"Excellence Challenge": a gamification strategy to enhance the motivation of students in a public school in Colombia

"Jogo de Excelência": Uma estratégia de gamificação para melhorar a motivação dos alunos em uma escola pública na Colômbia

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ABSTRACT
This mixed research focuses its objective on analyzing the role of gamification as a pedagogical and motivational strategy in the teaching process to eleventh grade students of a public institution in Colombia through the application of an academic game using Information and Communication Technologies with a sample of 48 students. This, after knowing that the lack of motivation is one of the factors that predominates in students today, hence the need for teachers to use more innovative and attractive pedagogical and didactic strategies. One of these strategies is gamification, the central axis of this research project. The methodology used was based on the application of a pre-test, the adaptation of a game to the computer class and a post-test to analyze the qualitative and quantitative results of the research. The results found show that, when using a gamification strategy in the classroom, the teacher must be clear about the planning, implementation, follow-up and feedback; this last factor must be permanent since it is a dynamic process that requires continuous improvement.

Keywords: Gamification, Motivation, Pedagogical strategies, Teaching processes, ICT.

RESUMO
Esta pesquisa mista tem como objetivo analisar o papel da gamificação como estratégia pedagógica e motivacional no processo de ensino para alunos do 11º ano de uma instituição pública na Colômbia por meio da aplicação de um jogo acadêmico utilizando...
Tecnologias da Informação e Comunicação com uma amostra de 48 alunos. Isso, depois de saber que a falta de motivação é um dos fatores que predomina nos alunos da atualidade, daí a necessidade dos professores utilizarem estratégias pedagógicas e didáticas mais inovadoras e atrativas. Uma dessas estratégias é a gamificação, eixo central deste projeto de pesquisa. A metodologia utilizada baseou-se na aplicação de um pré-teste, adaptação de um jogo para a aula de informática e um pós-teste para análise dos resultados qualitativos e quantitativos da pesquisa. Os resultados encontrados mostram que, ao utilizar uma estratégia de gamificação em sala de aula, o professor deve ter clareza quanto ao planejamento, implementação, acompanhamento e feedback; este último fator deve ser permanente, pois é um processo dinâmico que requer melhoria contínua.

Palavras-chave: Gamificação, Motivação, Estratégias pedagógicas, Processos de ensino, ICT.

1 INTRODUCTION

This document arises from the research project entitled "Gamification as a pedagogical strategy to enhance motivation in the teaching-learning process of eleventh grade students in a public institution in Colombia"; it proposes gamification as a classroom strategy to facilitate teamwork and problem solving and conflict resolution. In addition, it enhances individual skills and group competences, elements that optimize communication and socialization. All of these aspects are elements that strengthen the educational process, support motivation in the classroom and generate positive characteristics such as the possibility of anticipating situations and the ability to better plan movements and decisions. Additionally, it works on the commitment and sense of the students’ responsibility because if they have a specific role within the game, they are part of a community and the success of the process depends on them. It is common to find groups within educational institutions where disinterest in the subjects increases the unfavorable results.

The current situation in which we live is more than a propitious space to apply what the knowledge society and technology have brought with it. The new scenarios make students' interests change, which is why it is necessary for teachers to explore new strategies and resources in their classes to increase motivation and engagement with their students (Ortíz, et al, 2018).

This project presents the particular case of students in a public institution in Colombia where negative academic figures are related to factors such as boredom, demotivation, attrition, among others (characteristics expressed by the students). For this reason, it was decided to carry out a game based on the use of technological tools that allow students to put into practice their knowledge in the area of computer science.
through the application of collaborative work; in this way it is intended to analyze whether gamification contributes to the motivational process of students and their academic performance, this under the assumption that Information and Communication Technologies (ICT) have within the subject and its mediating work to facilitate the learning process.

2 WHY GAMIFICATION

The use of gamification in the classroom as a pedagogical strategy allows the integration of important aspects of the learning that is structured through games, that is why it is necessary to delve a little deeper into the conceptual references of this project: Game and play, gamification, motivation, teaching strategies and processes and information and communication technologies (ICT).

2.1 THE GAME AS AN INITIAL LEARNING TOOL

For Muñiz, et al, (2014) the use of games as a didactic resource for teaching and learning increases the motivation and interest of students towards the study of subjects, thus favoring the acquisition of knowledge; Area y González (2015) raise the need for schools to transform its teaching materials, adapting them to the new experiences and expressive forms of the digital society. In the same way, Fuentes et al (2019) affirm that there is a lack of innovation in the methodologies associated with technology and the high level of coexistence between the technological integration. But specifically about gamification in the classroom, Ramirezparis (2009) found that the game allows meaningful learning and also develops skills such as communication because it demands effort, commitment and encouragement to reach the goal. It also enhances attention, improving academic performance and, consequently, minimizing desertion and demotivation towards educational life.

In this way, the game does not necessarily require technological elements, as gamification does, since what is needed is to optimize the resources available or simply start from the imagination and a clear and concise regulation. That is the difference between gamification and games, however, both, can be an element to be used in all areas of knowledge, depending on the subject or competencies to be developed, strategies can be reused with simple modifications as appropriate. An important characteristic of gamification is teamwork where trust bonds are strengthened, mental maturity is favored and coherence is enhanced by discovering new and unknown paths (Malone, 1984), but
at the same time, satisfactory and enriching. All of this becomes more solid with processes of self-evaluation and co-evaluation in a permanent and almost intuitive way, since, depending on each advance, the feedback of the game itself will make them rethink and continue with the strategies and encourage continuous improvement from the interaction of the various actors involved in the process.

2.2 GAMIFICATION AS A METHODOLOGICAL TOOL IN THE CLASSROOM

Burbules (2002) states that the gamification implementation process in educational institutions should start from the areas that facilitate a playful environment that fits the classroom plan of the course. This is what the authors call "experience strategies", which are part of the background and skills that are developed through practice and that will be useful in a more complex future because it provides motivation and perspective towards change.

This position coincides with the authors Ortíz et al (2018) who highlight that the main characteristic offered by gamification is motivation. They base this statement on various proposals where they found a relationship between motivation and the benefit with learning for student development. They also highlight the contribution that gamification has in the cognitive development of the student and the direct relationship it has with emotions and socialization.

All innovation represents evolution, that means that an influence of the inherited culture exists in the formation of human beings, but that is transformed and nourished with the learned culture, a result of its environment and the characteristics of the era in which life is developed. In this way, Westera (2005), affirms that technologies implemented in an operational setting would be necessary to investigate the assessment of efficient, practical, personalized and, of course, effective and attractive learning.

Finally, it can be concluded that gamification as a practical element of quick fixes that brings rewards to those who participate (Turon, 2014). That makes it an attractive strategy for educational processes that are stagnant and leave the perception of monotony. What these types of tools seek is to support changes that are positive for educational environments that can influence changes related to attitudes, behaviors and commitments.

2 RESEARCH METHOD

The methodological approach that supports this research is mixed, it contains aspects related to the qualitative approach, supported by the observation method and the
quantitative one, based on the input and output behaviors (before and after) of the application of the strategy. The selected population corresponds to eleventh grade students from a public institution in Colombia. This sample was made according to measurements made to find out emotional perceptions regarding the pedagogical practices of the institution. Thus, the didactic strategy supported by ICT was defined to promote gamification in the area of Technology and Informatics, taking into account four fundamental axes of analysis and measurement: 1) game, gamification and play, 2) motivation and emotions, 3) strategies and teaching processes and 4) ICT for the classroom.

The eleventh grade is a group of students between 15 and 18 years old. It is important to highlight that among them there were feelings of affinity and empathy that facilitated the perception of trust from the students towards the teacher, a key factor to obtain sincere results in the process, since previous experiences allow generating a comfortable space to obtain more accurate perceptions. Additionally, the two courses total 48 students who are equally divided in the gender topic, a necessary balance for the process.

Before planning the strategy, information was requested from the students in relation to the four axes of analysis, and from there, emerged some relevant subcategories to take into account when applying the gamification strategy.

![Figure 1. Categorization of the process](Source: Authors’ elaboration)
Among them, elements such as affective learning, the thematic needs of students, the actions that arise when feeling motivated or not in the classroom, the weight of innovation and the reforms that this implies, both in the curriculum and in the attitudes and didactics of teachers, thus breaking paradigms and generating a greater impact on students.

Once the request was made, four categories emerged for the development of the game: 1) Motivation, 2) Technologies, 3) teaching process, and 4) didactic strategies. Once the categories were constructed, we proceeded to design the game based on gamification for the computer science class.

2.1 PLANNING OF THE "EXCELLENCE CHALLENGE" GAME

The first step was based on the execution of didactic sequences and curricular planning in 4 moments: Exploration, Structuring, Practice and Transfer. These must be done sequentially to pass each one. The first three stages are mandatory, the fourth is optional. The stages are described below.

1. Exploration: Activities of reflection and introduction to the theme of the sequence where the students understand the theme they are going to learn about and how they can use this knowledge in their daily lives. (This phase does not count with a numerical grade, the teacher evaluates and gives an approval so that the student can move on to the structuring phase).

2. Structuring: Moment where all the theoretical knowledge on the subject is acquired, carrying out comprehension activities, theoretical research, information analysis and basic practices. (This stage has a maximum grade of 20, where the minimum to pass is 12.5).

3. Practice: Application of the knowledge acquired in practical areas, building models and using tools. (This stage has a maximum grade of 20, where the minimum to pass is 17.5).

4. Transfer: Moment where the student voluntarily puts their knowledge at the others’ service, generating tutoring activities for other students in previous moments or in the construction of tutorials. (The maximum mark in this moment is 10, there is no minimum mark to pass, given the voluntary nature of this stage).

To calculate the complete grade of the sequence, only the grades of each stage must be added up, giving a maximum grade of 50 and passing with a minimum of 35. A table of positions was generated where the student, by carrying out the activities planned
for the subject, accumulated points for specific achievements. For the structuring and practice stages the maximum score in terms of the criteria outside gamification was 15, the remaining 5 was given as score for game elements such as: speed of delivery, spelling and writing, creativity, level of research, appropriation of the content (substantiation). Each element was worth 1 unit, where students were evaluated by placing them in Ranks, having five ranks, being rank 1 the lowest and rank 5 the highest.

5. Wildcards: At random moments in the sequence, lightning activities, such as quizzes in Kahoot, or bonus activities that gave wildcards to the best 5 students in each activity were performed. Also, collaborative tools such as social networks, blogs, chats and wikis were used to carry out the game.

2.2 DATA COLLECTION

Instruments were designed for the data collection process. It is important to keep in mind that a precise order must be followed in order to achieve the research objectives. Figure 2 shows the data collection process once the game has been applied.

Figure 2. Collection Instruments Planning

Thus, in the first stage that refers to the input behavior, students were asked to answer questions related to motivation and play in the Google Classroom tool and through a participatory research process they were questioned about the functioning or behaviors of the group in relation to their attitudes towards the classes in order to receive feedback that would allow taking measures for their benefit. For this first instrument, a Virtual Forum with a participation form was used. After receiving the 48 results, the various
responses were analyzed and the results were grouped by crossing them with checkpoints based on the questions asked. The results were grouped in an analysis matrix.

3 RESULTS

After applying the selected instruments to the population presented in the methodology, it is necessary to measure the results and find points that reinforce or invalidate the thesis of this project. Table 1 shows the matrix of results taking into account the factors related to motivation.

<table>
<thead>
<tr>
<th>Checkpoints</th>
<th>Acceptance Goals</th>
<th>Performance Goals</th>
<th>Learning Goals</th>
<th>Projection Goals</th>
<th>Teacher Dependency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation to take classes</td>
<td>Compliance</td>
<td>Completion of cycles</td>
<td>By satisfaction</td>
<td>Training</td>
<td>Attitude</td>
</tr>
<tr>
<td>Methodology of the area</td>
<td>Interesting</td>
<td>Motivation Deepening</td>
<td>Variety Novelty</td>
<td>Attractive Classroom climate</td>
<td>Equality Basis</td>
</tr>
<tr>
<td>Classroom expectations</td>
<td>Surprise</td>
<td>Difference</td>
<td>Practicality</td>
<td>Non-distracting</td>
<td>Re-explanation</td>
</tr>
</tbody>
</table>

Font: Authors’ creation

3.1 INPUT

According to the table 1, the respondents consider that what motivates them to take classes is compliance, either out of mere responsibility or because it has always been stipulated as part of the students' duties. Since they are in their last year of school, they feel that it is time to close a cycle, but some also do it for pleasure, for the need to be trained, but if the teacher's attitude is not the best, surely the motivation will decrease.

Regarding the methodology of the area, they consider that it deals with interesting topics, that it is motivating because there is a variety of contents and it is striking because it is developed in a different space from the master class. But it runs the risk of becoming monotonous and susceptible to the routine that all classes are the same, that is why this factor is one of the aspects that depend on the teacher, who is the one who provides facilitators to make it a subject that attracts interest.

About the class expectations, students want more playful moments, where they delve into topics of interest with a new curriculum, where the classroom climate is conducive and they know that it is their responsibility and that the teacher delivers the
key fundamentals so that everything meshes in a proper way. At this point emotions begin to appear.

Finally, when additional comments or aspects that they wanted to highlight regarding the subject were requested, the concept of the surprise factor emerged to make a difference and thus be more attractive. They are aware that it is easier when there are no distractors at the time of taking the class, but these depend entirely on their own attitude and disposition. The point in charge of this factor by the teacher is the willingness to re-explain and delve into the subject seen as many times as necessary to make it completely clear.

To conclude the results of the input behavior, it was inquired about the tastes in relation to the games and how they would classify them and the division that emerged is the following: the games can be of any type, as long as they have characteristics such as roles, punctuation, levels of complexity, rewards, diversity of environments, novel approaches and imagination. Students, according to their opinions, are willing to conform to the rules of the game as long as they are inclusive, clear and fair. So it can be concluded that their previous experiences related to play, children's games and progress towards video games lead them to be experts in the technique of gamification pedagogy. Hence, it is estimated that, once the basis of the technique is understood, there is endorsement for its application.

3.2 GAME APPLICATION

Figure 3 shows the game phases and implementation. While the students finished their game, the researchers made field journals and participant observations to learn the qualitative results of this research.
Said results were grouped into categories and subcategories of analysis that emerged from the research framework. Table 2 shows the qualitative results of the game according to this categorization.

Table 2: Qualitative results according to the categories of analysis.

<table>
<thead>
<tr>
<th>Category Subcategory</th>
<th>Teaching Strategies</th>
<th>Motivation</th>
<th>Teaching Process</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game</td>
<td>Gambling is related to fun, therefore, it generates motivation in individuals (Hu et al, 2013). Hence, if it is included as an active and relevant part in the teaching process, striking didactic strategies will be generated. They are not only talking about those who are related to technology. But games that represent competition, appropriation of a role and positive results in ranking.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Gamification</td>
<td>Gamification is the concept that the gaming process receives in the classroom, it may be with the use of technology or not (Fortunato &amp; Telles, 2017), but since in the current era the contribution of ICT in the classroom, hence it is more related to video games applied to the classroom and the appropriation of learning.</td>
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<tr>
<td>Affective learning</td>
<td>Affective learning is one that is related to emotions, which in turn generate attitudes and behaviors. And that is when motivation appears, since it occurs when classroom didactics generate a positive response, valuing the process and generating in the student a level of organization and an appropriation of the concepts (Melo-Solarte &amp; Díaz, 2018). that he learns to use them in everyday life situations and thus generates empathy with the objective of teaching.</td>
<td></td>
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</tr>
<tr>
<td>Performances</td>
<td>Students reflect the emotions generated by the learning process, regardless of whether they are positive or negative through their attitudes, they will always express a feeling (Rossi et al, 1995) Hence, if they are They observe in the student positive reactions related to a specific didactics in the classroom, this resource should be used more continuously, since it generates motivation and positive response from the student.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Needs</td>
<td>Needs are always the generators of inventions and solutions (Retalis &amp; Papasalouros, 2005), so they represent innovation since they are the input for individuals to find more appropriate strategies for a given problem or shortcoming. In the case of teachers, starting from the need to make their classes more motivating and attractive for their students, they must find more didactic ways to achieve it, hence the game becomes an option.</td>
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</tr>
<tr>
<td>Curriculum</td>
<td>Curricula tend to be very rigid and standardized to the vision and mission of educational institutions, hence they require modifications. Teachers from their individual activities can initiate the reform of this, showing that the inclusion of new methodologies and the use of ICT within the classroom will have an impact on greater motivation when learning and therefore this will be reflected in better results, higher quality standards and finally, social development (Gutierrez &amp; Pérez, 2015).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paradigms</td>
<td>Education has always carried traditional methodologies due to the fact that they are proven throughout its history, in addition to the influence they have when validated over many generations. These learnings obtained from home or pre-learned cultures make people feel a certain resistance to using new or untested methodologies, both on the part of teachers, as well as students and their families. The objective of didactics that bring novelty and innovation is precisely to deliver a new vision that improves things starting from very small changes and that at no time invalidate what has historically been used (Kafai, 2005)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Impact is the measurement of the influence exerted by a new methodology. In this case, the positive and negative that the application of the gamification tool brought within the classroom. Because it was something novel, visually attractive and with a representative speech change, the impact generated was high, both in the motivational results and in the evaluations (Porter et al, 2008).</td>
<td></td>
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</tbody>
</table>
The effectiveness ranges increased taking as an example although the qualifications were supported by a ranking of effectiveness within the game, the individual work of the students in the sample was also valued.

**Innovation**

This aspect is not only related to technological issues, much less to trends; on the contrary, it must be analyzed from a more general perspective when evaluating the entire process (De la Torre Fernández, 2019). Globalization has brought about new forms of learning, since contrary to how it was before, developments and connectivity have made information not a bargaining chip, but on the contrary, it is abundant and widely accessible, so the processes in that is delivered must be more assertive, intuitive and responsible with the work of the teacher and the training of the student.

**Exploitation**

As we currently have so many developments and increasing accessibility to them, it is essential to train teachers and institutions in the importance of optimizing resources (Tingley et al, 2009). Sometimes, as a result of the paradigms or the lack of training, the adequate use of the elements that are available is not made and that causes important investments to be lost, or, on the contrary, what is not made public is not made public. Institutions count to facilitate the work of teachers and enhance student learning.

**Reforms**

All of the above can be summed up in the need for a “reform” both of structures, of methodologies, of the curriculum, in short, of the system. Although traditional strategies have worked, the measurements of international standardized assessments leave the country very badly, showing that it is possibly time to act for the benefit of learning and education in the country. As Amiel & Reeves (2008) remark, the use of technology is not sufficient if hardware or software are inadequate or inappropriate and difficult in adopting new technologies.

3.3 OUTPUT

The output was carried out in order to evaluate if there was a direct relationship between motivation and the gamification strategy on the part of the students and based on the lived experience.

At this point, an application of a deviation of the CEAP48 Scale test was carried out, with its two subscales - SEMAP01 and SEAT-01 created at the University of Catalonia, but with a modification related to the issue of gamification, which is the pedagogical strategy that you want to evaluate. The tests have been applied to the 48 students of Grade Eleven Two and Eleven Three of the ITI Tocancipá, with the following specifications:

A test with 23 questions related to school motivation was applied after the application of the gamification method. The answers are presented in a Likert method where the box that best reflects the answer should be answered with an X, considering that score 1 corresponds to total disagreement (0%), 2 strongly disagree (1%), 3 disagree (5%), 4 indifferent (6%), 5 agree (15%), 6 strongly agree (60%) and 7 total agreements (13%).
After tabulating the results, 90% students consider themselves good students in a factor of "totally agree" and study because they have an influence "agree" in 72% because their relatives motivate them on the importance of studying to Improve Life Quality.

Although there is a high factor related to the fact that they have to study because it is required by society and they must pass in order to graduate and finish this stage without being sure of their personal and academic future. With concern it is found that the students, although they are competitive in the answers, are facing a moment of high demotivation because it does not generate more than 10% interest in obtaining better results to be in a better position than their peers. The key point focused on measuring whether the game influenced the motivation to attend class, to which 65% answered affirmatively.

The results obtained corroborate in a simple way that the gamification technique supports the objective of the research in verifying that it is really accomplished by demonstrating that diversifying in pedagogical techniques promotes interest in new topics. But to support it from the inferential statistics and not to leave it in the merely descriptive one, a Chi test is presented that affirms the thesis that is the object of the present investigation.

The notorious demotivation that remains, when investigated in greater depth, is not focused on the subject specifically, nor on the curriculum or teaching methods; on the contrary, it is an element that goes deeper into the future projection. Students see that their generation is closer to extinction than to evolution.

3.4 TRIANGULATION THROUGH THE CHI TEST

The chi square test determines whether two variables are related or not. Null hypothesis; Alternative hypothesis

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Application Gamification vs. Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ho:</td>
<td>The gamification technique influenced students' motivation for the class.</td>
</tr>
<tr>
<td>H1:</td>
<td>The gamification technique did not influence students' motivation for the class.</td>
</tr>
</tbody>
</table>

Table 3. Chi Square test

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By obtaining a result in which the Chi-square value is lower than the distribution table and thus the alternative hypothesis is rejected and the null hypothesis is accepted, then it is proved that the gamification technique influenced the students' motivation for the class. Again, but with descriptive statistics, it is shown that pedagogical techniques should be improved to motivate students.

**4 CONCLUSIONS**

The success of the process lies in a high percentage of the design of the model (game). So it can be concluded that, in order to implement a gamification strategy in the classroom, the teacher must have clear planning, implementation, monitoring and feedback. This last factor must be permanent since it is a dynamic process that to achieve the objectives with the best possible quality requires continuous improvement and much
of it emerges from the players themselves and their experiences when interacting with the game.

Another aspect to highlight is that the teacher offers a learning option, but is no longer the central axis, but assumes the role of leader and guide, but the students are the protagonists, since they can reach or advance as far as they wish, building their own knowledge and facing their experiences. They can highlight the points to improve and be aware of their competencies, strengths and weaknesses and thus optimize the resources they have to meet the challenges and competitiveness of the model. The gamification process carried out at ITI has a similar conclusion to the work of Melo and Diaz (2018), since it is palpable the favorable contribution in the motivation of students, because for them to discover each time something new in the process, produces the need to do something to learn and advance in their learning and in turn to try to get the rules to grant them benefits for their good results.

After the process of applying the gamification tool in the classroom has been completed, many lessons remain. Some of them may become future focuses of study in greater depth, of which the following can be highlighted:

If students are more committed to their processes, more autonomous, critical and aware, possibly humanity will begin to change in the same way. Gamification is presented as one of the various tools that technology offers to enhance positive results, it should only work in a responsible manner and focused on specific, clear and fair objectives. In addition, it will allow the potentialization of equally positive values that should be included in the game, allowing a better appropriation of the concepts and consequently a greater acquisition of learning.

The advantage of the new generations is that they were born with technological advances, so within their cultural heritage is the acceptance of video games, social networks and permanent connectivity. This is a factor that allows processes such as gamification to be enhanced more easily and with a higher possibility of success, since intuitively and almost by cognitive programming they have the ability to understand them, manage them and include them in their training in a simpler way than previous generations.

The more the tools are known, the more the mastery of their use will be visible and it is possible that all the possible utilities and benefits that these technologies may have in the academic and educational processes and finally, in the appropriation of that
learning may not yet be recognized. for the adaptation of this in the lives of individuals and for the benefit of their role in the community.

Current education requires new approaches, where the resources offered by technological and recreational contexts are optimized. The planet and its particular circumstances (environmental, social, economic, political, etc.) make life increasingly unsettling and this generates a lack of projection in students; it is increasingly difficult to think about the future because there is no certainty of anything, so motivation becomes a key factor for success in the school process because of its importance in applying dynamic and innovative models.
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