Gamification Applied to the Physics Teaching

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***Abstract*—As an essential assumption of gamification, we observed the motivation of the students involved, due to affinity. The re-signification achieved is of great impact, favoring its pedagogical use and giving support to the growing number of researchers who replicate the use of gamification as a modern teaching tool. The gamification in education allows numerous approaches to conceptual or practical learning in order to promote meaningful learning for students. In addition, to the competitive nature which encourages students to strive harder to reach a goal or even win the game. In this work, we will present the importance of the application of gamification in Physics teaching.**

***Index Terms*—blended, mooc, science, gamification, physics, tools**

I. Introduction

In the current dynamics of technological revolutions, where the development of new technologies grows exponentially, the contextualization becomes very important in the teaching-learning process.

The use of new technologies enables the teaching-learning process to be a more dynamic, interactive, contextualized and closer to students' reality.

The use of new technologies in physics classes has not been a reality in the current high school. Teachers do not use computers in your labs, in experimental physics, and do not even use students' smartphones as a multimedia in the teaching-learning process [1].

Computational simulations not only facilitate, but also attract students to physics [2]-[4]. In addition, they demystify the idea that physics in high school is a "heap" of meaningless formulas.

When we offer technology within their reach as a pedagogical tool, we contribute it. In order to obtain more attention, and consequently, the appropriate and coherent use of school knowledge and the curriculum itself.

In this context we should try to streamline the current classes, making them more interactive and attractive to the student. A meander would be the use of smartphones throughout the class.

The teacher must know how to use the smartphone as a pedagogical tool for teaching, using the newest applications for the enrichment and dynamization of the contents, nevertheless it is necessary that the teacher becomes familiar with the tool so that the students' supposed doubts are healed. With this, the student can contribute to the dynamism of the classes, working together with the educator. We have that, technological evolution transforms individual and social behavior, at different times, this reflects the uses that men make of the technologies that are the basis of the productive system.

In this work we will present the benefits brought by the insertion of multimedia in physics teaching.

II. Gamification

Currently, there has been a great growth in the number of surveys aimed at gamification as a pedagogical methodology, and the potential for growth of this teaching methodology is proven [5].

Education has been updated with new teaching methodologies, mainly because it goes through a period of transformations and constructions with the insertion of digital techniques.

Among the modern learning methodologies, gamification is one of the most outstanding, since it is an active approach that uses elements of games as an educational element of the most varied content involved. With gamification the goal is to involve more students bringing more motivation and attention in the activities, promoting a more structured exemplification of the concepts.

It is worth emphasizing the attention and affinity of the students with the games, Brazil is the 4th country in the world in games consumption.

Gamification offers a more functional connection between the school and the student, their customs and their daily practices using their recurrent interaction with new technologies such as computer games and smartphones.

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The other objective of the gamification use is to engage the students in the teaching-learning process. Thus, the gamification in physics teaching gains space, applying as an educational tool, if it intends to have a greater success in young students, totally adapted to the new technologies.

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III. METHODOLOGY

Gamification uses elements of the games, but outside the game environment, that is, it uses the affinity of the students with the games for pedagogical approaches. The gamification helps the teacher in this process and has several applications and games as educational tools, some of which stand out are: kahoot, scratch, foursquare, among others. Another widely used possibility is the use of famous games as elements of re-signification of proposed content concepts such as Angry Birds.

Our methodology consists of the applicability of each application. For example, kahoot is used as a developer of wanted regarding the content worked, taking advantage of the game environment created to encourage students to discuss the proposed topics. Kahoot turns classroom teaching into a game of knowledge, used by 20 million American students and awakens from the admiration of the combination of education and technology to the fear of losing learning to competitiveness [6].

The kahoot corresponds to an on-line quiz where the teacher can prepare his complementary activities and determine the time needed to solve the exercises, as well as the degree of difficulty.

IV. GAMIFICATION IN PHYSICS TEACHING

As an essential assumption of gamification, we observed the motivation of the students involved, due to affinity. The re-signification achieved is of great impact, favoring its pedagogical use and giving support to the growing number of researchers who replicate the use of gamification as a modern teaching tool.

The gamification in education allows numerous approaches to conceptual or practical learning in order to promote meaningful learning for students, many elements of gamification are already used by teachers, and often, evaluative weights are similar to games. In addition to the competitive nature which encourages students to strive harder to reach a goal or even win the game

We have been applying the aforementioned applications, in the last three years, and verifying the increase in the student approval rate at our institution, as we can see on Fig. 1, for Biophysics.

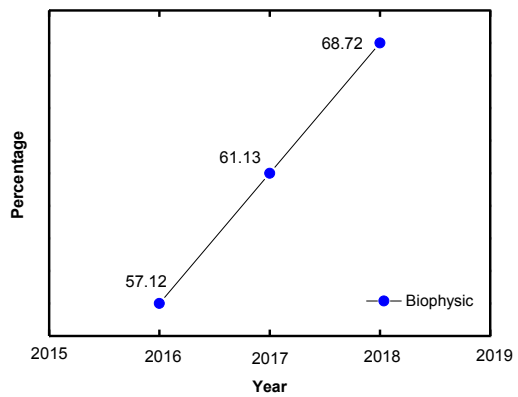

Figure 1. Year as a function of percentage of student approval.

In this context it is notorious the need to insert contents that bring students closer to the physics present in everyday situations, exemplifying the applications of these contents and their importance to the modern world. Therefore, an elaborate approach through an educational product through elements of games would encourage / motivate the students. In addition, to making them independent and active participants in the learning process in the most diverse spheres.

As an example, applications of physical concepts are very evident in Medicine: the use of radiation for diagnostic purposes, as well as the use of magnetic resonance and ultrasound equipment, among several other applications [7]. These concepts of the so-called "Medical Physics" are applied directly in the improvement of our quality of life, since they are linked to the treatment of the most varied types of diseases. These concepts are addressed in high school as: Waves, Electromagnetism and Modern Physics.

This aforementioned contextualization follows the steps of Fig. 2.

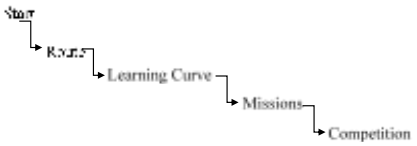

Figure 2. Steps of gamification.

Basically, throughout the classes we respect the course according to the programmatic content released. Then, the tools are passed on to the formation of a new teacher at the cognitive level of learning [8]. Continuing with each mission a new physical concept is discussed and healthy competition among students occurs as a function of time [9].

In providing a discussion of Physics concepts applied in Medicine, we have the opportunity to demystify this subject and demonstrate the importance of the applications of radiation and how they are present in our daily lives, more than students imagine. In these assumptions, we can even direct the proposal to an STS (Science, Technology and Society) perspective, being also aided by the use of several famous and everyday events that involve Medical Physics and Radioactivity.

The study of radioactivity involves current and controversial issues such as: Energy, environment, nuclear accidents, tailings, medicine, nuclear power plants, among others, besides being fundamental for understanding the structure of the atom, contemplating several areas of science education from nature.

The proposal of insertion is mainly in medical applications, by understanding the historical moment in which the scientific dissemination of Roentgen was given, for example, by rapidly influencing the diagnoses in medicine through the X-rays, as well as the technological evolutions that allowed a modernization of the methods of diagnosis, also using alpha and gamma radiations of different energies, culminating with the emission of positrons that, today, is the most modern through the Tomography by Emission of Positrons. As well, in applications of the concepts of physics in ultrasound equipment and magnetic resonance imaging.

V. Learning

Quality teaching involves many variables ranging from the pedagogical project to the individual motivation, be it the teacher or the student. In this context it is still an environment with adequate infrastructure, and the use of accessible technologies.

The present classes, for the most part, are purely expository, we would not go wrong in saying that they are the same ones that occurred in the last century. But in this one in which we live, interactivity predominates, in which we can affirm that the use of new methods is fundamental in order to make the student a participatory agent.

In that interim the search for new multimedia will be of paramount importance to horizontalize the position of the teacher. Task variability, goal setting, and involvement from the beginning to the end of classes awakens a sense of motivation. We argue that among many methods, electronic learning, ubique and mobile learning (and, ue m-learning) are the most accessible to students since they are owners of smartphones, and have more and more access to information quickly, without depth and / or direction.

It is important to emphasize that the internet helps in the educational process and, in this way, the school must explore its diverse potentialities both on the internet and the existing technological devices. In this connected world in which students are increasingly inserted and bombarded by various types of information, he emphasizes that it is fundamental for the teacher to act as a mediator of learning by stimulating the interpretation and contextualization of information favoring a cooperative construction of knowledge.

We have available various communication and information mechanisms, such as chats, e-mail, blog, facebook, twitter, instagram, among other social networks of daily use of individuals. Although we must be aware that it is necessary to visualize the expansion of virtual learning environments, inserting and expanding the different modes of teaching, there are still restrictions on their use by teachers, which justifies the need for continued teacher training so that contemporary professionals can be up to date. In addition, this behavior tends to increase their possibilities of work resources.

There is currently an emptying of classrooms, much due to the socioeconomic situation observed in the state of Maranhão, Brazil. In methodological terms, apparently, the student is from body to classroom, but his mind in another time / space.

The aforementioned leads us to believe that the teaching-learning relationship as a whole lacks' new knowledge. In addition, we would approach both face-to-face and the distance called blended learning (b-learning). The term, apparently, was introduced intentionally since our desire is to present a classroom different from the current one, where the teacher presents itself as a knowledge centerer and acts vertically as the holder of knowledge.

VI. Information and Communication Technologies

It is important that the school and the teacher take into account that the student is a thinking being, and that brings with him experiences and varied world experiences. From this perspective, the insertion of cultural artifacts in new digital technologies, can generate cultural leaps in the school environment contributing to the student to have greater autonomy of learning. They refer to digital technologies, both Communication Technology, which deals with the way information is transmitted, including basic media such as magazines, newspapers, books, faxes, telephones, radio, videos and the Internet, as well as information technology, which deals with the storing, reproducing and processing information through catalogs, magnetic tapes, cameras, hard drives, CDs, photocopying machines.

Information and Communication Technologies are in all environments, since they go beyond the use of the computer or the cellular device. It is important to note that physical tools or technologies constantly evolve, and in schools there is a high use of notebooks, data shows, films, posters, etc. While physical technologies are upgraded, symbolic technologies (linked to communication) continue, so to speak, to stagnate. Individuals adapt quickly to the requirements of each new medium, without reflecting or even knowing the languages with which they must operate, adapting to most occasions.

Oral and written language do not cease to exist, but along with them are added new and convenient ways of producing and propagating knowledge, communication and information. In this process: computers, sound techniques, images, programs and texts mark the new way of assimilating knowledge. One can understand how important the adaptation of new techniques to educational uses is. Given this context, it is perceived that technology is not far from our eyes and much less our actions; only different technologies generated different worldviews through two meanders: in the first as a pedagogical tool and in the second as a complex object of studies. Applying ICTs in basic and higher education aims to modernize, broaden, encourage and facilitate the teaching-learning process by motivating the students involved not to give up the completion of their studies and prepare them for later arrival in high school or the labor market. But we propose an update of this with a new "methodological arsenal" based on the use of ICT. Despite the difficulties faced in the insertion of these artifacts in pedagogical practice, it is undeniable the importance of rethinking that the school can bring to its means resources that will provide more creative means of learning. It is also necessary to take into account that the insertion of these artifacts in the classroom must be done in a critical way by the teacher and the school. Only the adoption of a technological artifact does not play the role thought by the scholars of the area.

Based on the assumption that all this technological arsenal is present in the daily life of students and teachers,

by whatever supports, it is still astonishing how the school proceeds as to the maintenance of didactic material, and some professionals fail to break with the traditional model of teaching.

It is important to keep in mind that education has not always used the new technologies. Traditional or traditionalist education in Brazil, despite being the pioneer, is still quite prevalent in several classrooms, which is worrying. However, new pedagogies have been and are being experimented in favor of a quality education, which is concerned with the integral formation of the student.

Currently, the most used media are computers, notebooks, tablets and cell phones. They are present both in residences, where people use them to access social networks, for entertainment, communication, to inform themselves about regional, national and international news, among other things; as well as in schools that have computer laboratories; as well as in some classrooms (computers and data show), where teachers use these resources on a daily basis in the teaching-learning process. These classroom accessories can be used for the reproduction of slides, short and feature films, images, as well as for the management and monitoring of academic activities, making it an indispensable tool for teaching practice.

VII. Conclusions

The insertion of gamification has brought a number of benefits to physics students. Throughout the project implementation process, the greater participation of students is reflected in a higher approval rate in the physics disciplines.

We believe that interactive methods such as kahoot present themselves as possible substitutes for traditional methods of evaluation. This conclusion was determined after obtaining the testimony of the students involved, who stated that it is more motivating to attend / participate in a Physics discipline, be it basic or advanced.

Therefore, by introducing in the topics of Waves, Electromagnetism and Radioactivity, as well as its applications in Medicine, we will have enough luggage to sustain a good discussion about the importance of the applications of the concepts of Physics in Medicine and of how radioactivity brings benefits to society, acquiring the necessary skills and abilities for the physics teacher

Our next step will be to introduce this methodology into the most different levels of teaching in our state.

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