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Digital technologies: experiences “with”, “in” and “for” teacher training

Ana Carolina de Oliveira Salgueiro de Moura
Federal University of Pampa (UNIPAMPA), Dom Pedrito, Rio Grande do Sul, Brazil,
anamoura@unipampa.edu.br

Renata Texeira Gomes de Freitas
Federal University of Pampa (UNIPAMPA), Dom Pedrito, Rio Grande do Sul, Brazil,
renata.tg.tg@gmail.com

Diovana Santos dos Santos Habermann
Federal University of Pampa (UNIPAMPA), Dom Pedrito, Rio Grande do Sul, Brazil,
diovanahabermann@gmail.com

Abstract: This article shares the research of an experience mediated by digital technologies "with", "in" and "for" teacher education, through a curricular component of the Professional Master in Science Teaching at the Federal University of Pampa - UNIPAMPA, and a research project developed by the author of this article and the professors ("postgraduate students"). This experience carried out during the suspension of presential activities, started with the objective of developing science teaching projects mediated by digital technologies, which was developed through the creation and sharing of the podcast Conexões, asynchronous activities on Moodle, synchronous activities on Google Meet, and a WhatsApp group as a space for dialogue and interaction. In addition, this experience led to the organization and publication of a book, in digital format, open and free, designed to publish the projects developed, valuing the production and authorship of each one, and allowing access and use of these projects by other teachers.

Keywords: Digital Technologies; Teacher training; Science teaching.

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Tecnologias digitais: experiências "com", "em" e "para" a formação de professores

Resumo: Este artigo compartilha a investigação a partir de uma experiência mediada pelas tecnologias digitais “com”, “na” e “para” a formação de professores, por meio de um componente curricular do Mestrado Profissional em Ensino de Ciências da Universidade Federal do Pampa – UNIPAMPA, e de um projeto de pesquisa desenvolvidos pela docente e pelos professores (acadêmicos da pós-graduação). Tal experiência, realizada durante a suspensão das atividades presenciais, partiu do objetivo de elaboração de Projetos de Ensino de Ciências mediados pelas tecnologias digitais, o qual foi desenvolvido por meio da criação e compartilhamento do podcast Conexões; de atividades assíncronas no Moodle; de atividades síncronas no Google Meet; e de um grupo no WhatsApp como espaço de diálogo e interação. Além disso, tal experiência resultou na organização e publicação de um livro, em formato digital, aberto e gratuito, elaborado com intuito de publicizar os projetos elaborados, valorizando a produção e autoria de cada um e viabilizando o acesso e uso desses projetos por outros professores.

Palavras-chave: Tecnologias digitais; Formação de professores; Ensino de ciências.

Tecnologías digitales: experiencias “con”, “en” y “para” la formación docente

Resumen: Este artículo comparte la investigación a partir de una experiencia mediada por las tecnologías digitales “con”, “en” y “para” la formación docente, a través de un componente curricular de la Maestría Profesional en Enseñanza de las Ciencias de la Universidad Federal de la Pampa – UNIPAMPA, y un proyecto de investigación desarrollado por el profesor y los profesores (estudiantes de posgrado). Esta experiencia, realizada durante la suspensión de las actividades presenciales, se basó en el objetivo de elaborar Proyectos de Enseñanza de las Ciencias mediados por tecnologías digitales, que se desarrolló a través de la creación y difusión del podcast Conexões; actividades asíncronas en Moodle; actividades sincrónicas en Google Meet; y un grupo de WhatsApp como espacio de diálogo e interacción. Además, esta experiencia dio como resultado la organización y publicación de un libro, en formato digital, abierto y gratuito, diseñado con el objetivo de dar a conocer los proyectos desarrollados, valorando la producción y autoría de cada uno

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y posibilitando el acceso y uso de estos proyectos por otros profesores.

Palabras clave: Tecnologías digitales; Formación de profesores; Enseñanza de las ciencias.

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1 INTRODUCTION

The experience that gave rise to this text was developed in July 2020, in the modality of remote teaching due to the COVID-19 pandemic. This experience took place through the curricular component "Science Teaching Projects Mediated by Information and Communication Technologies" (PECTIC), of the Professional Master in Science Teaching at the Federal University of Pampa - UNIPAMPA. The curricular component includes the evaluation of the potential of Information and Communication Technologies (TIC) in the school environment; criteria, tools, and guidelines for the use of TICs in school; and the elaboration of science teaching projects using TIC. With a class load of 30 hours, the component was offered in a condensed way (8 hours per week) and with synchronous and asynchronous activities.

Figure 1: Component timeline and pedagogical/evaluative organization

Source: Produced by the first author, (2020).

In Figure 1 we highlighted the schedule and the pedagogical and evaluative organization of the component, both to illustrate the different resources and strategies used for this new way of being in pedagogical coexistence and to highlight the importance of this prior organization and its presentation at the very beginning of the teaching and learning activities. In the figure above you can see the legend created to highlight the dates, materials, synchronous and asynchronous activities, and expected assessments that will serve as a guide for the teaching and learning actions.

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As a means of communication and interaction, we used UNIPAMPA's Moodle as an asynchronous classroom, Google Meet as a synchronous classroom, and a group in the messaging application WhatsApp. The learning production and sharing activities were: discussions in forums, dialogues, text production, reading of articles, production of audio for podcasts, and production of projects.

2 METHODOLOGICAL AND PEDAGOGICAL APPROACHES

We use different digital technologies in different spaces. But what are these spaces? Spaces differ in terms of spatial context, spatial support, and spatial intention (MOURA *et al*., 2020). It is possible to think of spaces in terms of the context in which digital technologies are used: in the context of family, friends, school, university, as a teacher, as a student, as a researcher... It is also possible to think of space as support: devices (mobile phone, notebook, tablet, desktop) and platforms, applications, and software (learning environment, text document, audio, audiovisual, images, social network). But along with this choice and definition of space-support and space-context, there is the space intent, that is, the use that is made of digital technologies is determined by the intentions of use. Intended space is configured as space in the sense of a place of action and also specifies the purpose of the use of digital technologies. The idea of space intent makes us understand that, besides the fact that each tool has an operational characteristic, that is, it works with such commands and settings, each of these tools has multiple pedagogical potentialities that will depend on the goal, the need and the construction of meaning that we, as teachers, establish in the mediating action with the student.

The proposition and understanding of space intuition are related to the concepts of Humberto Maturana and Pierre Lévy. Maturana (2001) says that we use different digital technologies according to what we want with our actions, that is, it is our emotions that guide our technological life, not the technology itself. Lévy (2008, p. 194, our translation) also agrees with this perspective when he says that "Technology, in general, is neither good, nor bad, nor neutral, nor necessary, nor invincible", it is the human being, with his political, social and ecological baggage, who sees, uses and creates technology in this or that way. And it is precise because we understand that we are the ones who determine the purpose of the use of technologies that we use the term "digital technologies" instead of the term "information and communication technologies". After all, it is the

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characteristics of these technologies and not their function that specify them. And also to say that we are talking about technologies of the digital space, the Web, and the Internet network.

2.1 The Conexões podcast

The podcast Conexões was created for this edition of the component so that part of the digital material would be available in audio format: accessible to mobile phones, lighter than videos, and allowing the development of physical or domestic activities while listening. The podcast Conexões (MOURA, 2020a), consisting of seven episodes, was distributed through the Anchor[1] platform and the Spotify[1] application. In each episode, the teacher responsible for the curricular component addressed questions and discussions about the possible connections of digital technologies with teacher training, teaching, and learning.

The first episode explored some of the concepts and ways of understanding and using digital technologies: How does the expansion of access to technologies change the way we relate to each other? How do these changes change our models of teaching and learning? In what contexts and through what media do we experience technologies? How do our intentions determine which technologies we use and how we use them? In episode 2, there was a discussion about the articulations made for the creation of Conexões and also about the challenges of the teacher who is on the Internet. Episodes 3, 4, and 5 presented reports from students of the class in different contexts: as teachers in remote teaching; approaching different teaching situations with the use of quizzes, games, simulation, flora species identification application, video, and animation; and as students in a period of non-presence in the experiences of learning and research. For the sixth episode, Professor Débora Laurino, from the Federal University of Rio Grande (FURG) was invited to talk about learning projects and digital technologies, discussing different experiences, both in basic education and in the university.

2.2 Asynchronous activities on Moodle

The Moodle platform was the support space for the curricular component, organized in weekly themes to provide experiences for learning, interacting, researching, and producing. The first week, "To start a conversation about mediation with digital technologies", was designed in a more

[1] Available on: https://anchor.fm/anamoura and https://open.spotify.com/show/5l9ZAA8RsBAvVXA4FZMaqG.

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extended format for the adaptation of the non-presence routine and the integration at home with the master's activities, besides the familiarization with the Remote Teaching.

In each class, the activities of listening to podcasts, reading articles, or learning through videos of lectures were interspersed with activities of audio production, text production, dialogues in forums, preparation of questions and discussions in synchronous classes. The podcast Conexões guided the approaches and discussions of each class, either through episodes recorded by the teacher or episodes in which the voices and experiences of the students appeared, as well as through interviews with the students.

The video lecture "Possibilities of learning mediation in the context of social distance"[2] (MOURA, 2020b) presented some experiences related to the challenges of the current moment, from the teacher responsible for the component. Professor Marco Antônio Moreira's lecture "Different ingredients combined in Teaching Projects Mediated by Digital Technologies"[3] (MOREIRA, 2016) starts from the context of Distance Education but it brings approaches and orientations that were fundamental for the moment lived (Remote Teaching), besides enthusiasm and passion for being a teacher. From the reflections raised by the lecture, the students created a collective digital board.

Also, as a theoretical basis, two articles were made available during the component: "For a new concept and paradigm of Digital Education onlife" (MOREIRA; SCHLEMMER, 2020), which discusses different terminologies and conceptions of Education measured by Technologies, and "Pedagogical Foundations for the Use of Simulations and Virtual Laboratories in Science Teaching" (PAULA, 2017), which made it possible to deepen perceptions and learning about the relationships of pedagogical foundations that guide and determine ways of teaching and learning mediated by Digital Technologies.

As foreseen in the guidelines, one of the main activities of the component was the elaboration and proposal of Science Teaching Projects with the use of Digital Technologies (PECTIC). For this activity, the following script was shared Class/grade; Science content; What do I want to teach; What do I want the students to learn; What curiosities do I have about the chosen topic and content; Why do I want to teach; What relationships do I want the students to build? What is the role of the teacher in teaching with Digital Technologies; Theme of the content approach;

[2] Available on: https://www.youtube.com/watch?v=i-LUUoRGVDM.
[3] Available on: https://youtu.be/S-s3QxmSfTI.

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Digital resource to be used; How will the chosen digital resource(s) be used; What are the possible contributions of the chosen digital resource(s) from such a pedagogical foundation of Science Teaching; and References. Throughout the component, it was suggested to the participants that they adapt their proposals of pedagogical intervention of the masters or their teaching actions to include the mediation with Digital Technologies, based on this script. The PECTICs were elaborated or adapted individually, but three versions were created, which received suggestions from the responsible teacher and also from colleagues through discussion groups on Moodle, based on the affinity to the chosen topics or digital tools.

2.3 Google Meet synchronous activities

Google Meet is one of the tools that allow teachers to conduct their classes online via video calls using computers and/or mobile phones. It was the way that educators found to compensate for the absence of presential classes during this pandemic period. The synchronous activities on Google Meet made the students participate responsibly in the curricular component and later in the proposed project.

In the first synchronous meeting, the presentation of the class and the component was made to organize it, to show the schedule with its activities and assessments, as well as the presentation of the Moodle space and its tools. In the second synchronous meeting, the collective board created by the class was presented and the academics were challenged to adapt or create a Science Teaching Project mediated by Digital Technologies, from the understanding that: Digital Technologies are the ways we communicate, teach, and through which students can learn; and that we are in a space where we learn to teach something, and learn because we teach, and learn because we teach in such a way ... so why not create a space that shares the actions and the planning? With the arguments that justify them? As well as the pedagogical foundations of these actions.

In another synchronous session, after reading the text "Pedagogical Foundations for the Use of Simulations and Virtual Laboratories in Science Teaching", students had to create questions about the text to develop the activity called "Secret Problematizer". In this activity, the teacher mediated a draw in which one student asked the question and another answered it. This dynamic allowed the class to participate as questioners and answerers and also to discuss the text through different approaches. As additional material, the teacher recorded a video with some highlights of

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the article read. The propositions and the theoretical basis of the activities developed in the curricular component were shared in the last class, which is available in the video: "Digital Technologies in the Mediation of Science Teaching Projects"[4] (MOURA, 2020c).

2.4 The WhatsApp group as a space for dialogue and interaction

The WhatsApp app was used as a space for dialogue and interaction, favoring "direct" contact between participants and allowing for flexibility in sharing knowledge, ideas, messages, and discussions among the subjects. The space served as a "corridor" for socializing and asking questions. The group was a good solution for informal exchange and collective learning and represented the intention to use the application as another way to be in a "collective" - to send and receive tips, to feel part of the class. It also allowed for self-management and autonomy in the discussions, as well as sending alerts about connection problems during synchronous moments. We also noticed that the group motivated the participants, who, by reading messages from their classmates with their doubts, reading tips, and life suggestions, stayed involved in the curricular component and could interact with each other in a meaningful way.

3 RESULTS AND DISCUSSION

At the end of the activities of the curricular component, the research project entitled "Digital technologies and Science Teaching Projects in different spaces: intention, context and support" was created to organize and publish a book, in digital format, open and free. The Research Project proposed to publicize the projects developed by the students in the curricular component, valuing the production and authorship of each one and allowing access and use of these projects by other teachers. As a result, nine master's students, among the twenty-one students in the class, joined the project and the organization team of the book.

The development of the Research Project and the organization of the book happened collectively and collaboratively among the members. In a continuous process of learning and dialogue, we organized ourselves to divide and share the different activities involved in the

[4] Available on: https://youtu.be/_DyTJsN6Zl4.

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publication of a book: inviting possible authors; organizing the acceptance, submission, and revisions; elaborating the draft of the book chapters; reading and revising the texts and the standards of the Brazilian Association of Technical Standards (ABNT); designing the book; creating and designing the book cover; requesting a catalog; registering with the Brazilian Book Chamber to obtain the International Standard Book Number (ISBN); and elaborating and publishing the book launch video.

The book entitled "Teaching Projects with Digital Technologies - Contributions to teaching practice in Science"[5] (MOURA *et al*., 2021) presents eleven projects developed from the proposed script and through the guidance and discussions held in the curricular component. The authors of the projects are scientists who participated in the component, with the co-authorship of their supervisors, since their proposals were related to their investigations in the Master's degree. The projects present proposals for the spatial context of primary and secondary education; with content from the natural sciences, and from the areas of physics, chemistry, and biology teaching, and also the use of different support spaces: social networks, applications, interactive maps, podcasts, images and videos.

The diversity of digital resources proposed in the projects that integrate the book reaffirms that such resources, when they bring "[...] information aimed at the construction of knowledge [...]" make explicit "[...] their pedagogical objectives" and are "[...] structured in such a way that they can be reused and recombined" (CARNEIRO; SILVEIRA, 2014, p. 239, our translation), can be used in different spaces - intention, context, and support. For Paula (2020, p. 79), "we can understand how new mediations create new possibilities of action for students, through which they can come to master or appropriate certain concepts and sciences", and "teachers also find in new mediations other possibilities of action to share with students the meanings of these same concepts and methods" (PAULA, 2020, p. 80, our translation). Thus, to articulate the possibilities of teaching science with digital resources, associated with the pedagogical foundations of science teaching and teaching mediated by digital technologies, the book has the potential to contribute to teaching actions in schools.

The book is available for download under the Creative Commons License, which allows the free distribution of the work and preserves its copyright. Since the proposal was to publicize the

[5] Available on: https://coeducarunipampa.files.wordpress.com/2021/01/livro-projetos-ensino-em-ciencias-com-tecnologias-digitais-2.pdf.

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projects and contribute to teachers' actions in Science Teaching through Digital Technologies, we carried out, collectively, the virtual launch of the book, through the production of a video, published on the Youtube platform and shared in the social networks of the organizers and authors of the book. The book aims to contribute to the training of teachers, sharing ideas so that others can be inspired and carried out.

4 CONSIDERATIONS

In the shared experience, we recursively used Digital Technologies: we started with the goal of elaborating Science Teaching Projects mediated by Technologies, we achieved this goal through interactions and dialogues built through Digital Technologies, and we shared the results in the publication of a digital book. Thus, we experienced Digital Technologies "with", "in" and "for" teacher education. We highlighted the collaborative, intense, and effective participation of students in synchronous and asynchronous activities, with many contributions and interactions in forums and class discussions. The need to change spaces and modes of interaction resulting from the Covid-19 pandemic calls for us to use Digital Technologies to establish connections and create learning communities. The project and the organization of the book were also spaces of conviviality, motivation, lightness, and the belief that it is possible to continue to feel a sense of belonging to the University and to be an author of practices and publications. By living the experiences expressed in this text, we have shown that it is possible to learn, create, research, and share through Digital Technologies.

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