Playful Strategies and Their Contribution to the Generation of New Knowledge in University Students

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Article history:	**Abstract**
	The purpose of this article is to characterize the playful strategies that can be used to generate new knowledge among university students. The Desk Research methodology was used to review studies related to aspects that can promote knowledge generation, as well as to identify characteristics present in playful strategies that can facilitate the development of cognitive abilities and thinking styles in university students. It was determined that the application of playful strategies is indeed adequate for developing research skills and abilities in university students due to the training generated by repeating activities related to their future professional practice, in a motivating and low-stress environment.

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1 Introduction

Cognitive function evolves as an individual is exposed to certain circumstances or conditions (exposure to the world), fostering a process that generates different levels of abstraction and awareness, which increase with experience and time. These levels involve processing available information and solving problems using prior knowledge (previous cognitive achievements). These continuous operational patterns of thought condition cognitive function, which is in turn influenced by the thinking style: inductive-concrete, deductive-abstract, and intuitive-experiential (Sternberg, 1999).

Thinking styles aim to account for cognitive aspects, but also for the learning activities of each individual (Valadez, 2009), so the methods for organizing cognition or ways of thinking used by each individual are those that allow for a solution to a problem in a specific context or task, the thinking style is not permanent over time, so the individual can make changes throughout his life, being a stimulating element for change, the experience resulting from the need to investigate, in which the generation of new knowledge allows people to move between things and experiences that move their ideas (Padrón, 2008; Padrón & Camacho, 2000).

The generation of knowledge, part of a set of characteristics, which have been defined, and which must be considered each as complementary, which include: a) measuring, counting or carrying out experiments, b) establishing the probabilities of occurrence or non-occurrence of events or characteristics based on statistical techniques, c) delimiting a topic and carrying out fieldwork, d) studying facts that can be measurable or observable, e) conclusively explaining a problem without exhausting all the possibilities of study, f) theorizing developed under logical rules, whose contents are evaluable and criticizable, g) the consideration of multiple approaches to the development scheme, as well as the work of communicating results, among other aspects (Moretta, 2018).

Due to the set of characteristics that must be met for the act of research or for the generation of new knowledge, it is very useful to identify teaching-learning strategies that allow the development of cognitive capacities in students at the university level, and that also support and facilitate flexibility in their thinking styles (Cicutti et al., 2019; Torres, 2019). Among the sets of teaching-learning strategies, which can be directed to the aforementioned purpose, are playful strategies, which use games as a mobilizing instrument, providing participants with an inspiring environment for scientific production (David et al., 2006).

Playful strategies are characterized by guiding students towards exploration and research around objectives, topics, and content, making use of different resources such as: images, music, colors, movements, sounds, among others, while creating a favorable space for the student to feel interested and motivated by what they learn (García, 2004). These strategies allow the creation of spaces in which collaborative learning is a fundamental element (Pérez-Rodríguez et al., 2020; Rodríguez-Borges et al., 2020) and in which the contents are congruently related and the student acts as a builder of new knowledge based on previous knowledge (Pérez-Rodríguez et al., 2020).

The playful strategy in the teaching-learning processes began to be incorporated at the beginning of the 20th century, from the contributions indicated by Piaget (1978), who stated that playful activities are essential for the acquisition of language and the development of creativity, as well as for the creation of new knowledge and levels of understanding, if these are related to their environment and / or experience (Piaget, 1978), in the same way Lev Vygotsky, stated that it was through the game, that the individual forgot his environment and gets involved in the roles, assuming the development of the role as his main task (Vigotsky, 1979), a well-known statement by George Bernard (Hernández, 2015), indicates that we learn 20% of what we hear, 50% of what we observe and 80% of what we do, so it is possible to predict that the greatest knowledge will be generated in the individual from activities where he performs (plays) an active role, allowing These dynamics ensure that students are able to carry out the different stages involved in the generation of knowledge: descriptive, explanatory, contrastive or applicative, which warrants the processes of scientific research (Padrón & Camacho, 2000).

The application of playful strategies must be carried out with some considerations, starting from the criterion of the presentation of the game method, because when it is applied to adults, they usually present rejection on some occasions, since these types of activities are usually stereotyped, as an experience for training exclusively at early ages, used for children's or school teaching. Therefore, it is relevant to explain to university students that through the repeated practice of playful activities related to their future professional work, they can develop skills and abilities that facilitate the realization of activities specific to research, in a harmonious environment and with less stress (Sánchez, 2007).

It is useful to analyze how playful strategies contribute to the creation of new knowledge and what advantages this teaching-learning strategy offers for university students. Therefore, this research aims to characterize the playful strategies that can be used to generate new knowledge in university students (Bijwaard et al., 2015).

2 Materials and Methods

Based on the defined objective, the type of research to be developed was assessed, which focused on the Desk Research methodology (Nazarko & Kuźmicz, 2017), and a review was carried out of studies on the elements and dynamics that promote the generation of knowledge and the experiences of applying playful strategies, to encourage the development of cognitive abilities and thinking styles in university students, subsequently an analysis was carried out that allowed valid conclusions to be drawn regarding the characterization of the playful strategies that can be used for the stated purpose.

This research was based on evidence in the field of playful pedagogical strategies applied to university students (Méndez & Monzón, 2019; Rodríguez Ávalos, 2019), aimed at promoting the creation of new knowledge at the university level.

3 Results and Discussions

This technique involves a series of steps, including: a) planning of inclusion criteria, extraction and synthesis of documents found, b) searching using keywords defined in the research as criteria, c) preliminary selection of suitable articles, d) evaluation of article quality based on context and search criteria (primarily the last 5 years, languages, publication databases, among others), extraction of a synthesis of the most relevant data, e) analysis of the different criteria and experiences found to conclude. This procedure is systematized in Figure 1, presented below-
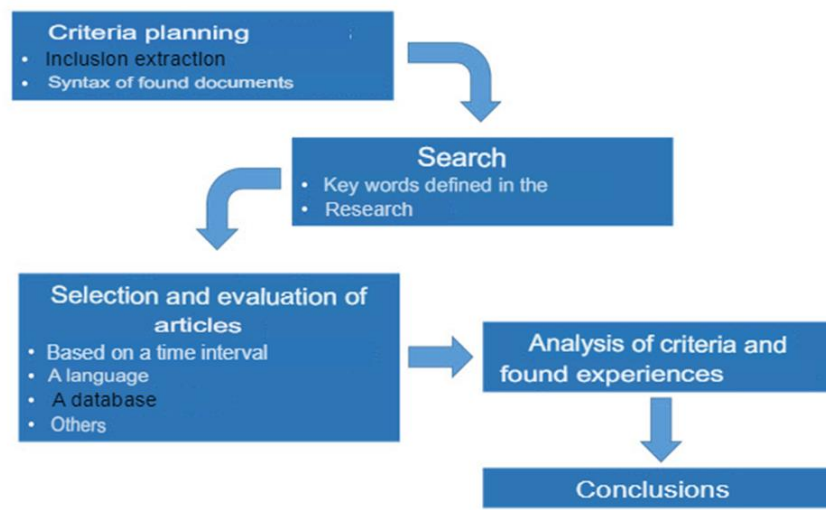

Figure 1. Steps for applying the Desh Research methodology

This type of selected research technique allows the creation of knowledge, based on publications made in primary and secondary studies (Revelo-Sánchez et al., 2018).

The results found in this research are the outcomes of the stated objectives, which are based on characterizing the playful strategies that can be used to generate new knowledge in university students. A review of different databases was conducted, including Redalyc, ScienceDirect (Scopus), and Google Scholar, showing the number of publications on the topic from 2010 to 2019, as shown in Figure 2.
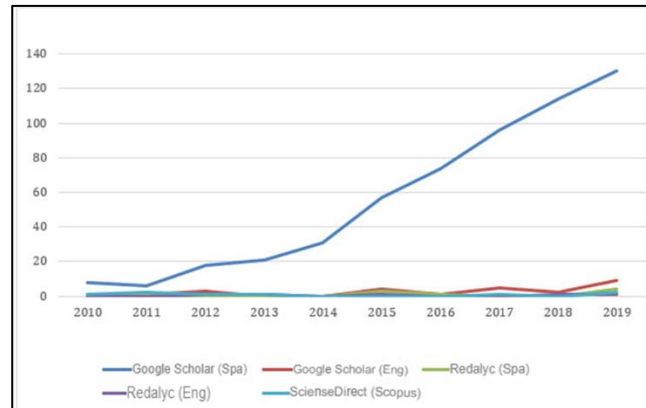
Figure 2. Publications found with the term "University play strategies"

Figure 2 shows an increase in the number of articles published in reference to the term "University play strategies" in regional and global databases. There is evidence of an increase in publications on this topic, starting in 2011, in Google Scholar, showing a growing trend, which shows an interest from researchers in recent years.

Currently, due to the development of information and communication technologies (ICT) and social media, recreational activities are part of common daily activities. Gamification in teaching, understood as game techniques and elements used in non-game activities, has shown to have important other advantages, for its use in staff training, in the areas of marketing and sales, and has also proven to be an excellent motivational strategy in educational environments, allowing students constant feedback, generating autonomous learners, and a greater connection between students and the content (Calle et al., 2016).

In the teaching-learning processes, through recreational activities, it is possible to generate positive effects on students, because these are aimed at promoting two basic principles in scientific research: exploration and inquiry, in addition to other aspects necessary to develop in students, for the generation of knowledge, such as: the need for validation and verification of scientific proposals, systematization, contrasting theory and practice, relationship between the concrete and the abstract, cognitive independence, the solidity of the knowledge provided, among other relevant aspects to consider (Stöcker, 1964). The aspects that interact in recreational activities have been outlined as presented in Figure 3, which represents the interrelation of the elements of the strategy, technology, and content.
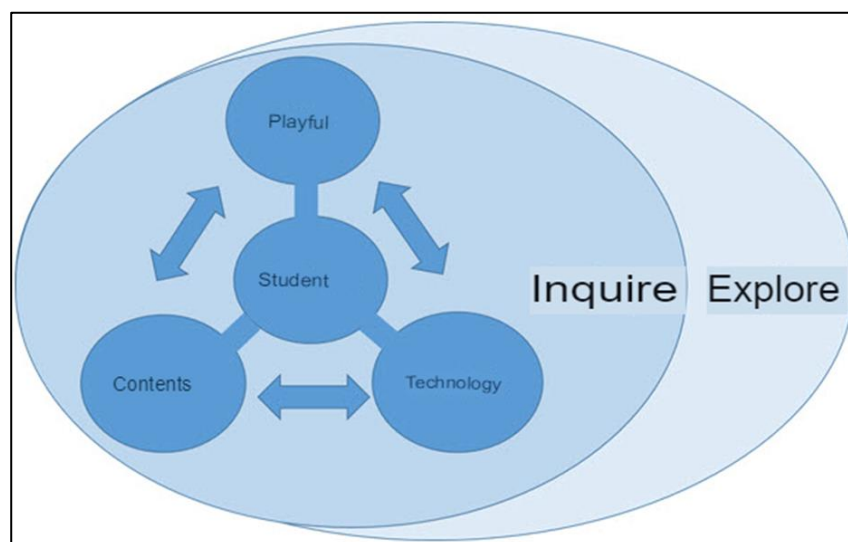

Figure 3. Interaction of learning elements with playful strategies in scientific research activities

The playful activities used in the teaching-learning process provide a different vision to the traditional teaching process, which is conceived as a rigid process where knowledge comes from a teacher, while in playful strategies the students

are involved in an interaction with the contents of the subject or particular task to be investigated, and technology, under a flexible, pleasant environment and even at times it is no longer perceived as a learning activity of the subject, due to the feeling that is given to the student by having greater freedom and space to participate in their learning (Cuadrado, 2019).

Among the advantages that gamification presents in teaching, there is the intrinsic motivation that is generated towards the contents of the subject and towards the learning process itself, the extrinsic motivation achieved even though the student initially presents little interest in the contents of the subject, but finds that participating in the activity is delaying and for him, and is permeated by the contents to achieve the desired end, both aspects facilitate significant learning and retention of the contents, accommodate student participation, development of logical and creative thinking, stimulates collaborative work, and allows to respond creatively to problems (Calle et al., 2016).

Gamification applied to teaching considers a systematized design and process for its development, to meet its objectives. For this purpose, 6 main objectives have been proposed to be covered, which are the following: a) definition of the game objective and its pedagogical scope, b) simulation, in which the rules of the game and parameters for its replicability are established, c) definition of the interaction in the simulation, d) methodological route of problems and solutions (progression), e) decoration, made up of attractive elements for players, among which multimedia objects can be considered, and enriching aspects of the experience, f) conditions of use and the rules that allow the learning objectives to be met (Lozada-Ávila & Betancur-Gómez, 2017). This proposed procedure for the design of the activities to be gamified has been represented in Figure 4.
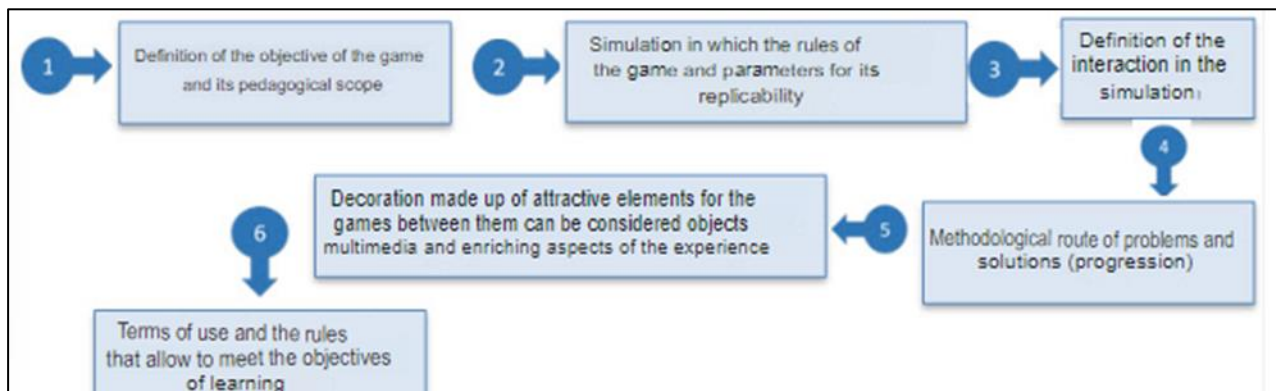

Figure 4. Procedure for designing recreational activities aimed at teaching content for knowledge development.
Adapted from Lozada-Ávila & Betancur-Gómez, 2017.

The playful activity applied to the area of science and the creation of new knowledge, has a particular characteristic, if observed as the role of the researcher, and is part of the teaching that students-apprentices will understand, in the area of research and generation of new knowledge, the game never ends, and it is the critical spirit of the players, who make it advance, in their critical judgments on conceptual aspects, and in the contracting of reality, with the models to represent, as a sequence of games, where each time they are closer to the truth. So this is the vision to be transmitted to those young people who begin in the field of research; it is a significant contribution to make them understand that the game of science demands the acceptance of criticism from other players and even their self-criticism in a path whose reward is summarized in a greater approach to the truth (Ballesteros, 2011).

This dynamic of iteration for the search for new methods of knowledge and approach to science, and therefore to the truth, must be present not only in students, but also in teachers, for the adoption of new motivational strategies. Among the teaching experiences found in which those applications of playful strategies that have allowed the development of knowledge in the university environment, among them, those that have been directed to critical thinking, computational thinking, lateral thinking, and others, to achieve the solution of problems posed and ultimately for the creation of new knowledge (Belousova, 2014).

In studies conducted on the application of playful strategies in the university setting, their use among students in the first semesters, specifically in the area of mathematics, stands out. Mathematics is a fundamental component of the early stages of a large number of degree programs, such as science, engineering, architecture, and others. Studies maintain that these courses, in general terms, do not show adequate levels of student performance, and that

methodological didactics developed by teachers are also detected, which generate disinterest and rejection (De Rincón, 2005).

In Case 1: At Simón Bolívar University (Venezuela) a study was conducted on students in the first trimesters of the University Initiation Cycle, in which playful strategies were planned and executed in a group of them (Experimental Group), keeping the rest as control groups, the grades were on a scale of 1 to 5, obtaining the results presented in Table 1.

Table 1
Distribution of final grades

Groups	Number	Rating frequency and percentage			
		1 (%)	2(%)	3(%)	4(%)
Control	65	11(16,9)	21(32.3)	30(46.2)	3(4.6)
Experimental	62	1(1.5)	19(29.2)	35(53,8)	7(4.6)

The results show how the students who carried out the playful strategies obtained better performance, both in grades and the number of passes. In addition, during the process, better levels of socialization were evident through sharing and team cooperation, reinforcing meaningful learning. Motivational improvement was also evident, as well as a change in attitude towards mathematics (De Rincón, 2005).

Case 2: At the Technical University of Manabí (Ecuador), as the final activity of the courses in Physics, Microcontrollers, and Computer-Aided Design (CAD), which consisted of competitions on "Robot Creation and Design," the tournament objectives and pedagogical scope were established, focusing primarily on motivation, cooperation, and organization. Subsequently, the rules, regulations, and a schedule were established. Different modalities and corresponding awards were defined (Urh et al., 2015).

The students organized themselves into teams and created their designs, demonstrating their knowledge and mastery of robotics techniques. They then built their prototypes, all with the guidance of a robotics teacher. The event was carried out as planned, with significant participation, including students from other courses as observers, as shown in Figure 5. Observations were made throughout the activity, demonstrating a high level of motivation. The atmosphere was one of group integration and mutual support, including assistance between members of different teams. Once the activity was completed, proposals were made for the creation of a robotics club.

Figure 5. Robot Creation and Design Competition at the Technical University of Manabí.

These experiences described, along with other equally significant ones implemented at various universities around the world, have demonstrated that the motivating elements of playful strategies are aspects that must be considered to increase performance and learning in various subjects, but particularly those focused on science and the creation of new knowledge (Hidalgo et al., 2019).

4 Conclusion

Recreational activities can contribute to the construction of knowledge as a catalyst in the creative process undertaken by human beings. They promote the inherent satisfaction of empowerment that comes with achieving goals and the organization of problem-solving in a continuous cycle that must consider self-criticism and criticism, allowing for a successive approach to the truth. The recent incorporation of this strategy in the university setting has promoted increased motivation in the teaching-learning process in subjects associated with science and the learning of scientific research techniques, achieving valuable benefits for the training of young university students.

The application of playful strategies must be carried out considering the need to explain to students how, through repeated practice, these strategies, developed from content related to professional practice, can develop their skills and abilities for technological research and development in a harmonious, flexible, and low-stress environment.

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