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GAMIFICATION IN THE STUDY OF ORGANIC CHEMISTRY FOR PHARMACY UNDERGRADUATES: AN EXPERIENCE REPORT

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ABSTRACT

Gamification proposes the use of games or their elements in the performance of an activity. This work reports the experience carried out in the study of organic chemistry in the Pharmacy course through gamification. The students developed didactic games with the programmed content of organic chemistry previously studied. The class was divided into teams that defined the games, developed layouts and pieces, tested and played. The experience required engagement, interaction, decision-making and exploration of the knowledge studied from the participants. The results were positive, demonstrating the fixation of organic chemistry content and the development of important skills such as attention, proactivity and cooperation. Thus, practice demonstrated that gamification was a great teaching alternative, considering that it is an innovative method capable of providing content fixation in an easy and fun way. This method contributes to teaching by diversifying the practice of teaching, also allowing to contemplate the variety of behavioral characteristics of students.

Keywords: Gamification. Organic chemistry. Apprenticeship. Teaching method.

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INTRODUCTION

The teaching and learning process in the university context has been shown to be less than effective when carried out through the traditional teaching methodology. Studies indicate that this group needs to be encouraged to solve problems and, therefore, the teacher needs to reframe the way of teaching, providing a more engaging environment in which students can learn in a different way (LEÃO; PIN; OLIVEIRA, 2016). Allied to this, there are also students of the new generation, who were born in the digital world, making use of the most varied technological devices such as computers and *smartphones* in their daily lives (ALVES, 2018). For these reasons, in classrooms, it is daily to come across situations in which students have difficulties in assimilating new knowledge (COSTA; DANTAS; TAL, 2019).

Exact disciplines, such as chemistry, physics and mathematics bring great learning challenges, as they involve mathematical calculations, equations, chemical symbols and specific knowledge. Particularly, organic chemistry becomes a complex discipline, as it is difficult to establish a relationship between concept and practice, as well as the relationship between the macroscopic world and the molecular world (ROQUE; SILVA, 2008).

Therefore, knowing how to identify the diversity of students' characteristics, that is, how the student learns, is a differential for the application of personalized and more assertive educational models (COSTA; DANTAS; TAL, 2019). Neuro-Linguistic Programming (NLP) classifies students by behavioral patterns, based on their sensory characteristics (LORENA; PINHO, 2015), as can be seen in Chart 1.

Chart 1 – Behavioral patterns and their main characteristics

KIND	CHARACTERISTIC
VISUAL	Need to have a broad view of the content; reader; writer; imaginative; Thorough.
AUDITORY	Communicative; Opinionated; good speech; argumentative; good vocabulary; The quality and intonation of the teacher's voice is decisive in making him or her save the information.
KINESTHETIC	Identifies with dynamic classes; body movement.
DIGITAL/VIRTUAL	Ease in assimilating what they hear; Questioner; it needs a significant amount of information; difficulty concentrating and staying focused.

Source: LORENA; PINHO, 2015.

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In this context, the use of technologies in teaching environments has challenged teachers and students to establish partnerships and innovate in the way they teach and learn. Thanks to access to technology, the student becomes more independent and the educator needs to follow all this evolution in order to keep up to date with the content and the way of teaching (SANTOS; SOARES (2011), the teacher goes from being the holder of knowledge to being a mediator and the students become protagonists of the process. With the use of active teaching methodologies, methodologies that make the student be active in the classroom, whether through a practical class, a dialogued exposition, problem-based learning, flipped classroom, among others (KLOCK et. al, 2014). What can be seen is that both parties must keep in mind that education is not only the act of transmitting and receiving knowledge, but a process that must exist in order to communicate with the world around us. Thus, technology presents itself as an important tool for this event (SILVA LEITE, 2017).

A good example of new teaching-learning techniques is gamification. It consists of proposing the use of games, or elements of them, to carry out an activity or solve problems. The method that seeks to stimulate, motivate and engage participants has gained popularity in recent years (BLANCO, 2017).

In view of this new conception of teaching, the present work aims to share the experience carried out in the classroom, combining the application of new methodological practices, innovative tools and technology, respecting the behavioral characteristics of the participants. From the recognition of the importance of making the means and methodologies of teaching/learning more flexible, it was proposed to the students to learn through games considering the syllabus of organic chemistry. Thus, the objective of this work is to report the experience of students in the seventh semester of the Pharmacy course at the União das Américas University, Biopark campus, in the study of organic chemistry through gamification. The activity, requested by the mentor teacher, resulted in the delivery of didactic games that were provided by the students to the institution.

CASE REPORT

This work consists of an experience report on the use of the gamification method for the study of organic chemistry, applied in the seventh semester class of the Pharmacy course at the União das Américas University - Biopark hub, during the second semester of 2021.

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The proposed activity aimed to review, in a playful way, part of the content related to the study of organic chemistry of the Analysis of Pharmaceutical Ingredients II Project. The class, divided into groups of five or six students, had the freedom to choose the type of game and develop the respective layouts and pieces, associating the content studied with the game. At the end, they participated in a class where the games were exchanged between the teams so that everyone could play.

During the planning of the game, the students discussed and researched possibilities of games that could contemplate the knowledge acquired. Thus, the choice of *games* was made considering possible adaptations in already known games, such as crosswords, dominoes, game of seven mistakes, memory game, game of the monkey. On the other hand, one of the teams chose to create its own game, with rules developed specifically for the activity, but maintaining the proposed content.

In this way, the team that developed the domino game, for example, began by reviewing the concepts of organic chemistry passed on in the classroom. The colleague who presented the domino idea explained to the other members of the team that the pieces should be assembled with the aim of forming pairs, just like in an educational domino game. After the team's acceptance, each member elaborated four or five pairs of questions and answers and, together, selected the 28 most relevant, since the traditional domino game has 28 pieces. A member of the team used the computer to simulate each of the pieces, considering that the left side of each one was completed with the answers and the right side with the randomized questions. After this step was completed, the file was printed on sheets of adhesive paper and each piece was cut. The team acquired an educational wooden domino game and used it to glue the newly developed chemistry content, thus finishing the work and elaboration of the game. Immediately the dominoes were tested among the team members. Some parts needed to be redone in order to adjust the information and enable the correct fitting of the parts. After the adjustments were finalized, the game proved to be didactic and coherent with the content, being approved by everyone so that it could be exposed to other colleagues.

Subsequently, in the class intended for the exchange of games between the teams in the room, each group had the opportunity to play and learn about the various types of games prepared by their colleagues. It was possible to notice that each game presented a different level of difficulty, some easier and others very difficult to solve. Throughout the practice, the teacher accompanied the groups observing the unfolding of the challenges. At

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the end of the practice, the students delivered the games to the mentor who kept them at the institution to be used by other classes.

DISCUSSION

The teaching methodology practiced by Descomplica + Uniamérica – Biopark pole in the Pharmacy course is active, which allows the teacher to use a range of proposals for education, such as: flipped classroom, problem-based and/or project-based learning, case studies and even based on games or gamification. Thus, it agrees with what is cited by Valente (2018) who highlights that these proposals aim to put the student in real situations and encourage him to solve problems.

As reported, during the execution of the activity in the classroom, it was possible to verify the interaction of the students and the interest in completing the task. The playful component was perceived in the interpretation of roles, decision-making and knowledge passed on by the team members. In this context, gamification corroborated the foundation of the proposal of education by active methodologies where it occurs, according to Freitas; Maciel (2021), the priority of the student's performance in pedagogical experiences, considering their participation and effective exercise during the construction of knowledge, being complemented by Blanco (2017), considering that this methodology allows students to be engaged and motivated during the elaboration of activities, while fixing the content studied.

The proposal to deliver a game, with the objective of fixing the content of organic chemistry, is in line with the study carried out by Barata et al. (2013), whose report highlights the application of gamification and comparison of a discipline, in which greater participation, proactivity, understanding of the didactic material and learning results can be obtained. These authors present positive results, and the students considered the activities more laborious but not more difficult, in addition to being more motivating and interesting than the non-gamified ones.

As a result, the teacher and the students concluded that the use of gamification in the Pharmaceutical Input Analysis II challenge really allowed the fixation of the content in a playful way, in addition to contributing to the interaction between the students who cooperated by helping colleagues who had difficulties during the game. The diversity of the games was also a relevant factor, as it aroused curiosity in the students, challenging them to remain in the classroom in order to participate in each one of them.

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CONCLUSION

Youth and adult education presents itself as a challenge to teachers and the active methodology brings a new dynamic to the classrooms. The methods, considered innovative, are able to contribute to the fixation of the subjects studied in a playful and less monotonous way. As reported, activities that involve a differentiated proposal represent a great support in education, as the diversification of educational practices enables learning regardless of the behavioral characteristics of the students. As an example, gamification has been shown to arouse engagement and increase student interest in the content applied. The present report confirms this theory, considering that the students, divided into groups, felt comfortable in fixing the content considered complex in the study of chemistry.

With the delivery of the games to the institution, it is expected that other students can benefit from studying the same content. However, it is recommended that these new classes are also encouraged to use gamification in this or other challenges, in order to take advantage of the technique and advantages that it presents as a didactic practice.

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