teachers they took the "mysteries" of learning already revealed to the students, without allowing them to be the protagonists of their learning. As a result, it was noticed that the mentees taught classes in a "traditional" way, which is strongly linked to the training path of most teachers – which is a barrier to be broken. This further reinforces the need for continued training or even monitoring, with the possibility of integrating technologies, as the professional is also a reflection of their training trajectory.

Given this, the teachers were satisfied with the activities, as they realized, and constantly emphasized, the importance of teaching in this way, enabling the autonomous construction of knowledge. It can be said, then, that this objective was achieved, because according to the reports and productions of the teachers, it was noticed that there was a significant development of the teachers in planning with the integration of technologies, accompanied in the mentoring process, each meeting held.

From the meetings onwards, the teachers began to allow themselves and feel comfortable with the technologies, until the moment came when they planned their classes alone. In this way, it was possible to identify that the mentoring strategy had a significant influence on the professional development of the teachers, as they did not feel alone when carrying out their planning, resolving their doubts about possible questions regarding the activities, and as reported by them, the mentor served as support and encouraged them more.

Given this, the process was very productive, as the activities were developed following the objective that mentoring requires: being incisive at the beginning of the process and becoming less present as soon as the mentee becomes comfortable. to produce alone. Finally, we reiterate the reflection on the importance of the mentoring strategy for the integration of technologies in mathematics classes, as the world is increasingly competitive and requires professionals who keep up with technological developments.

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Author 1 – Data collection, data analysis, and text writing.
Author 2 – Project coordinator, active participation in data analysis and review of the final writing.

DECLARATION OF CONFLICT OF INTEREST

The authors declare that there is no conflict of interest with this article.