Challenges and opportunities for the use of digital information and communication technologies in education during the COVID-19 pandemic: an experience with active methodologies

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Abstract: The use of digital communication and information technologies allows the creation of more dynamic and interactive classes, which favor collaboration between students and the personalization of teaching, facilitating the adoption of hybrid teaching models that combine the best of the face-to-face and online worlds. Thus, this experience report discusses how the COVID-19 pandemic has transformed education, increasing the need to use technologies in the classroom and allowing distance learning. It highlights the importance of investments in equipment and data packages to ensure that all students are included in the teaching-learning process. In this same context, the use of gamification tools, such as Flippity and Wordwall, can make the learning process more dynamic and attractive. The objective of the article is to present opportunities and threats regarding the use of these tools, as well as active blended learning methodologies, and propose an action plan to support teachers to develop digital skills and work with personalization and group learning in a more integrated way. and collaborative.

Keywords: COVID-19 pandemic; digital communication and information technologies; distance learning; gamification; active methodologies; educational games.

Desafios e oportunidades do uso das tecnologias digitais de informação e comunicação na educação durante a pandemia da COVID-19: uma experiência com metodologias ativas

Resumo: A utilização das tecnologias digitais de comunicação e informação permite a criação de aulas mais dinâmicas e interativas, que favorecem a colaboração entre os alunos e a personalização do ensino, facilitando a adoção de modelos de ensino híbrido que combinam o melhor dos mundos presencial e online. Assim, esse relato de experiência discute como a pandemia da COVID-19 transformou a educação, aumentando a necessidade de usar tecnologias na sala de aula e permitindo o ensino a distância. Destaca-se a importância de investimentos em equipamentos e pacotes de dados para garantir que todos os alunos ser incluídos no processo de ensino-aprendizagem. Neste mesmo contexto, o uso de ferramentas de gamificação, como Flippity e Wordwall, pode tornar o processo de aprendizagem mais dinâmico e atrativo. O objetivo do artigo é apresentar oportunidades e ameaças quanto ao uso dessas ferramentas, bem como metodologias ativas de ensino híbrido, e propor um plano de ação para apoiar os professores a desenvolver habilidades digitais e trabalhar com a personalização e aprendizagem em grupo de forma mais integrada e colaborativa.

Palavras-chave: Pandemia de COVID-19; tecnologias digitais de comunicação e informação; ensino a distância; gamificação; metodologias ativas; jogos educativos.

1. Introduction

We cannot deny that the global COVID-19 pandemic has re-signified educational processes at the national and global level from 2020 onwards, bringing the use of digital Information and Communication Technologies (ICT) more present in the classroom. The

use of digital technology made distance learning possible. But it also contributed to a significant increase in teachers' workload, including teaching how to use and redesign the classroom with new tools ALMEIDA, CANTUÁRIA e GOULART (2021).

Throughout history, few investments were made in education, which often made the use of ICT in the classroom unfeasible and even the lack of education and training for education professionals (ALVES e LIMA, 2018). Some of the problems mentioned by education professionals that hinder continuing education include: excessive workload, double or triple shifts to compensate for low wages, lack of financial incentives, lack of qualified professionals to organize, plan and administer programs, structural problems and lack of interest from government officials and some teachers who do not fight for their rights FREITAS e PACÍFICO (2020).

The history of education makes us reflect on the lack of incentives for training new teachers, as well as their training and continuing education. Since education in Brazil tends to meet the demands of capitalism, teacher training aims to prepare students for the new society, preparing them for the job market. Thus, this "new" society, based on technology, capital and individualism, needs indoctrination, and for this reason the school would be the main responsible (NETO, 2021). Despite all the difficulties and lack of incentives, education professionals from Brazilian public schools were able to develop their educational activities during the pandemic period, learning new methods, discovering new tools, and appropriating ICT.

In this experience report during the pandemic period, we sought to work with the use of active methodologies, through the use of Blended Learning (BL), Flippity, and Wordwall tools. BL appears, nowadays, as an alternative to innovating in the teaching-learning process through a pedagogical approach that "mixes" face-to-face activities with activities made possible through educational technologies, making the learning process more attractive and dynamic (MORAN, 2015). For VALENTE (2014) the flipped classroom (FC), a classic example of BL, which has been strongly incorporated into different levels of education, including Basic Education. According to VALENTE (2018), with this approach, students are taught in virtual learning environments (VLE) before moving on to face-to-face classes.

This article aims to discuss the opportunities and threats related to the use of the Flippity blended learning tool and active methodologies in the classroom, using the Wordwall application. Through an experience report with students in the 6th year of Brazilian elementary education, strategies will be presented that aim to support teachers in the process of adopting these approaches. The aim is to show how these tools can be used dynamically and attractively, favoring personalization and group learning, in addition to contributing to the formation of important digital skills for hybrid teaching.

2. Theoretical foundation

In this theoretical foundation section, we will present the definitions related to the topic in question, to clarify the concepts and fundamentals necessary for understanding the subject. First of all, we present some types of education. Then, we present some related works that use the Flippity and Wordwall tools in their pedagogical proposals will be discussed, highlighting the potential of these tools for hybrid and distance learning. The Flippity* dynamically and attractively, favoring personalization and group learning and of personalized educational games for different themes and school subject, with numerous customization possibilities (TETTY, 2022). The objective is to offer theoretical

*Link for download Flippity Tool: ⟨https://www.flippity.net/⟩

and practical subsidies for using the Flippity and Wordwall tools in different educational contexts to stimulate student learning and promote interactivity and engagement in the classroom.

2.1. Types of education definitions

Distance learning (DL), is a teaching modality in which educators and students are geographically separated, being structured by educational institutions with the use of various communication technologies (MAIA e MATTAR, 2008). Even though DL consists of methodological teaching actions developed remotely, some authors understand the existence of divergences between distance education and remote activity. Remote teaching practiced during the COVID-19 pandemic resembled distance learning only in terms of technology-mediated education **??**).

Blended Learning (BL), or hybrid education, in turn, is a teaching modality in which face-to-face and online classes complement each other, with a focus on personalizing teaching, using various digital resources, in which the student can learn in his own time and at your own pace (BACICH; NETO e TREVISANI, 2015). We can say that the traditional classroom and the virtual space gradually complement each other and this happens precisely because, in addition to the use of various digital technologies, students interact as a group, intensifying the exchange of experiences in different environments and moments. The experience of working with a new methodology in the classroom is always a great challenge for teachers, as it requires us to leave our comfort zone to experience new possibilities. Therefore, nowadays, the challenge for all of us, educators, is to adopt active methodologies, and digital skills, and work with personalization and group learning in a more integrated, flexible, and collaborative way MORAN (2021).

2.2. Gamification tools

The **Flippity** tool is an extension of Google Sheets, specifically linked to Google Education (ALVES e LIMA, 2018) that allows the creation of games and personalized interactive activities for teaching (SANTOS, 2020). It is very versatile, offering different models of ready-made games and also the possibility of customization, allowing teachers to adapt to their specific teaching needs (BRATEL *et al.*, 2021). Flippity's applications in teaching are diverse and can be used to create review activities, board games, quizzes, raffles and even to generate random work groups. The tool can be used both in face-to-face classes and in remote classes, being an excellent alternative for hybrid and distance learning. Flippity can help engage students in online activities, offering a playful and dynamic environment for learning, which can contribute to improving the quality of teaching and learning.

The use of Flippity in conjunction with other digital tools can bring even more benefits to distance learning. As examples in Figure 1, it can be used to create games that address content from different disciplines, such as science, mathematics, and literature. Furthermore, Flippity allows customization of the games, which can help meet the different learning needs of students. With this, the tool can be an important ally for hybrid and distance learning, allowing teachers to create interactive and personalized activities for their students, contributing to a more dynamic and attractive education.

The **Wordwall**[†] tool is an online platform that allows teachers to create personalized activities using the criteria of a few words, what we commonly call gamification. Besides that it is considered an interactive and engaging educational tool

[†]Wordwall link for download: ⟨https://wordwall.net/pt-br/community/jogo⟩.

for activities, such as quizzes, puzzles, games, and interactive exercises, using various templates and game-based features. The platform supports multiple languages, and teachers can create activities that are customized to their student's learning needs and objectives. Wordwall Tool can be used both in traditional classrooms and in distance learning environments, and it aims to promote active learning and improve student engagement and retention.

Figura 1. Examples of some activities that can be developed by Flippity with thumbnails and links to instructions and demos.

2.3. Related Works

BL combines synchronous and asynchronous classes, which can take place via face-to-face and virtual learning platforms or in fully online formats ARGYRIOU, BEANAMAR e NOLOLAJEVA (2022) and BILGIN e GUL (2020). In this sense, the learning method can take any form such as video, web-based instruction, and more. Other studies show us that BL is an active method that combines learning environments, using platforms to optimize time efficiency and encourages students to become independent and self-responsible learners (CUI; ZHAO e ZHANG, 2022) and (SHEN *et al.*, 2022).

In this sense, the use of gamification makes it possible to work with activities more playfully and is a technological resource that can be used within the BL. Thus, gamification consists of a way of taking games with an educational purpose in which the student learns the content to be taught LIMA *et al.* (2021). In this sense, educational games are tools that encourage students to learn with playful resources that aim to complement their academic training in a fun and pleasant way LIMA *et al.* (2017). Therefore, regardless of the area of expertise, the use of games and applications generates a new look at distance education, updating the way of teaching and improving its quality SENDACZ, MORAN e LIMA (2022).

3. Materials and methods

This work is a descriptive study (SEVERINO, 2017), of the experience report type, carried out from the experience of the teacher of the discipline of Religious Education in Elementary Education in the final years, in a public school in the state of Minas Gerais, located in the midwest region of the city of Uberlândia with 90 sixth-year students, from August to September 2020. In addition, the present work used a bibliographic survey, based on material already prepared, consisting of books and scientific articles (GIL, 2008).

Articles about Distance Education, BL, Active Methodologies, FC, and Gamification were used as references (LIMA *et al.*, 2021; SEVERINO, 2017; ARGYRIOU; BEANAMAR e NOLOLAJEVA, 2022; MORAN, 2015; SHEN *et al.*, 2022). These articles discuss how the COVID-19 pandemic has impacted education and how the use of ICT can support teachers in developing more dynamic and engaging

teaching practices, particularly in the context of hybrid learning. In this experience report, two materials were used to promote gamification in the teaching process: Flippity, a tool integrated with Google for Education tools, and Wordwall, a gamified platform.

3.1. Experience report

We seek to develop an active teaching methodology based on the concepts of personalization, individualization, and differentiation, through the inverted classroom model. In this sense, the classroom becomes a place where already learned content is processed, practical activities are carried out, problems and projects are solved, and group discussions and workshops are held. This allows the teacher to use the activities recorded in the virtual environment to make an accurate diagnosis and determine what the student has achieved, what difficulties they have encountered, what their interests are, and what learning strategies they have used. This method allows the implementation of more personalized learning.

For the development of this flipped classroom proposal, we used the digital tools provided by Google for Education. In this way, through Google Classroom (LIMA e ISOTANI, 2022) we were able to make available all the theoretical parts, explanatory videos, activities, and games that allowed students to access as many times as necessary, at their pace and in their time, to prepare the student for the discussion. in the classroom, with the removal of doubts and resumption of concepts. Among the syllabus to be developed, we work on the theme "Know thyself", a phrase widely spread by the philosopher Socrates, as he considered that it would only be possible to obtain true knowledge if, first, we knew ourselves. Many attributed the phrase to a philosopher, but this phrase by an unknown author was inscribed on the portal of a temple at the entrance to the city of Delphi in ancient Greece (SALLES *et al.*, 2014).

In our first class, we made available to students at the beginning of the week on Google Classroom a video on the theme Know Yourself, in addition to a text using non-verbal language with images related to this theme. As an activity, a game was proposed with a series of multiple-choice questions through the Wordwall Application, which aimed to provide students with a playful and didactic way to reflect on themselves.

On the day of the synchronous class, a slide presentation was made with the theme: Looking inside, the aim was to instigate students to reflect on the importance of our five senses in discovering who we are, such as the smell of a cake can bring us an affective memory and transport us to a good or bad memory that makes up our tastes and preferences. In the second moment of the class, we propose that the students do a collective activity through a trial board game. The rules were presented and the room was randomly divided into eight groups. We worked with an online board game, consisting of eight pegs, a dice, forty-five squares, and a magic box, with questions about the topic discussed in the classroom and self-knowledge questions. The proposed game is available for free through the Flippity digital tool. The Flippity digital tool allows us to customize the game, in a simple way, through Excel spreadsheets, according to the topic we want to work on in the classroom with the students.

The activity lasted approximately 30 minutes in each class and at each space that the teams advanced, the students' satisfaction with having succeeded was evident, as well as when they had to go back or stay a move without throwing the dice, it was clear that they wanted to continue the match to see who would reach the finish line first. Games and games are important sources of development and learning that enable students to acquire knowledge and skills in the context of language, cognition, values, and sociality VIEIRA e OLIVEIRA (2010). Through the collective work, we were able to perceive the integration

of the students, even the students considered "shy" participated in an active way talking about their preferences, hobbies, fears, and dreams the students it was considered positive. Therefore, collective work provides growth, learning, and the development of autonomy DUARTE, PINTO e BARREIRO (2017).

During the development of the class, it was noticed that some students were already more advanced in the process of understanding the content worked before and during the class, indicating which activities needed to be reinforced for some of them and how the content of the activities could be better developed. Thus, in a classroom, there are different subjects, with different needs, and the educator must understand that maintaining the same rhythm and dynamics for all students is harmful for the group PIRES (2015). In this sense, personalizing learning is not necessarily doing different activities for each student, but proposing different activities at asynchronous times that allow students to access the content as quickly as possible to repeat as much as necessary, taking into, account their times and rhythms (MORAN, 2015).

3.2. Summary of activity steps

The active teaching methodology has been increasingly used in the classroom, seeking to engage students in a more meaningful and personalized learning process. Below is the summary of the 8 steps for the application of the previously detailed experience report.

1. To develop an active teaching methodology based on the concepts of personalization, individualization and differentiation, through the inverted classroom model.
2. Use the digital tools provided by Google for Education to develop the flipped classroom proposal.
3. Select the syllabus to be developed, such as the theme "Know yourself".
4. Make available to students in Google Classroom a video on the subject, in addition to a text using non-verbal language with images related to it.
5. Propose a game with a series of multiple-choice questions through the Wordwall Application that aims to provide students with a moment of reflection about themselves.
6. In the synchronous class, make a slideshow with the theme "Looking inside', urging students to reflect on the importance of our five senses in discovering who we are.
7. Propose a collective activity through a track board game, with questions about the topic discussed in the classroom and with self-knowledge questions. ,m Use the Flippity digital tool to customize the game according to the theme you want to work on in the classroom with the students.

3.3. Results

As an evaluative activity, a form was sent by Google Sala de Aula with the following instruction "Reflecting on the theme 'Know thyself' I challenge you to take a picture of something that expresses or represents 'Who you are'. You can take a picture for example: Favorite food; Game or prank; Animals; Hobbies; Family; Landscape. Anyway, the idea is that photography expresses a little about who you are. Use your creativity and name your photo". Each 6th-grade class consisted of 30 students, with a total of 90 students. However, we received a total of 78 activities according to the pie chart in Figure 2.

From the photos received, a composite video was edited with the 78 photos and their titles, being as diverse as possible as we can see in Figure 3 in the form of a cloud

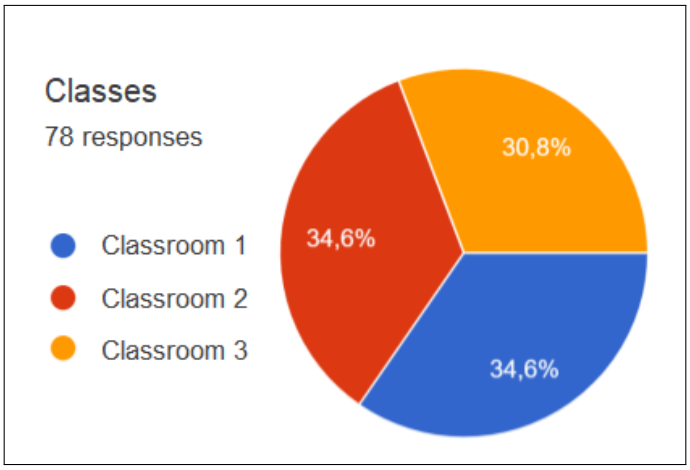

Figura 2. Pie chart representing the distribution of assignments by a paper submitted by class: Class 1 (34.6%), Class 2 (34.6%), and Class 3 (30.8%), that is, 78 papers delivered.

of words, made in the Flippity application, demonstrating more a feature of this tool. This tool allows us to create flashcards, questions and answers, random roulette, padlock game, virtual board, click and drag, memory games, timelines, bingo, awards, scoreboard, a spelling game, word search, crossword, break jigsaw, hangman, word cloud, mad-libs, lettering, virtual certificate (SANTOS, 2020). Through the cloud of words, we tried to represent the titles of each photograph and through the titles, we can have a brief idea of what each one of them portrayed. The video was shown during the synchronous class, via Google Meet, and after it was shown, a moment of discussion was held for students to express their opinion about the photographs and what motivated each of them to choose the photograph sent.

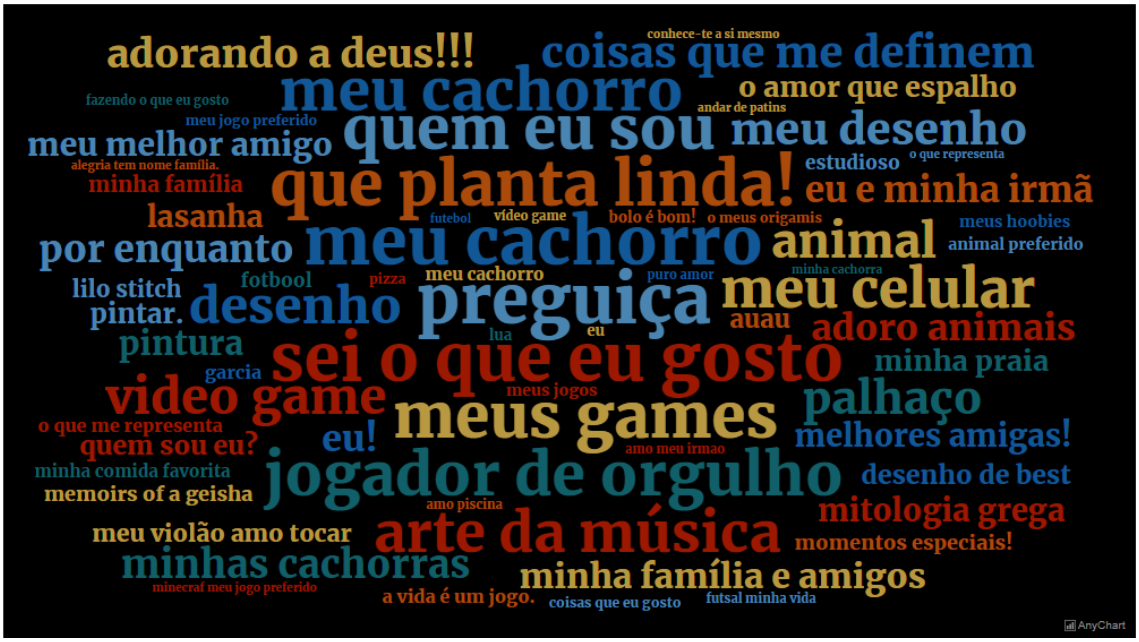

Figura 3. Word cloud made with the Flippity application from the 78 titles of the photographs submitted by the students.

All the activities developed were aimed not only at the individual learning needs but also those of the group. Therefore, the use of an active methodology aimed to contribute to the learning process through the use of games and games at all stages, offering playful moments and interaction with all participants.

4. Analysis and Discussion of the Report

Working with children and adolescents in this modality is a constant challenge and without the support of parents and/or guardians, this task would be practically impossible to accomplish. We could see during the synchronous classes, and even in messages left on the Google Classroom wall, the student's interest in the educational games that were made available in the Activities tab. The same can be seen during the games we made collaboratively during the synchronous classes held using the Google Meet tool and which certainly made all the difference. That way, we envisage the following **opportunities**: a (a) use of active methodologies in Emergency Remote Teaching (ERE) to provide more personalized learning; (b) availability of digital tools such as Google for Education and Flippity for creating content, activities, and games that allow students to learn at their own pace and time; (c) use of games and games as a source of development and learning that enable students to acquire knowledge and skills in the context of language, cognition, values, and sociality; and (d) the possibility of using gamification to make learning more fun and engaging.

A negative point is that in our public school reality, unfortunately, we are unable to serve all students in this teaching modality, as there was no investment in technological equipment and data packages so that everyone could participate in classes through Google Meet, and access materials and classes in Google Classroom. Despite all the difficulties and challenges, it was noticeable that ICT, when well applied in the school environment, through well-structured planning, have good results in the teaching and learning process. We also envision some **risks**, such as (a) difficulty in accessing the internet and digital tools by public school students, which may compromise the effectiveness of the methodology; (b) lack of technical skills and adaptation on the part of teachers to use digital tools and develop content and activities suitable for the active methodology; (c) difficulty keeping students' attention during synchronous classes, which can be hampered by the lack of physical interaction and visual fatigue caused by prolonged exposure to screens; and (d) the challenge of developing active methodologies that allow the inclusion of all students, regardless of learning differences and skill levels.

To face these threats, we suggest the following **Action Plan** so that teachers can apply BL with tools that support gamification and active methodologies in the classroom:

1. Ensure access to the internet and digital tools: In this sense, it is necessary to seek partnerships with companies and institutions that can provide devices and internet connections for students who do nohasve resources. It is also important to make printed educational materials available to students who do not have internet access.
2. Training for teachers: It is necessary to offer skills and training contextualized with the needs of educators so that teachers can develop technical and didactic skills to use digital tools and create content suitable for the active methodology. It is important to promote a collaborative environment among teachers to share good practices and help each other.
3. Alternate synchronous and asynchronous activities: It is important to balance synchronous and asynchronous activities to avoid eye strain and maintain students' interest. Synchronous activities like live classes can be alternated with asynchronous activities like reading and exercises. It is also important to encourage interaction between students through group activities.
4. Adaptation of the methodology for inclusion: It is necessary to develop active methodologies that allow the inclusion of all students, regardless of their abilities and learning levels. This can be done through strategies that cater to different learning styles and promote the participation of all students. It is also important

to ensure access to accessible resources for students with disabilities.

With these actions, it will be possible to overcome threats and ensure the effectiveness of the active methodology even in a remote teaching context. These actions must be constantly reviewed and updated to meet the needs of students and teachers.

5. Final considerations

The pandemic caused by COVID-19 boosted the use of ICT in the classroom, which led teachers from most different educational levels to adjust to the new reality and seek new knowledge so that the isolation caused by COVID-19 was only physical and not social, using the means of communication available to contact their students. It is essential to point out that the work carried out with our students using games contributed significantly to the knowledge appropriation processes, since, during the proposed activities, the students were presented with synchronous and asynchronous activities, in which they had to be submitted to respecting rules, visual perception, self-control, observation, and memorization. In this sense, it can be seen that the games were pedagogical instruments for the cognitive, affective, and social development of the children involved in the classes.

By using active methodologies, it is understood the great responsibility that teachers must assume in the training of their students, since the role of educators is to systematize relevant scientific knowledge through mediation, thus contributing to transforming education. For future work, it is necessary to further explore the potential of ICT and games as pedagogical tools in the teaching-learning process. Teachers must continue training to use these tools effectively and creatively, to engage their students and make classes more dynamic and interactive. In addition, it is necessary to more systematically evaluate the impact of using these active methodologies on the cognitive, affective, and social formation of students, to identify the best practices and guarantee a transformative and quality education.

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