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PLAY TO LEARN: HOW GAMIFICATION IMPROVES THE EVALUATION IN PHYSIOTHERAPY STUDENTS

JUEGA PARA APRENDER: CÓMO LA GAMIFICACIÓN MEJORA EL PROCESO DE EVALUACIÓN EN ESTUDIANTES DE FISIOTERAPIA

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ABSTRACT

The objective of the present study is to define the effectiveness of gamification in the evaluation process within the Physiotherapy career of the Universidad Técnica Particular de Loja (UTPL), for its development the final academic performance was compared in a control group and a group experimental, in order to determine the contribution of gamification in the fixation of knowledge and its implementation, the methodological approach used in the development of this research was based on a combination of quantitative research of descriptive scope and quasi-experimental design , the research consisted of two parts: one of a bibliographic nature and another of a qualitative nature. The students were randomly assigned to one of two groups: an experimental group that was evaluated within their training process using gamification and a control group that received training using traditional methods. Both educational programs lasted 16 weeks. To evaluate the theoretical-practical transfer, the Physiotherapy competency matrix was applied, which included both theoretical and practical sections. The results of the knowledge questionnaire showed that the students in the experimental group achieved significantly higher scores than their peers in the control group, evidencing that the use of gamification as a teaching strategy in the evaluation process in the Physiotherapy degree can be more effective than traditional educational methodologies in terms of theoretical-practical transfer.

Palabras clave:
gamgamificación, evaluación en fisioterapia, transferencia de conocimiento.ification, evaluation in physiotherapy, knowledge transfer.

RESUMEN

El objetivo del presente estudio es definir la efectividad de la gamificación en el proceso de evaluación dentro de la carrera de Fisioterapia de la Universidad Técnica Particular de Loja (UTPL), para su desarrollo se comparó el rendimiento académico final en un grupo control y un grupo experimental, con el fin de determinar el aporte de la gamificación en la fijación del conocimiento y su puesta en práctica, el enfoque metodológico utilizado en el desarrollo de la presente investigación, se basó en una combinación de investigación cuantitativa de alcance descriptivo y diseño cuasi experimental, la

	investigación constó de dos partes: una de carácter bibliográfico y otra de carácter cualitativo. Los estudiantes fueron asignados aleatoriamente a uno de dos grupos: un grupo experimental que dentro de su proceso de formación fue evaluado empleando la gamificación y un grupo control que recibió una formación empleando métodos tradicionales. Ambos programas educativos tuvieron una duración de 16 semanas. Para evaluar la transferencia teórico-práctica, se aplicó la matriz de competencias de Fisioterapia, la cual incluyó tanto apartados teóricos como prácticos. Los resultados del cuestionario de conocimientos demostraron que los estudiantes del grupo experimental alcanzaron puntajes significativamente más elevados que sus pares en el grupo de control, evidenciando que el uso de la gamificación como estrategia de enseñanza en el proceso de evaluacion en la carrera de Fisioterapia puede resultar más efectivo que las metodologías educativas tradicionales en cuanto a la transferencia teórico-práctica se refiere.

Introduction

Gamification

Gamification, consists of the incorporation of game elements and mechanics in non-game contexts in order to make them more attractive and encourage the active participation of users, these principles of game design are applied to different areas, such as education, work, health and environment, among others, in the educational field, gamification is used to make learning more fun and effective, allowing the educator to incorporate game elements in their lessons, such as point systems and rewards, to motivate students and improve their academic performance (Pereira et al, 2020) .

Gamification in the Area of Health Sciences

Currently, one of the main challenges in the acquisition and transfer of knowledge in the health area is the lack of motivation and commitment of students, many times, students can feel overwhelmed by the amount of information presented, having difficulty maintaining attention and retaining information, in addition, the complex and detailed nature of information in the health sciences can be difficult to understand and apply in practice.

Therefore, there is a need to look for new teaching methodologies that are innovative and allow addressing these challenges, ensuring that students acquire solid knowledge that can be effectively applied in the future. A research that reinforces the importance of seeking new strategies in the teaching process is that of Ellis et al. (2016) where he presents a comprehensive study that delves into the benefits of gamification to improve learning and assessment of occupational therapy students in a university setting, the authors conducted extensive research and observed that gamification significantly improved student engagement and satisfaction.

The study described that gamification, properly employed, can help students develop a deeper understanding of complex concepts and theories. The use of game elements, such as challenges, rewards and leaderboards, can motivate students to actively participate in the learning process and develop critical thinking, problem solving and decision making skills in an environment that simulates a real space.

Theory-Practice Transfer Through Gamification as a Way to Promote Meaningful Learning

One of the goals of the university training process is that students develop competencies to apply the knowledge and skills acquired in one situation, to another different situation; that is, to transfer theory to practice, hence, in the professional training of physical therapy, the need for the methods and techniques applied to patients to enjoy not only the technique but also the theory, and through its integration can generate knowledge to improve their professional performance (Tamayo and Borrego, 2018).

This transfer can be of two types: vertical, when knowledge acquired in one teaching situation is applied to a similar practice situation; and horizontal, when knowledge acquired in one teaching situation is applied to a different practice situation (Ortiz et al., 2018).

Theoretical and Practical Transfer in Physiotherapy Students

Theoretical-practical transfer refers to the ability of university students to apply the theoretical knowledge acquired in practical situations and how this can help them in

the real world, the transfer can be of specific skills or general concepts (Michaelsen and Marek, 2018), for example, a Physiotherapy student can apply the theoretical concepts of biomechanics in clinical practice, or an engineering student can apply the theoretical principles of mechanics in the construction of a bridge.

There are several theories on knowledge transfer that have been applied in the field of Physiotherapy according to Lim and Kim (2017) among them, the following stand out:

- The theory of near transfer.
- The theory of distant transference.
- The theory of transfer from training to practice.
- The theory of transfer from practice to training.

In this context, the theories of knowledge transfer in Physiotherapy are an important tool to reflect on the methodological possibilities to generate significant learning, understand and improve the quality of education, the theoretical-practical transfer can be measured in various ways, such as performance evaluation in practical situations, the transfer of theoretical knowledge to practical situations can be influenced by several factors, such as the quality of the theoretical teaching, the relevance of the practices, the motivation and commitment of the student to practical learning (Pereira et al., 2020).

The practical application of theory in education can improve the quality of education and the transferability of theoretical knowledge to practice can be an important factor in this process. According to Michaelsen and Marek (2018), school and teaching internships allow students to apply learned theory in real situations and reflect on their experience, which can enhance their training and positive perceptions of their learning. In addition, Pereira et al. (2020) point out that knowledge transfer can be facilitated through critical reflection and the relationship between theory and practice.

What is Expected to Be Learned Through this Research on the Use of Gamification in the Assessment of Physical Therapy Students?

Through this research, we intend to explore the effectiveness of gamification in the evaluation of Physiotherapy students, specifically to determine the contribution of gamification in improving the transfer of theoretical knowledge to practical skills among students.

The study will focus on identifying the relevance of a gamification strategy and a traditional methodology by comparing their linkage using the Physiotherapy Competency Matrix, thus aiming to develop a framework for the integration of gamification in Physiotherapy education that can be replicated in other settings. This will allow a greater number of students to feel engaged and motivated to learn, which will result in better results not only for the students but also for the performance and relevance as a teacher.

Method

Design

This study used a quantitative methodological approach of descriptive scope with a quasi-experimental design to obtain objective and detailed data on the study phenomenon. The hypothesis put forward in this research developed within the Physiotherapy career at UTPL was: What is the impact of gamification in the process of

evaluation and theory-practice transfer in the development of professional competencies in Physiotherapy students?

Population

The research was based on an official list of students enrolled in the April-August 2023 school year, resulting in a study population of 52 heterogeneous individuals of different genders.

The research was developed within the Pathophysiology component and was divided into two groups: a control group with 26 randomly selected participants and an experimental group with 26 randomly selected participants.

According to Popper (2002) "it is a process of reasoning that starts from a general premise to reach a particular conclusion" (p. 34), in this case the performance of students in a traditional evaluation process versus a process based on the evaluation from gamification was observed in a general way to have a first approximation to the reality of the educational process in the context of the research.

Gamification Strategy to Be Used

The gamification strategy employed consisted in the use of challenges that the students had to face, for which a roadmap was provided, which had to be solved in order for the groups of participants to advance.

Objective: Encourage the active participation of students in the evaluation process through teamwork.

Clues: Ten clues were hidden in different locations around campus, each with a riddle for students to solve.

Group work: Solving the clues required collaborative work among students, fostering communication, cooperation and the exchange of ideas.

Points: Points were assigned for each correctly solved clue, creating a leaderboard with the score achieved.

Instruments

The present study used the competency assessment matrix in Physical Therapy by Quiroz et al. (2012) to assess and measure the competencies of their students in various areas. The matrix is based on a set of standards established by the program and regulatory bodies in Physical Therapy, and features a Likert scale ranging from "Not at all competent" to "Very competent".

The Physical Therapy competency assessment matrix covers a wide range of areas and subcategories, such as clinical assessment, clinical reasoning and therapeutic treatment. Students are evaluated on their ability to demonstrate knowledge and skills in each of these areas, and their level of proficiency is determined by their performance.

Procedure

To carry out the present study, the population was divided into two groups: an experimental and a control group, to evaluate the competencies to be developed, an identical evaluation model was used, in the first group, a traditional practical and written evaluation was applied, while, in the second group, gamification was used as the evaluation method.

To ensure the validity of the criteria within the assessment performed, the competency validation matrix of Quiroz et al. (2012) was used.

Figure 1

Matrix of professional competencies in Physical Therapy

ITEMS	Nothing competent	Poorly competent	Moderately competent	Competent	Very competent
Applies the biological foundations of human body movement as a basis for the analysis of motor activity and its pathokinetic implications, as well as the development of promotion, prevention, assistance and rehabilitation programs in the individual, family and community.					
Integrates the processes of motor control and learning as a basis for the diagnosis and physiotherapeutic approach to the individual, the family and the community in the different stages of the life cycle, taking into account the different areas of performance in the osteomuscular, neuromuscular, cardiopulmonary and vascular domains, and following the bioethical guidelines of the profession and evidence-based practice					
Examines, evaluates and diagnoses osteomuscular, neuromuscular, cardiopulmonary and vascular deficiencies and limitations, based on pathokinetic analysis and the theoretical foundations of human body movement, interacting in disciplinary teams.					
Selects and applies physical, kinetic, pneumatic and/or educational physiotherapeutic intervention modalities for the maintenance and optimization of motor skills, and the improvement of deficiencies and limitations in the osteomuscular, neuromuscular, cardiopulmonary and vascular domains, under bioethical principles, evidence-based practice and the theoretical foundations of the profession, interacting in disciplinary teams					
Designs, executes, directs and controls physiotherapeutic intervention programs necessary for health promotion, prevention, assistance and rehabilitation of human body movement disorders in individuals and communities, interacting in disciplinary teams.					
Plans, organizes, directs and manages services, projects and activities in Physiotherapy according to current legal regulations.					
Describes and argues the epistemological, methodological and conceptual components of the process of scientific knowledge production related to health and human body movement, from a critical and reflective perspective, to provide innovative, timely, effective and efficient professional solutions from the collection and analysis of information, scientific research and evidence-based practice.					

Note. Quiroz, et al. (2012, p.160)

Data Analysis

According to the results obtained in the study, it was demonstrated that the experimental group obtained significantly better results in all areas, except in communication, suggesting that the intervention applied was effective in improving the skills and competencies of the participants of the experimental group.

The differences in performance between the two groups were especially notable in areas such as planning, organization, management, scientific knowledge production and physiotherapeutic intervention. In fact, the experimental group outperformed the control group by a margin of 30% in these areas.

It is important to note that communication was the only area in which the experimental group did not perform better than the control group; however, their performance, although narrowly, was better. This could be due to several factors, such as

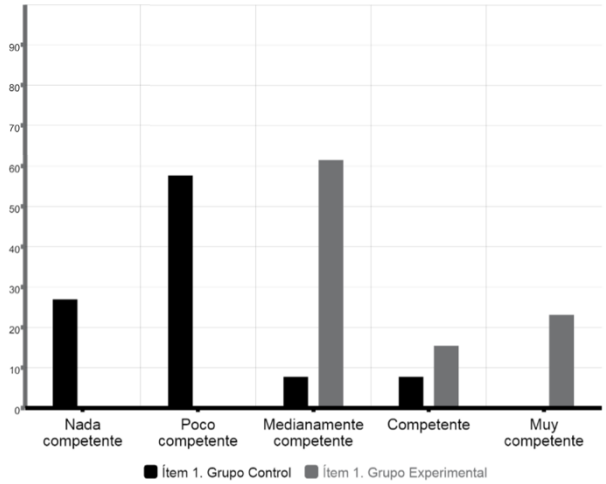
the fact that communication skills are often more difficult to teach and improve than other competencies.

These results suggest that the intervention carried out in the study succeeded in improving the skills and competencies of the participants in the experimental group, the results also highlight the importance of focusing on specific areas of competence when designing interventions aimed at improving performance and achieving specific goals.

Results

Figure 1

Item number one valued within the matrix of professional competencies of Physical Therapy.



Item one of the Physiotherapy professional competency matrix assesses the ability to apply the biological foundations of human body movement in four areas: analysis of motor activity, pathokinetic implications, promotion of motor activity, and prevention, assistance and rehabilitation.

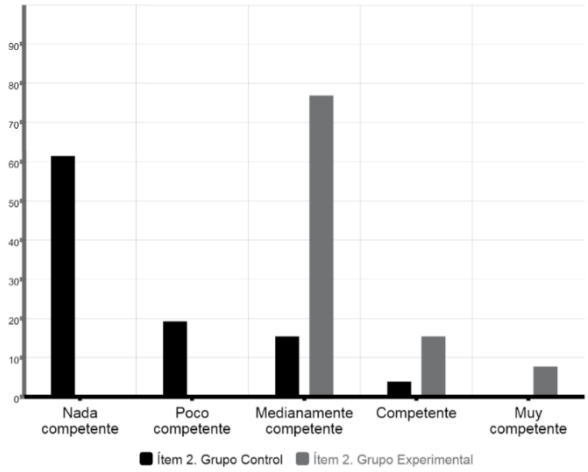
Differences

- An analysis of the aspects considered shows that the experimental group related movement alterations to different pathologies (20% more than the control group).
- Identifies risk factors predisposing to movement pathologies (30% more than the control group).
- It includes mechanisms for the prevention of movement pathologies (40% more than the control group).
- It presents better strategies to promote the regular practice of physical activity (20% more than the control group).
- The experimental group performs better than the control group in the application of the biological fundamentals of human body movement.

The intervention carried out with the experimental group has been effective in improving the knowledge and application of the biological foundations of human body movement.

Figure 2

Item number two valued within the matrix of professional competencies of Physical Therapy.



The second item assesses the ability to integrate motor control and learning processes as the foundation of the physiotherapeutic diagnosis and approach for individuals, families and communities at different stages of the life cycle, this assessment is crucial to determine the effectiveness of the intervention and the overall improvement of patient health outcomes.

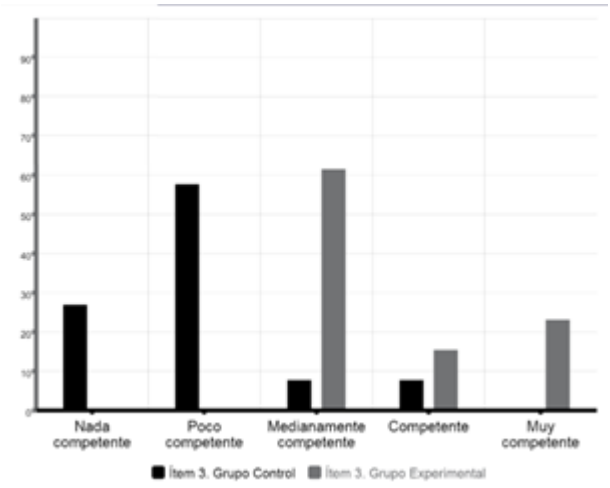
The graphical table presents that the experimental group performs significantly better in the integration of motor control and learning processes in all domains, including musculoskeletal, neuromuscular, cardiopulmonary and vascular, the results indicate the positive impact of the intervention in understanding the overall health and well-being of the patients.

Differences

- The experimental group shows a 40% reduction in the number of participants with no knowledge of the musculoskeletal domain.
- The experimental group has 10% more participants with basic knowledge and 10% more with intermediate knowledge.
- The experimental group presents 20% of participants with advanced knowledge, which is not observed in the control group.
- Differences similar to those in the musculoskeletal domain were observed, with better performance of the experimental group in all levels of knowledge.

Figure 3

Item number three assessed within the matrix of professional competencies of Physical Therapy.



The third item of the assessment measures the ability to examine, evaluate and diagnose musculoskeletal, neuromuscular, cardiopulmonary and vascular impairments and limitations. A comparison of the percentages between the control and experimental groups reveals significant differences in the ability to examine, evaluate and diagnose these conditions.

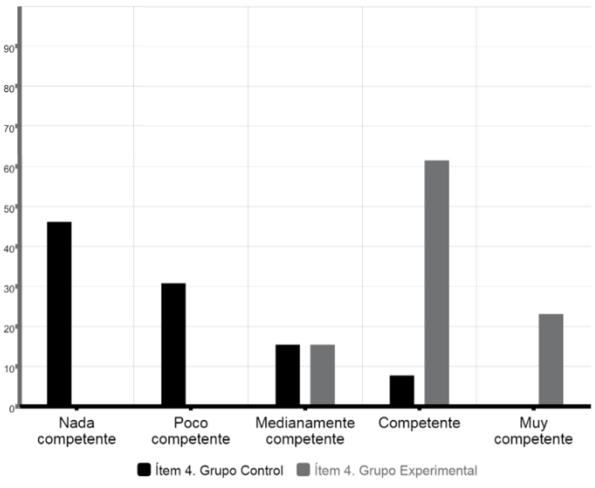
There was a 40% reduction in the number of participants who had no knowledge at all, and a 10% increase in each of the levels of knowledge: basic, intermediate and advanced. The presence of 20% of participants with advanced knowledge in the experimental group indicates the positive impact of the intervention.

Differences

- 40% reduction in the experimental group in the number of participants without knowledge.
- 10% increase in the experimental group in each of the levels of knowledge: basic, intermediate and advanced.
- Presence of 20% of participants with advanced knowledge in the experimental group.

Figure 4

Item number four assessed within the matrix of professional competencies of Physical Therapy.



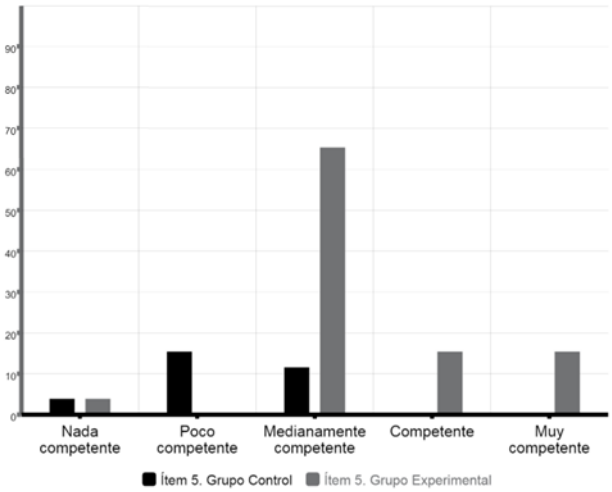
Item 4 assesses the ability to select and apply physical, kinetic, pneumatic and/or educational physiotherapeutic intervention modalities for the maintenance and optimization of motor skills, and the improvement of deficiencies and limitations in the musculoskeletal, neuromuscular, cardiopulmonary and vascular domains. The experimental group performs better than the control group in the selection and application of physiotherapeutic intervention modalities in all domains; the difference in performance between the two groups is greater in the musculoskeletal and neuromuscular domains.

Differences

- 30% reduction in the experimental group in the number of participants who do not apply intervention modalities.
- 10% increase in the experimental group in the application of intermediate intervention modalities.
- 40% increase in the experimental group in the application of advanced intervention modalities.

Figure 5

Item number five assessed within the matrix of professional competencies of Physical Therapy.



Item five evaluates the ability to design, execute, direct and control physiotherapeutic intervention programs for health promotion, prevention, assistance and rehabilitation of human body movement disorders in individuals and communities.

In the experimental group, in which gamification was used, there was a significant improvement in performance compared to the control group, in which traditional methodology was used in all areas, the difference in performance between the two groups was most notable in health promotion, with a 30% increase in performance in this area.

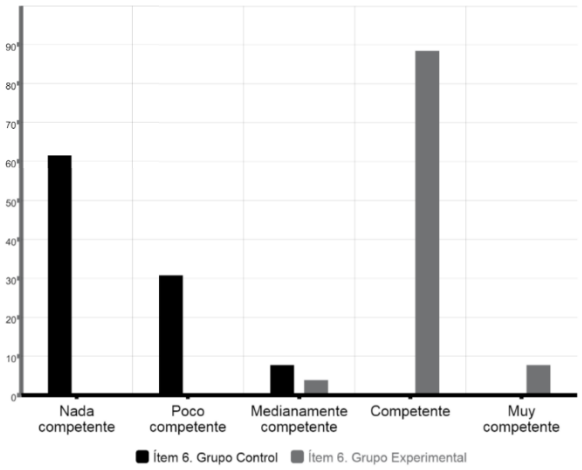
The intervention carried out with the experimental group was effective in improving the participants' ability to design, implement, manage and control physiotherapeutic intervention programs. This was especially evident in the experimental group, where the use of gamification techniques helped to engage and motivate participants, leading to better performance results.

Differences

- Forty percent of the control group has the ability to design, execute, direct and control physiotherapeutic intervention programs for health promotion, this figure increases to 70% in the experimental group.
- 70% of the control group and 95% of the experimental group have the ability to design, implement, manage and control physiotherapeutic intervention programs for rehabilitation

Figure 6

Item number 6 assessed within the matrix of professional competencies of Physical Therapy.



Item six evaluates the ability to plan, organize, direct and manage services, projects and activities in physical therapy in accordance with current legislation. The experimental group performs better than the control group in all areas: planning, organization, leadership and management.

The difference in performance between the two groups is greater in planning (30%), the intervention carried out with the experimental group has been effective in improving the participants' ability to:

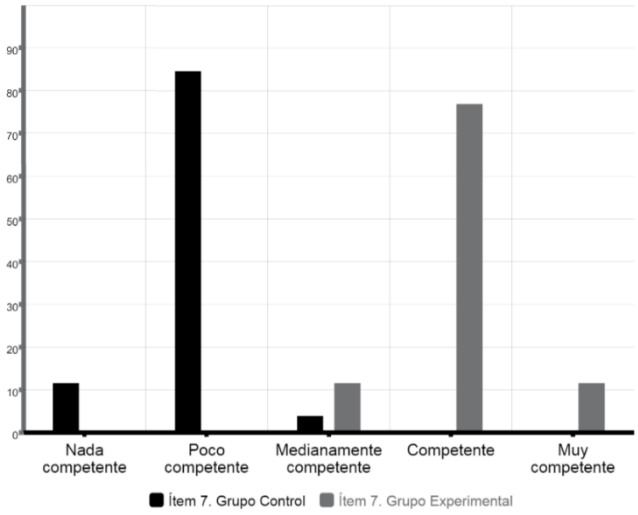
- Planning services, projects and activities in Physical Therapy.
- Organize services, projects and activities in Physiotherapy.
- To direct services, projects and activities in Physiotherapy.
- Manage services, projects and activities in Physiotherapy.

Differences

- 80% of the experimental group and 50% of the control group possess the skills to organize services, projects and activities in Physiotherapy. This 30% difference indicates that the intervention with the experimental group was also effective in improving the participants' ability to organize their work.
- 90% of the experimental group, compared to only 60% of the control group, have the ability to manage services, projects and activities in Physiotherapy. This 30% difference highlights the importance of leadership and management training for Physical Therapy professionals.

Figure 7

Item number seven assessed within the matrix of professional competencies of Physical Therapy.



Item seven evaluates the ability to describe and argue the epistemological, methodological and conceptual components of the scientific knowledge production process related to health and human body movement, from a critical and reflective perspective, to provide innovative, timely, effective and efficient professional solutions based on the collection and analysis of information, scientific research and evidence-based practice.

Differences

- The intervention carried out with the experimental group has been effective in improving their ability to understand and apply the components of the scientific knowledge production process.
- The experimental group performs better than the control group in the description and argumentation of the epistemological, methodological and conceptual components of the scientific knowledge production process.
- The difference in performance between the two groups is greater in epistemology by (30%).

Discussion

Traditional assessment processes have been the norm in academia for many years, but with the advent of technology and the growth of gamification, educators have begun to explore and apply these new training and assessment strategies to their students. It is important to note that gamification should not be considered a substitute for traditional assessment processes; rather, it should be considered a complementary tool that can be used to enhance the learning and assessment experience, allowing educators to create a more dynamic, modern and engaging learning environment that better suits the needs of today's learners.

The study highlights the advantages of using gamification-centered assessment processes in the health sciences, taking advantage of the unique characteristics of gamification, and the ease of creating a learning environment that is more adaptable to changing generational needs. The results identified coincide with the research carried out by López et al. (2018) where it was shown that gamification had a positive impact on motivation and experience, as well as on the understanding and implementation of the conceptual part of the subject.

It is important to highlight that the items that were identified as very competent were achieved exclusively by the experimental group; on the other hand, the items that were identified as not competent at all were only established for the control group, a relationship that points to gamification as positive when pursuing and achieving learning results in students and significant improvement on their competencies.

The findings of this study provide valuable information on the potential of gamification as an effective educational tool in the field of Physiotherapy, it is recommended that educators adopt gamification in their teaching methodologies to improve student learning outcomes, in order that further research in this field can help identify other potential benefits of gamification in education within not only Physiotherapy but also in other health sciences and its direct impact on the development of career-specific competencies.

Gamification is a powerful tool that can be used to motivate and engage students in their learning process, however, it requires meticulous planning and preparation to ensure that the activity is effective in the field of Physiotherapy, the physical space is a key component in the application of gamification, it must be designed in a way that facilitates the activity and encourages interaction between students situation that requires time and effort to ensure that it is promoting learning.

This includes providing the necessary physical space, equipment and technology, as well as promoting and adapting to these new measures of assessment in education within the healthcare setting, ultimately, the success of gamification in the assessment process in Physical Therapy depends on the commitment and collaboration of all parties involved.

Conclusions

Gamification as an assessment strategy is very effective, but it can also be used in the daily teaching process to meet the specific needs required to achieve the objectives in each class, it should not be limited only to health education, but can also be used in other fields of education, incorporating gamification into teaching can facilitate better understanding and learning.

Collaborative learning is enhanced when it is generated between peers versus that which is generated between an authority figure or someone who is not in a situation of equality, in addition, gamification can be an effective tool to motivate students to actively participate in the learning process, by incorporating game elements such as points, challenges and rewards, students are more engaged and motivated to learn.

This strategy is worth considering for any teacher looking to improve their teaching methodology and achieve better learning outcomes for their students, when gamification is used as a teaching strategy, it shifts the focus from a behavioral reinforcement model to a constructivist approach, a situation that is achieved by placing the student at the center of the learning process, encouraging critical thinking and

reflection, through gamification, students can actively participate in their own learning experience, making it more engaging and interactive.

Gamification is an innovative strategy that can revolutionize our approach to education in the area of health sciences, this strategy can create a positive and engaging learning experience that suits the needs of the modern learner, its correct application will help students develop important skills, it should be kept in mind that education today is like a toolbox and gamification is a powerful tool that we can add it box to make it even more effective.

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