Problem-Based Learning as reinforcement for remote teaching in times of COVID-19 using the moodle learning environment

Patrícia Costa dos Santos da Silva
College professor, Graduate Nursing Course - Medical school, University of Uberlandia. Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0001-9643-1865
Email: patriciacosta@ufu.br

Lorena Cristina Pereira
Graduate student, Graduate Nursing Course - Medical school, University of Uberlandia. Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0002-6270-0462
Email: crissilva72@hotmail.com

Lívia Ferreira Oliveira
College professor, Graduate Nursing Course - Medical school, University of Uberlandia. Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0003-1978-7889
Email: liviaenfermg@ufu.br

Mariana Ramos
Graduate student, Graduate Nursing Course - Medical school, University of Uberlandia. Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0003-3230-8424
Email: mari.ramos2009@hotmail.com

Michele Aparecida Silva Maciel
Graduate student, Graduate Nursing Course - Medical school, University of Uberlandia. Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0003-3230-8424
Email: michele_unitri@hotmail.com

Efigênia Aparecida Maciel de Freitas
College professor, Graduate Nursing Course - Medical school, University of Uberlandia. Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0003-4434-7762
Email: efigenia@ufu.br

Andréa Mara Bernardes da Silva
College professor, Graduate Nursing Course - Medical school, University of Uberlandia.
Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0001-5126-1110
Email: andrea-bernardes@hotmail.com

Suely Amorim de Araújo
College professor, Graduate Nursing Course - Medical school, University of Uberlandia.
Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0001-9234-166X
Email: profasuelyamorim@ufu.br

Luana Araújo Macedo Scalia (Corresponding author)
College professor, Graduate Nursing Course - Medical school, University of Uberlandia.
Uberlandia, Brazil.
ORCID: https://orcid.org/0000-0003-1000-8738
Email: luanascalia@ufu.br

Abstract

In times of pandemic, the social distance made the teaching practice suffer several adjustments to meet emerging demands, thus the aim of this study was to report the experience of the authors with problem-based learning as reinforcement to remote teaching in times of COVID-19 utilizing the moodle learning environment, as a way to implement changes in the discipline Interdisciplinary Project II of the Undergraduate Nursing course, which has always been offered in the face-to-face modality. The study was conducted from March to July 2021 with students enrolled in the course. The results of this study indicate that the use of problem-based learning resources during remote teaching can become an efficient resource for professional training.

Keywords: education, teaching, nursing, Covid-19

1. Introduction

The world scenario is marked by a severe acute respiratory syndrome called Coronavirus 2019 (COVID - 19), caused by coronavirus 2 (SARS - CoV - 2), which started dissemination in China, has reached more than 220 countries and poses threats to global health and economy. So far, the number of infected people in the world is 184,803,226 (Dong et al., 2020). In addition, there is a high infection rate among healthcare workers (Qing et al., 2020).

In in addition to infecting healthcare professionals, COVID-19, also affects clinical learning environments (Tomietto et al., 2020). Thus, this situation interferes with healthcare students' learning opportunities, as many practical subjects have been suspended due to the uncertainty of healthcare

environments and social and organizational restrictions to minimize unnecessary access to services, and many face-to-face activities have changed to remote teaching.

In this context, many researchers have been investigating the future of nursing education (Ramos-Morcillo et al., 2020; Tomietto et al., 2020). A relevant question is how will it be possible to graduate nurses in a society that faces measures of isolation and social distancing, but at the same time, in a society that increasingly needs qualified clinical nurses (Tomietto et al., 2020).

Therefore, it is evident that the challenges emerging from the pandemic, such as changes in the format of the subjects and the stoppages have marked education in these times. Furthermore, there are the epidemiological, technological and psychological aspects that should be more valued in the return to classroom activities (Lira et al., 2020). There are numerous possibilities that are being explored in nursing education; there is the emergence of interface technologies that articulate the physical with the digital and that expand the debate, the exchange of experiences, interaction, reflection and critical thinking (Lira et al., 2020).

The search to understand the experiences and expectations of students facing this scenario has been the object of study, and it is essential to assistance educational leaders and teachers to allocate sufficient resources and reorient the university education of nursing students (Ramos-Morcillo et al., 2020). Thus, different teaching methodologies are being used: real-time videoconferencing (including chats), videotaped lectures uploaded to the e-learning platform, audio podcast, chat (exclusively), homework assignments, and document submission (Word, PPT, PDF) (Ramos-Morcillo et al., 2020). To assist faculty who experience this situation, problem-based learning is a student-centered learning strategy in which students are presented with situations experienced in practice that can be used to bridge the theory-practice gap (Matlala, 2021).

The discipline Interdisciplinary Project II, which has the objective of knowing public policies and health care programs, articulate issues related to education, and promote the interface between theory and pedagogical practice, previously occurred in a theoretical and practical format, as a result of the pandemic, it was divided into two modules, a theoretical module and a practical module that will be carried out later. The theoretical module was carried out using the active problem-based learning (PBL) methodology as reinforcement for remote teaching using the moodle learning environment and the Mconf platform.

Thus, the purpose of this study was to describe problem-based learning as reinforcement for remote teaching in times of COVID-19 using the moodle environment.

2. Methodology

2.1 Participants

The activities began on March the 5th 2021, the synchronous classes occurred weekly, with a class load of 15 hours, the learning environment Moodle was used as a tool for the use of PBL in teaching and learning of the subject Interdisciplinary Project II, which was offered in the period from March to July 2021. The student body was constituted by 44 students regularly enrolled in the course.

2.2 Tutoring

The planning and organization of activities was carried out by the teacher responsible for the subject Interdisciplinary Project II (PROINTER II), being also one of the tutors. The use of the PBL method was carried out in an interdisciplinary way with the total participation of six teachers, who helped in a tutorial way and three students who had previously participated in the discipline, also helped the teachers in the management of the Mconf and Moodle platforms. As PROINTER II proposes to work in an interdisciplinary way, the course had the participation of teachers responsible for the areas of Mental Health, Women's Health, Children's Health and Collective Health II. The tutor, in teaching, is presented as the teacher who is concerned with teaching the student to "learn how to learn", especially in the PBL (Mezzari et al., 2011). Thus, the tutor is a guide who helps students in their learning process, prepares activities to support teaching, respecting their own rhythms, trying to integrate them and establishing the challenge of performing a dialogical relationship by means of a follow-up through the teaching dynamics, evidencing the shared teaching and learning process (Botti & Rego, 2008; Mezzari et al., 2011). In this study, tutors were responsible for mediating dialogues and discussions, as well as being available to answer students' questions, besides being responsible for maintaining the content available on the Moodle course page and evaluating students' performance.

2.3 Virtual Learning Environment (VLE)

The Virtual Learning Environment (VLE) was constituted by means of the instructional design made on the Moodle platform, which enabled the process of interaction and exchange of knowledge between students and tutors, being a space for publishing content, besides the management of online activities (Mezzari et al., 2011). The Moodle platform was selected because it is free software and because it is already used by the university at other times. In addition, it provides the administrative structure with registration information, report and calendar; the academic structure, with tips, research, subjects, glossary and study guides; and also interaction tools, such as e-mail, chat and forum. All this allowed the development of this study with ABP activities during the remote activities during the pandemic by COVID-19.

2.4 Tool Usage Strategy

The teaching of PROINTER II in this study was prepared with synchronous and asynchronous classes. In Moodle environment, all the materials used in synchronous classes were made available on the course page, including the Power Point presentations. In Moodle, used as VLE, the following tools were chosen for the development of the remote modality in the course:

•*Link to a file or page* - provided scientific articles, case studies and questions about both, relating the subject matter given in class in the same period. The questions had to be answered by a predetermined deadline, before the synchronous meeting. It was designed so that students did not have direct answers, but sought them through research and reading of the proposed articles (Mezzari et al., 2011);

• *Chat* - was used to create a synchronous communication channel between students and tutors. It provided a space for dialogue and knowledge exchange, with scheduled day and time, generating greater freedom to expose thoughts and allowing the exchange of information and the construction of knowledge in real time (Mezzari et al., 2011);

• *Discussion forum* - allowed asynchronous communication, developed at different times between students and tutors, being used for the construction of interactive processes and experience of the seven steps of PBL (Mezzari et al., 2011). Through these teaching and learning tools, which enabled the development of autonomy and responsibility for shared knowledge, through research and prior study of the content listed by the students themselves to develop the activities of GPA and synchronous meetings (Mezzari et al., 2011).

2.5 Developing Problem-Based Learning on the moodle platform

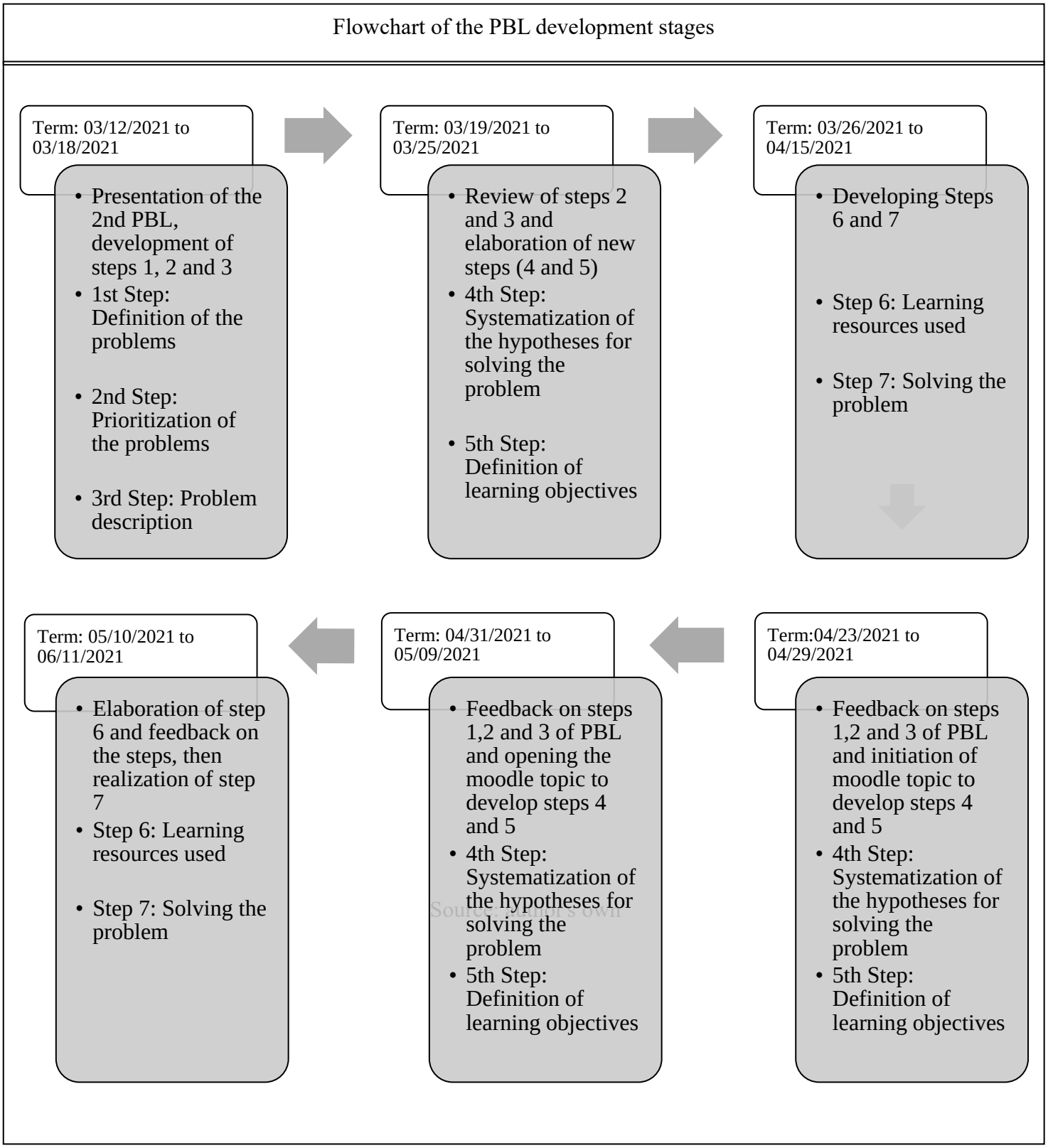
Problem-based learning is designed to change the traditional lecture-based teaching approach to a student-centered approach. Its application consists of seven steps: 1) term clarification: words or concepts that are not fully understood are explained; 2) problem definition: the problem is defined to help identify the main objective of the case; 3) brainstorming: pre-existing knowledge of the topic is used to formulate ideas about the points discussed in the case; 4) structuring and hypothesis: the proposed ideas on problem identification are linked and sorted to provide tentative solutions; 5) identifying learning objectives: following steps 1-4, the main learning objectives are defined as a consensus in the group; 6) Independent study: students will read privately about the topics at hand and try to meet their objectives; 7) synthesis: students discuss the results of their independent study with each other, which were added to their pre-existing knowledge about the case (Bodagh et al. , 2017).

To implement PBL online during the COVID-19 pandemic, each facilitator created a group to meet on Whatsapp with their group of students. Whatsapp is a service that enables videoconference meetings and online meetings. The functions were maintained with students using cell phones or webcam computers to participate in the online session.

During the course two PBLs were conducted. Thus, the students were divided into seven groups, containing 6 to 7 members, each group being named with a color, namely: yellow, red, blue, orange, lilac, green and white. Thus, the PBLs were executed as follows: 1º) the steps of the PBL were divided into weeks, in order to provide the students with a considerable amount of time to understand and conduct each step, 2º) the groups received a hypothetical case that they should read individually, 3º) after reading the material, the members of each group had to schedule a meeting through Whatsapp so that each member could make their considerations about what they understood, 4º) the group should reach a consensus and elaborate answers for the steps of the week and 5º) at the end of each week, each group should post in the discussion forum of the MOODLE platform the answers they elaborated for each step, as well as a synthesis of what was discussed and the prints of the WhatsApp conversations at the time they held the discussions. The groups that had any doubts during the elaboration of the steps would be able to solve them during the synchronous meetings on Fridays, as well as through the doubts forum of the MOODLE platform, or even through the Whatsapp group of PROINTER II or individually through the Whatsapp of the student and the instructor of the discipline.

The first PBL was held in order for the students to get to know this teaching methodology and to learn in practice how the steps of a PBL are performed, as illustrated in figure 1.

Table 1. Flowchart of the PBL development stages. Uberlândia, Minas Gerais, Brazil, 2021.



After the completion of the first PBL, the students were already more familiar with the methodology, so a second PBL was conducted. Thus, the groups were given different case-problems that were discussed in the second PBL, as shown in Table 2.

Table 2. Problem cases discussed by the groups participating in the PBL. Uberlândia, Minas Gerais, Brazil, 2021.

GROUPS	PROBLEM CASES
Yellow	Child Health - Domestic accidents in childhood during the pandemic
Red	Women's Health - Pregnancy consultation
Blue	Women's health - Prenatal care
Orange	Elevated rate of cesarean sections in Brazil
Lilac	Mental health - Bereavement during the pandemic
Green	Adult health - Diabetes mellitus
White	Adult health - Systemic arterial hypertension

Source: author's own

Although the groups received different case-problems, the divisions of the PBL steps remained the same, as shown in Figure 2. Finally, week 4 was devoted to the preparation of an educational video that succinctly included all the steps taken during the development of the PBL, as well as an action plan developed by the group in order to mitigate or solve the main problems identified in the population of the case-problem they received. The goal was for each group to plan an action that could be applied to a community. Finally, each group presented the educational video to the rest of the class.

2.6 Student Assessments

Every process change requires an assessment. For its validity, it presupposes the construction and validation through instruments capable of providing data for analysis and interpretation of reality (Mezzari et al., 2011). The assessment of the students during the remote teaching allowed to verify if the objectives of the subject PROINTER II were achieved and if the methodological strategies were adequate, being distributed one hundred points to the activities developed by the students. The performance of the students who participated in the distance activities in the chat and in the forum was also verified. Twenty points were given for the Forum participation, 20 points for the first PBL, 20 points for the second PBL, 20 points for the educational video presentation, 10 points for the individual participation in the chat activities, and 10 points for the course evaluation. Five scales were developed to evaluate these activities performed during the course.

3. Results and discussion

In this sense, this study was an experience that contributed as a resource for nursing education in times of pandemic. The construction and effectiveness of the course faced both potentialities and difficulties that can be found in table 3, presented below:

Table 3. Describes the strengths and weaknesses presented in the development and implementation of the subject Interdisciplinary Project II. Uberlândia, MG, Brazil, 2021.

POTENTIALITIES	DIFFICULTIES
1-Space for dialogue	1- Difficulty with internet connection
2- Space for experience exchange	2- Online work overload
3- PBL promotes autonomy and responsibility	3-Difficulty in training
4- Optimization of time	4-Excess of information in a virtual format
5- Promotes interdisciplinarity	5- Exhaustion

The use of moodle as a tool for applying PBL during the pandemic made it possible to create a space for dialogue and the exchange of experiences that was considered a potentiality, because students and tutors from different nursing disciplines participated and interacted in an atmosphere of knowledge sharing and reflexions.

In the aim of minimizing the risks of contracting SARS-CoV-2 by healthcare students and faculty, many universities have opted for remote activities. Because of the negative impact of the COVID-19 pandemic on education, there has been a shift to remote teaching at all levels of education, which may represent an ideal solution to maintain learning during this unprecedented period (Al-Balas et al., 2020; Bongomin et al., 2021). However, remote teaching may not facilitate the acquisition of clinical skills and competencies in resource-limited settings where online learning platforms are not well established (Bongomin et al., 2021).

In this regard, it is up to the teacher to create significant connections with students, which requires developing new ways to build virtual communities, as students often use social media to interact and share information with each other, but may feel uncomfortable having their teacher in this space, this requires new norms that need to be adopted (Smith, 2020).

Another potentiality of PBL was to enable teachers to work with autonomous students and responsible for their learning, which becomes student-centered. Thus, the COVID-19 pandemic has contributed to changes in the teaching and learning process, which used to occur in a face-to-face setting and now occurs remotely; thus, PBL emerges as a facilitating option, since it works on problem situations in small groups, in which students seek solutions guided by a tutor. A study conducted in Pandemic on the use of PBL showed that students were satisfied with the overall change to this collaborative e-learning environment and the new successful procedures of the virtual PBL sessions (Alkhowailed, et al., 2020).

In addition, even at a distance, PBL allows working with challenging situations that will be experienced in the practice of nursing professionals, and in the present work, each tutor participated in the construction of problem cases that were used for the development of PBL on the moodle platform. The use of online PBL through moodle allowed an optimization of time, because activities had to be scheduled in advance and each step was carried out gradually, and the weekly feedbacks and synchronous meetings allowed tutors to provide the necessary guidance for students to remain engaged and focused, so that time was better managed. In a study conducted during the pandemic at Carle Illinois College of Medicine, compared online and face-to-face PBL sessions, it noted that in the online environment, sessions tended to be slower because there was a need to pause to allow people to speak and others to understand. In this case, there is a greater risk that students will be distracted by the increased screen time and access (Coiado et al., 2020)

The other potential of the online format is the possibility of working in an interdisciplinary way, with teachers from different locations who can, through online meetings, share their experiences. In this work, the teachers formulated situations based on different realities and that would enable the development of cognitive and interpersonal skills. A study conducted in Japan with medical and nursing students showed that interdisciplinarity improved group discussions and performance in online classes in this pandemic period (Yamashita et al., 2021).

In relation to the difficulties encountered, one can mention the internet connectivity problems, because with the pandemic many people started to work at home office, which increased the demand for internet use, overloading the access to many sites and platforms. Thus, it is observed that there is a need to expand investments in digital education. A study conducted in Uganda during the pandemic by Covid-19, showed that Internet costs and poor Internet connectivity were cited as the main barriers to accessing e-learning among medical and nursing students. In addition, about 35% reported that lack of gadgets such as smartphones and personal computers are possible barriers to e-learning (Olum et al., 2020). In developed countries with good and cheap internet, e-learning has been assimilated as part of a blended education system with traditional lectures and e-learning (Ollum et al., 2020). However, in developing countries, barriers such as inadequate infrastructure and qualified personnel prevent the enhancement of a virtual learning environment (Olum et al., 2020).

On the other side, there are viable options to ensure that remote teaching activities are successfully integrated into nursing education in Brazil. First, universities can contact companies that manufacture computers or smartphones and establish a scheme for more affordable and accessible devices that are compatible with distance learning. Multilateral government agreements with telecommunications companies to provide free access to important remote learning applications such as Zoom, Google Meet, MUELE, etc., reducing costs and increasing acceptability among students. The use of good quality scientific articles that can be downloaded and subsequently used offline by students, either in electronic or hard copy, can be an alternative for students who do not have a laptop and face internet connectivity problems (Olum et al., 2020).

In addition, another difficulty identified is the overload of online work, because there are training courses, meetings, and other extra activities, all in digital format that require more dedication from technology users. Studies demonstrate that the time spent on remote learning platforms, when compared to face-to-face, is much longer. In order to manage the daily tasks, it is often necessary to perform the activities after formal working hours. Added to this, there is the recurrent use of applications such as WhatsApp® that keep individuals constantly connected to the work environment, implying a reduction of time to rest and to dedicate to other activities. (Souza et al.,2021)

The necessity of capacity building to work with PBL was quite challenging, since the abrupt transformations from the face-to-face model to the remote format brought with them the need to restructure the form and objects of work, through the introduction of technologies. The whole process was developed in a short period of time, without the possibility of prior adequate training, often with the absence of technological apparatuses and without minimal prescriptions on how to do it. The knowledge, in some cases, had to be acquired on their own and in everyday practice, bringing difficulties for teaching-learning (Souza et al.,2021). A study conducted by TIC Educação in 2018, showed that only 42% of teachers

received some kind of training during graduation and only 22% took a continuing education course on the use of technologies focused on teaching activities. Such data reflect the insufficient training of these professionals and can bring great challenges and obstacles to the development of remote activities and the effective implementation of technologies in education.

Among the difficulties it is also worth mentioning the excess of activities in the online format, which creates fatigue and difficulty in organizing and prioritizing activities. In this line, a study that aimed to map post-COVID planning priorities for a better balance between distance and face-to-face teaching reported that participants agreed that face-to-face teaching allows them to inspire students and have meaningful connections with them, they also agreed that remote teaching provides a good environment for most students (Ahmed et al., 2020). However, students with financial challenges and special needs may not have equal opportunities to access technology and referring to social issues, participants agreed that face-to-face learning offers a better chance for professionalism through enhanced teamwork and cognitive, communication, and clinical skills are better achieved face-to-face (Ahmed et al., 2020). Additionally, participants in this study agreed that the logistics of conducting remote learning are much more complicated when compared to face-to-face learning (Ahmed et al., 2020).

To plan for the future, educators need to understand that the choice of remote learning, although it was imposed as an alternative solution during the COVID era, has always existed as a possible alternative and will continue to exist after this era, so mapping the priorities of post-Covid-19 planning allows for maximizing the benefit of each method and guiding educators' decisions to minimize the disadvantages for the good of the learning process (Ahmed et al., 2020).

As the remote activities require prior planning and organization of activities, this leads to many hours of extra work connected to the Internet, which in turn leads to fatigue. Often, teachers work on their off hours and weekends to handle the rigorous workload. On the other side, the concern with maintaining professionalism makes teachers look for resources to maintain the quality of teaching. In this sense, the concept of professionalism is embedded in teaching practice and they develop as work processes occur, and teachers have been taught to monitor their professional behavior and this is a construct that refers them to a series of acceptable behaviors that are within the norms of the educational culture (Ahmed et al., 2020). These acceptable behaviors have developed very little since their emergence and changes in educational platforms require that the core concept of professionalism be revisited (Ahmed et al., 2020).

Given this context, these norms are challenged every day and need to be addressed and updated to accommodate new educational constraints and challenges (Sajid et al., 2016).

4. Final considerations

The discipline Interdisciplinary Project II, through the remote performance of teachers and students of the nursing undergraduate course at UFU, enabled the development of distance actions through the institutional platform Mconf, expanding the tools for teaching and learning.

This study has some limitations, as it is an experience report of the authors, describing the experience of a single center that may not reflect the reality of other regions.

It is encouraged that other higher education institutions promote interdisciplinary and shared actions involving different communities and replicate the teaching technologies presented here to other communities as a learning strategy in times of pandemic by COVID-19.

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