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## GAMIFICATION AS A TEACHING RESOURCE IN MATHEMATICS TEACHING

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**Abstract:** This article aims to present the relationship between the Gamification resource and Active Methodologies in the context of Mathematics teacher training. We sought to conceptualize the most diverse themes involved in the research, such as the Active Methodologies at BNCC, the use of technologies in the teaching of Mathematics and Gamification. The theoretical discussion carried out made it possible to broaden the look at these themes. It was possible to observe that the use of new technological resources by teachers is of paramount importance and directly reflects on their pedagogical practice. In addition, the use of Gamification contributes to social and digital inclusion. In the teaching of Mathematics, it is observed a good influence of this resource to develop calculation and logic skills for an effective learning of the students. The field research to be carried out will be exploratory and collaborative. There will also be a training action in the form of a mini-course on Gamification to equip teachers with the resource and later they can use it in their classrooms. In addition, we establish a direct relationship on the importance of this theme for a contextualized and quality education for an increasingly globalized and technological world.

**Keywords:** Gamification. Math. Technologies.

## INTRODUCTION

The contemporary cybercultural moment is linked to the use of technologies, resulting in the need to adhere to resources and strategies to create contextualized pedagogical practices (MARTINS; GIRAFFA, 2015). In the context of teaching Mathematics it is no different. It is essential to adapt such teaching to the new times, seeking support in new technologies as allies, incorporating them in the classroom, combining school contents with the interests that students have outside of school. The

realization of teaching practices that place the student as a protagonist in the teaching and learning processes are important in these circumstances.

According to Soares and Rego (2015), Mathematics is present in the most different daily activities, but there is often a significant gap between the Mathematics used daily and the Mathematics used in the school environment, causing a distance between them. The results of external assessments such as the Basic Education Assessment System (SAEB) indicate that Basic Education students, at all levels of education, have difficulties with Mathematics (BRASIL, 2017).

The teacher, when using technology in the school environment, proposes to explore the advantages that this resource can bring to the classroom, and consequently stimulate the student to learn. According to Barbosa et al. (2020), despite having a technological advance, the education and training of teachers in Brazil does not follow the same pace, making its wide use in the classroom difficult.

Many of the challenges for the teaching of Mathematics are linked to a progression of teaching practices, which need to be supported in a context of teacher training, allowing the educator to add new methodologies and technological resources to their praxis that enable improvements in the teaching process. teaching-learning (BRITO, 2020).

Thus, Gamification, as an Active Methodology, incorporates the game aspects that are used in the learning process, and shows itself as a pedagogical practice strategy that can help qualify the teaching and learning processes, motivating and engaging students. . Gamification mobilizes the main elements of games by presenting challenges, competition and rewards. In addition, it helps in the development of students' skills, facilitating problem solving, conveying a

sense of accomplishment through feedback and reward, and when well structured and applied, they increase motivation, persistence and aid in learning (MEDEIROS, 2015).

Therefore, through my master's research entitled "Appropriation of the Gamification resource for the teaching of Mathematics in the perspective of the documental approach of the didactic", I intend to approach the Gamification resource. The guiding question of the research is how does the Mathematics teacher appropriate the Gamification resource in the development of didactic skills?

To answer this question, we outlined the general objective of the research to analyze how the Mathematics teacher appropriates Gamification in his pedagogical practice. To meet this objective, we will follow the following specific objectives: Identify teachers' prior knowledge about the use of new technologies in mathematics teaching and, in particular, about gamification; Identify teacher training needs in relation to gamification; Provide a continuing education course in technology, in the teaching of mathematics for teachers of the SEECT-PB network.

We will use as a theoretical reference the Documentary Approach of Didactics (TROUCHE et al., 2009), which defines and distinguishes the resource of a document. We will also rely on research and curricular references that deal with the professional development of teachers and professional skills such as BNC-Initial and continuing education (BRASIL, 2019).

## **METHODOLOGICAL CONSIDERATIONS**

This is an exploratory and collaborative type of research. Exploratory research aims to provide greater familiarity with the problem, in order to make it more explicit or to form hypotheses. It can be said that

these researches have as their main objective the improvement of ideas or the discovery of intuitions. Its planning is therefore quite flexible, so that it allows the consideration of the most varied aspects related to the fact studied. In most cases, these researches involve: (a) bibliographic survey; (b) interviews with people who had practical experiences with the researched problem; and (c) analysis of examples that "stimulate understanding" (SELLTIZ et al., 1967, p.63).

Collaborative research, on the other hand, has as its main objective to meet the need to strengthen ties between school and academia, promoting fruitful results directly related to teaching practice, "contributing to the elaboration of new understandings about the work carried out in the school institution, establishing a commitment of the academy of also engage in the search for solutions to the problems presented there" (HORIKAWA, 2008, p. 27).

Survey data will be collected in stages. Following the perspective of collaborative research, the content to be worked will first be identified together with Mathematics teachers, based on the difficulties listed by them. Then, a training action will be proposed in a mini-course format on Gamification to equip teachers with the resource and later they can use it in their classrooms.

This way, we hope to infer and analyze what new skills/competencies these teachers developed when building and using Gamification. The instruments used in this data collection are interviews, videos of the recordings of the workshop/minicourse training and questionnaires so that we can analyze each stage of data collection.

## **TECHNOLOGIES IN MATHEMATICS TEACHING**

Unlike those born in the middle of the 20th century, children of the current generation

already live with technology from an early age, causing them to develop greater ease in dealing with these new technologies and the skills to understand them, and they find themselves in a time in which access to content and information is not limited to universities, schools or books, but extends to the internet, smartphones, tablets, among others (SHAW et al., 2019).

In the immense field of digital technologies, online tools provide a very innovative teaching potential, facilitating the work of teachers and improving students' teaching and learning, because through the internet, students can access multimedia resources such as images, videos, sounds, texts and animations (ARAÚJO, 2016).

According to Zabel et al. (2015), courses for the initial training of mathematics teachers need to pay attention to the development of some skills regarding the use of digital technologies in the teaching and learning process, such as:

- Use of utility software;
- Use and evaluate educational software;
- Integrate technologies into teaching and learning situations;
- Encompass technologies within a new paradigm of knowledge and learning;
- Recognize social and ethical implications of technologies.

For Dourado et al. (2015), it can be said that the use of computer technologies in the teaching process can, for the most part, provide greater interactivity among students and, consequently, provide the stimulus for students to practice more exercises.

Almeida (2016), says that the use of these technological tools, if used with a certain excess and in the wrong way, can negatively interfere with students' performance, as in the case of using them to search for resolved results, a fact that can interfere with students' reasoning, students contributing to a failure of

mathematics learning.

Therefore, it is extremely important that applications and websites can be monitored by teachers, so that it is possible for teachers to be prepared in order to interact with an updated and more informed generation, as the current means of communication such as the Internet, provide instant access to information and the current generation has much more facilities in the search for knowledge through the technology that is made available to them (ALMEIDA, 2016).

Several studies emphasize the importance of technologies in elementary mathematics education, but there is still an emphasis on schools that adhere to ICT programs, due to the lack of adequate infrastructure, equipment maintenance, pedagogical support, material provision. for the teacher and continuing education developed by the school itself (SILVA, 2016).

Araújo (2016) states that the objective of introducing new technologies in the school is in order to offer new pedagogically important possibilities in which it cannot be done in other ways, because the learner, using appropriate methodologies, can use the technologies in the integration of all subjects, especially in Mathematics, since in many cases from an early age in elementary school some already have some difficulty in the traditional teaching method, but when using technology, the school becomes a much more interesting place in which will prepare the student for his future.

The full development of ICTs can increasingly shorten distances, enabling rapid exchange between ideas, projects and joint activities in real time, recently thanks to access to digital mobile technologies and the internet it has become possible to break the limits of time and space by bringing people together and making it possible to share experiences and knowledge (COSTA et al., 2015).

The teacher must generally explore the didactic potential of educational programs, not being necessary to become a specialist in informatics or programming, since many educational software do not require such expertise, and it is important that teachers know the best choice between the educational software according to the objectives in which it intends to work and ensuring the most correct form in the application for didactic purposes (ZABEL et al., 2015).

## **ACTIVE METHODOLOGIES AT BNCC**

The use of active methodologies allows students to build a basis for carrying out educational actions in the school environment, starting from problems and real situations that will make sense for these students, as they will use the knowledge built in the present to solve problems and also in the future when it is necessary to use these skills developed (SILVA, 2019).

Bonfim et al. (2020) says that teaching and learning proposals, especially in elementary school, that choose active methodologies are based on a complex set of didactic resources, aiming at an education that can develop critical thinking, autonomy, proactivity and engagement for reflection. and action in solving social challenges by students, and must be designed with a focus on helping students to identify and understand real-life problems and with this awareness knowing how to intervene properly and creatively with the reality in which they are inserted, thus improving the situation for themselves and others.

Active methodologies tend to enhance learning through stimuli in relation to critical thinking, these methodologies, with the support of digital technologies, have great chances of providing greater responsibility in relation to the construction of knowledge by

constituting concepts in a more autonomous (ARRUDA et al., 2018).

According to Ferreira (2020), among the most specific skills of an active methodology for elementary education are the understanding and use of digital information and communication technologies in a more significant, reflective and ethical critical way in the face of various social practices and school, communicating through different types of languages and media, producing knowledge, solving problems and developing authorial and collective projects.

Taking into account that people are increasingly connected with the use of communication networks through participatory media, in which news, facts and new means of entertainment are presented in real time around the world, it is necessary certain changes in education and in teaching and learning methods (WELTER et al., 2020).

The BNCC, according to its pedagogical foundations, demonstrates its commitment to integral education, advising that in this integral education, the teacher must intensify the use of digital technology in order to teach Mathematics and other subjects at the beginning of basic education, acting with discernment and responsibility. in contexts of digital cultures, and it is important that the school preserves its commitment to reflection and in-depth analysis, contributing to the student's development of a critical attitude related to the content and multiplicity of media and digital offers (FERREIRA, 2020).

Welter et al. (2020), concludes that theories about active methodologies today have been reinterpreted, and can provide subsidies for a more dynamic practice focused on creativity, interaction and student autonomy, these active learning methodologies reconcile the student with the interactive activities with other students, learning and developing collaboratively.

It is also possible to verify the possibility of remote active methodologies and keeping with the educational principles and social responsibility, the remote activity with active methodologies when well executed can overcome the contradiction of distance learning, revealing itself as an instrument of inclusion, this mode of action can occur when there is the action and participation of educators committed to inclusive methods (BONFIM et al., 2020).

According to the MEC, Brasil (2018) regarding digital technologies and computing, the BNCC highlights some aspects related to the transformations that have taken place from the active methodological practices in basic education:

- Computational thinking: it involves abilities to understand, analyze, define, model, solve, compare and automate problems and their solutions in a methodical and systematic way through the development of algorithms;
- Digital world: it involves learning related to the ways of processing, transmitting and distributing all information in a safe and reliable way in different digital contexts, being physical like computers, cell phones and tablets, as well as virtual, in the In the case of the internet, social networks and data clouds, among others, it is possible to understand the contemporary importance of encoding, storing and protecting information.

## **GAMIFICATION IN MATHEMATICS TEACHING AND ITS POTENTIAL**

Teaching Mathematics is to develop the practice of logical reasoning, stimulating independent thinking, creativity and ability to solve problems, so the use of Gamification in Mathematics teaching is a natural way for the child to get in touch with reality, facilitating socialization, development of skills, creativity, teaching of calculations and the development of reasoning (SOBRINHO et al., 2021).

Traditional learning can often be passive, but games keep students focused, as they lead them to act and react based on the question they receive, so learning becomes more fun, engaging, and overall much more effective, (2015).

According to Tavares et al. (2020), nowadays education has as one of its objectives the inclusion of students and the socialization among them in the face of a society that is increasingly computerized and indifferent to what happens around them, thus the use of games in teaching is extremely important and gamification appears as an innovative factor in this process (TAVARES et al., 2020).

Gamification can be considered a driving tool in student engagement in Mathematics learning, and can improve learning objects and contexts, providing a more relaxed and also playful environment for young people, resulting in more effective teaching (MACIEL, 2020).

Gonçalves (2021) states that one of the challenges in relation to Gamification in Mathematics is to insert it within the school environment and adapt this process of Gamification with traditional school life in the long-term trajectory, even if the school is willing to conceive the teaching of Gamification in its curriculum of teaching activities, this activity needs to be consistent with institutionalized school life, it is possible to observe that one of the main obstacles is that some teachers still need to better understand the Gamification process.

It is possible to conclude that game elements are tools that must be used with some caution since Gamification cannot replace traditional educational programs, but in general Gamification can be used as a tool for integration between students and also as a way to to shorten the distance between teachers and students (GONÇALVES, 2021).

Some factors are necessary for the full development of a Gamified tool, according to Maciel (2020):

- Goal of the game: the purpose assigned to the player and a central objective, because without it the player would be free to take any action away from the main objective of the game.

- Rules: these allow the player to be creative and insightful according to what is proposed and following the rules as a form of discipline which is often observed with resistance outside of games.

- Feedback system: it helps players in the course of the game's narrative, normally a traditional Mathematics activity does not have an immediate feedback and this element encourages the student-player to continue in the game, since he can see his mistakes, the that needs to improve or what is good, trying to evolve according to your result.

- Voluntary participation: it is only possible if the player has intrinsic motivation to participate in the game and be part of its narrative, as playing something in a mandatory way reduces the player's interest and this same fact occurs with students in the learning situation. When the student is forced to perform a task without motivation, this task ends up being done anyway, but if the student is initially interested in the task, he will feel challenged and interested and then the task can be performed with much more effort and less chances. for errors.

Sobrinho et al. (2021), says that games are an essential part of children's knowledge construction process, especially in mathematical games, as they are highly requested to help students in the process of developing various skills in this discipline, helping teachers to transmit knowledge to their students in a practical way.

The participation of Gamification in the process of creating and participating in a

pedagogical game makes students more active and more critical of what they have learned and the quality of what they have learned, in general, teachers who use this Gamification process in the classroom, they seek to provide the best possible experience for students and use these tools to achieve this goal (TAVARES et al., 2020).

## FINAL CONSIDERATIONS

According to the above, it is clear that the use of new technological resources by teachers is of paramount importance and directly reflects on their pedagogical practice.

It is also worth mentioning the need for training that proposes to teachers new teaching methodologies capable of making learning more effective for students. It is also possible to generate reflections on beliefs, values, habits and pedagogical concepts, which depend on the teacher's professional constitution.

Regarding the use of Gamification, in addition to being great contributors to the social and digital inclusions necessary for a globalized life, in Mathematics it is observed a good influence of this resource to develop calculation and logic skills for an effective learning of the students, however, it is necessary to take into account the reality that it finds itself.

Therefore, Gamification is a topic that is expanding and we hope to understand how its use can influence the teacher's didactics and how it can help students' learning.

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