LUMEN ET VIRTUS

The use of the gamification strategy in the discipline of Entrepreneurship in the Computer Science course

https://doi.org/10.56238/levv15n38-088

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ABSTRACT

Entrepreneurship is linked to the creation of new businesses and the transformation of ideas into opportunities, it is not a talent that the individual is born with, but a skill that can be developed, so it is important that students are engaged during teaching, so that there is effective learning. Therefore, the objective of this research is to identify what are the advantages of applying the gamification strategy in the discipline of Entrepreneurship in the Computer Science course. To achieve this objective, a literature review was carried out through a search in CAPES journals and Google Scholar. Result: fifteen journals were selected, where the analysis of the studies enabled the construction of two themes: 1. Computer Science and Entrepreneurship, 2. Gamification and Education. It is concluded that the application of this gamification strategy offers several benefits.

Keywords: Entrepreneurship, Gamification, Entrepreneurial Skills, Methodology.

INTRODUCTION

Entrepreneurship can be defined as the way in which an individual takes responsibility for opportunities within their own condition, so the learning of the skills to be a successful entrepreneur needs to be taught in an alternative way to the traditional one (Dansi, 2022), as the concepts need to present a notion of their real application or demonstrate in a practical way how the process of entrepreneurship works (Lopes, 2019), therefore, when there is no adequate teaching process, the student may lose interest in seeking new solutions and opportunities as a professional, moving further and further away from the path of entrepreneurship.

Given this possible lack of engagement, which can be caused by traditional teaching processes, gamification can be an alternative to be used as an auxiliary strategy in the teaching and learning process. The basis of the concept of gamification is to enhance interest in learning through

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elements brought from games, and apply them in teaching so that they do not take the focus away from what is being taught, but rather enhance learning (Dansi, 2022).

Therefore, it is necessary to establish a relationship between the traditional teaching of entrepreneurship and the most modern forms of teaching, because the traditional model, where teaching is done in formal institutions of systematized learning, elaborated in a pedagogical way and with quantitative evaluations on the applied contents (Balabuch et al., 2019), can be less stimulating and therefore, There is a need to offer a more attractive education in this component.

There are already alternatives to traditional teaching approaches, such as problem-based learning, in which students solve challenges based on problems in reality, where there is the possibility of applying acquired knowledge that does not directly correlate with the discipline, but provides a learning result (Balabuch et al., 2019). Similar to this context, gamification produces interesting aspects, mediated by games to increase student motivation and engagement during the learning period, favoring playfulness into the classroom (Oliveira, 2016).

To the detriment of such scores, this study aims to identify the advantages of applying the gamification strategy in the discipline of Entrepreneurship in the Computer Science course in Brazil. To achieve it, the following research methodology was used: a literature review was carried out, through a search in CAPES and Google Scholar journals, using the descriptors (student OR student OR student) and gamification and entrepreneurship and (teaching or training) and "computer science" and tool. The inclusion criteria were established: journals in Portuguese; and available online. The exclusion criteria are: incomplete or duplicate works. The use of inclusion and exclusion criteria enabled the selection of fourteen journals and one book, according to the following authors: Alves (2015), Balabuch (2019), Costa, A. (2018), Dansi c(2022), Jorcelino (2020), Klock (2017), Lopes (2019), Oliveira, A. (2018), Oliveira, L. (2016), Ribeiro (2018), Silva, E. (2020), Silva, J. (2020), Silva, T. (2016), Sousa, E. (2016). An analytical and interpretative reading of the bibliographic collection was carried out, which enabled the elaboration of the themes, namely: 1. Computer Science and Entrepreneurship, where it was detailed about the training of students and the teaching of Entrepreneurship in the Computer Science course; exploring the skills covered during teaching and techniques used to pass on this knowledge. 2. Gamification and Education, where gamification was worked as a teaching strategy and how its use can be applied within the classroom, and what are the advantages observed when there is this application.

COMPUTER SCIENCE AND ENTREPRENEURSHIP

Within the field of computing, entrepreneurship acts as a fundamental discipline, helping students discover how to take risks and develop their competencies as professionals (Balabuch et al., 2019). The teaching of entrepreneurship can be approached in different ways, as exemplified by the

Federal University of São Carlos (UFSCar), where students participate in the creation of a practical project during the course, incorporating the concepts studied (Sousa & Lopes, 2016).

Given the objective of the Computer Science course, which is the training of competent professionals in the area of technology and critical and entrepreneurial spirit to identify problems and propose solutions (Objectives, 2022), entrepreneurial skills are correlated, such as Creativity and innovation, skills that can be used to improve the work area or solve specific problems within the labor market (Balabuch et al., 2019).

In the context of Computer Science, the teaching of entrepreneurship covers the following concepts: the role of the entrepreneur in the process of creating new companies; the steps in the business creation process, including researching opportunities and studying market trends; the project of creating and starting activities of a new company; management problems of micro and small nascent companies; entities supporting small and medium-sized enterprises; and cooperation structures between companies.

That is why the teaching of Entrepreneurship is important for this Course, as it covers a broad concept linked not only to businesses, but to the person or group that creates them, with a focus on turning the thoughts idealized by taxpayers into something concrete (Dansi, 2022), therefore, it is understood that entrepreneurs do not only aim to create and manage businesses, but entrepreneurial skills can be used for other purposes, even non-commercial ones, such as starting and managing social projects, starting a new company, all of which can be linked back to entrepreneurship, since the general objective is to make an idea or concept bear fruit from one's own effort (Lopes, 2019).

The definition developed by the *Global Entrepreneurship Monitor* (G.E.M, 2022) states that an entrepreneur is more than someone who starts a business, he is a person who knows how to take risks and can carry out innovations in his area of expertise. This concept highlights what separates entrepreneurs from ordinary people is the willingness to make things different from innovative ideas and the ability to turn the idea into an opportunity for growth and fulfillment.

According to Balabuch (2019), entrepreneurs can be divided into two categories: entrepreneurs by necessity and entrepreneurs by opportunity. Entrepreneurs by necessity are individuals who may or may not have the entrepreneurial skills developed, but see the opportunity to start a new business as an alternative to conventional salaried work for their survival, while opportunity entrepreneurs know how to observe the circumstances around them and have a more developed entrepreneurial profile, they usually do so because they want to feel fulfilled with the work created from their own ideas.

For Silva and Vargas (2020), entrepreneurs perform their duties out of love and the need to conquer, someone who not only wants to create a job, but a leader who acts according to their desires to innovate and uses their values for this purpose. They are usually people who already have some

stability and are looking to expand their horizons through a venture. However, it is not uncommon to observe entrepreneurs who risk success through the observation of opportunities.

The distinctions between entrepreneurs by necessity and by opportunity reveal different motivations and contexts for the emergence of the entrepreneurial spirit. These differentiations highlight the importance of understanding not only the motivations for entrepreneurship, but also the essential skills that underpin success in both categories. Entrepreneurial skills are fundamental to transform motivations into concrete and sustainable results, and the analysis of these skills needs to be developed in training and applied effectively in the context of entrepreneurship.

Given the concept of entrepreneurship, it is necessary to understand what skills can be considered important for the individual to become an entrepreneur. For this reason, the studies sought to distinguish the skills that favor the entrepreneurial character, and those that can be developed and taught from studies and practices were highlighted.

The first to be highlighted was leadership was mentioned in the research carried out by Erdman Silva (2020), because a good leader is able to affect the professional performance of those who accompany him, positively or not, so it is important for a good business, even if the individual works alone or with few people, that he knows how to behave in the face of a problem to lead and adapt, and knowing how to be persuasive in front of the team.

Innovation was cited as one of the main characteristics associated with entrepreneurship, as this ability can favor and adapt something that already exists in an unusual way (Balabuch et al., 2019), so for there to be innovation, the entrepreneur needs to be creative and know how to think differently from the competition.

In turn, Creativity is crucial for entrepreneurs, as it allows them to adapt quickly to changes in the market and technology. By thinking outside of conventional standards, entrepreneurs can create innovative and unique solutions, utilizing existing resources and parameters in new and efficient ways (Balabuch et al., 2019). This ability to generate new ideas and approaches is essential for evolution and success in dynamic and competitive business environments.

Another skill was Opportunity Identification, which refers to the ability to recognize the right time to act and know where to invest based on market conditions and the business itself (Balabuch et al., 2019). This skill is vital for entrepreneurial success, as it allows the individual not only to perceive and take advantage of the opportunities that arise, but also to assess which of them have the greatest potential to generate value and growth.

Interpersonal Relationships were also cited as fundamental to entrepreneurship, encompassing the ability to connect and interact effectively with other people. According to GEM (2022), *networking* and social influence are essential components of this skill, which requires not

only charisma but also empathy and understanding of social dynamics to build and maintain productive relationships that can benefit the business.

Finally, Self and World View involves the entrepreneur's ability to observe and evaluate their situation and their business from an outside perspective. This skill is crucial for developing critical thinking and for making informed and strategic decisions. An entrepreneur with a clear and objective vision is able to adjust their strategies and operations according to the realistic perception of their environment and capabilities (Balabuch et al., 2019).

Understanding and developing these skills are essential for an individual to excel in the field of entrepreneurship. Each competency contributes in a unique way to the formation of a successful entrepreneur. Enhancing these skills not only empowers the entrepreneur to face and overcome challenges but also to identify and seize opportunities more effectively.

However, entrepreneurial success does not only depend on individual mastery of these skills, but also on how they are integrated and applied cohesively. Another important aspect is to understand how these skills are developed from teaching and how educational and methodological practices can enhance their development.

ENTREPRENEURSHIP EDUCATION IN BRAZIL

Entrepreneurship is not innate and can be considered a skill, and just like drawing or singing, it can be taught and passed on. Entrepreneurship teaching by itself can be characterized as an enterprise, since the individual may be able to undertake his own teaching, where there is contact with others in order to generate individual or collective learning about entrepreneurship (Lopes, 2019).

The teaching of entrepreneurship generated discussions about whether it was really possible to pass and the conclusion reached by Dansi (2022), in his work was that teaching should be different from traditional forms, where there was a focus on problem solving and interaction with other individuals, where students learn from the mistakes of others, Therefore, it was necessary to create an environment as close as possible to real situations so that there would be more effective learning.

For Sousa and Lopes (2016), teaching needs to be based on three factors: on the individual who is learning aiming at his social formation, on the learning of concepts and history related to entrepreneurship and finally a practical part dealing with the experience of entrepreneurship. This learning can even be carried out from technical visits to pedagogical methods such as expository classes.

Another important piece of information is that many links to startups were found as a form of innovation adopted and in its conclusion it is understood that there is great potential within higher

education for the creation of new entrepreneurs, but that there are few resources and space for such investment (Sousa and Lopes, 2016).

In Brazil, the teaching of entrepreneurship takes place mostly in higher education, since it is used as a way to prepare students for the job market and assist in the development of creative thinking for problem solving, innovating within their area of expertise and improving as a professional (JORCELINO; FARIAS and DIAS, 2020).

The teaching of such skills takes place through disciplines linked to entrepreneurship and based on business administration, focused not only on the administrative part, but on the interdisciplinary part such as the recognition of opportunities and business modeling, reflecting the challenges of the entrepreneurial journey. Some disciplines related to entrepreneurship are: Entrepreneurship, Small Business Management, Innovation Management (Lopes, 2019). The research also reveals a dichotomy in the Brazilian university context: while there is a promising terrain for technological entrepreneurship, the lack of institutional support and adequate resources prevents the full exploitation of this potential. This scenario indicates the need for more robust policies and strategies that can provide the necessary support for universities to become true centers of innovation and entrepreneurship.

GAMIFICATION AND EDUCATION

Gamification as a system or strategy has already been applied in several areas, not necessarily linked to teaching or education, and can be observed, for example, in points generated in credit card purchases or in a mileage program in travel purchases (Ribeiro et al., 2018). In addition, gamification is also linked to increased employee engagement, and is also used by companies during employee training and specialization (OLIVEIRA, 2018). These examples demonstrate how influential and engaging gamification can be, and that it is not necessarily an element linked to education.

During the research conducted by Dansi (2022), students who participated in the validation test of the developed application approved the use of gamification techniques and the implementation of the application itself, resulting in an 85% pass rate. Soon, gamification engaged students and encouraged their interaction with the topic outside of the classroom, and play history allowed students to assess their own progress and decide whether they needed to study further or bring questions to class. The high pass rate indicates a significant validation of the effectiveness of this approach, the result suggests that gamification can be a tool to motivate learners and improve knowledge retention, while encouraging self-assessment and autonomy in the learning process.

For Oliveira (2018), gamification is linked to the increase in customers and employee engagement, being used more commonly by companies during employee training and specializations and, in education, its use is still scarce, even with great teaching potential.

The definition of gamification used by Costa and Geron (2018) and Klock (2017) is that gamification is defined by the use of visual elements, mechanics, and thoughts in order to promote engagement and encourage problem-solving and learning in a given area of application. To understand how gamification can achieve this empowerment where it is applied, it is necessary to understand that there are elements that need to be well defined.

Finally, Silva (2020) carried out his research in a Geometric Optics class, where he aimed to validate the increase in engagement and motivation of students who were present during the course. The research not only highlights the potential benefits of gamification but also underlines the importance of innovative pedagogical approaches to address contemporary education challenges. Gamification is implicitly defined as the incorporation of typical game elements and dynamics into a teaching context to improve student engagement and motivation.

Therefore, by bringing playful elements into learning, gamification creates a more interactive and dynamic environment, encouraging the discovery and learning of content from the students themselves. The results suggest that for this strategy to reach its full potential, it is essential to clearly define the elements and dynamics to be incorporated, ensuring that they are aligned with the educational objectives and the needs of the students.

ELEMENTS OF GAMIFICATION AND TEACHING

Among the elements of gamification, the characteristics necessary for teaching to be possible are listed, since it is not just simply turning a class into a game, but bringing teaching and learning in a differentiated way. According to Costa and Geron, (2018) gamification is made up of essential aspects for effective functioning: Challenges, Cooperation, Search for motivation within the activity, Construction of social bonds, Productivity linked to pleasure and Meaning in the completion or achievement of objectives. Each of these aspects correlates during learning in gamification. We will detail these aspects according to Segundo Costa and Geron, (2018) .

Regarding the challenge, gamification is effective if there are obstacles to be overcome, providing students with goals to be achieved. Challenges create a sense of reward, encouraging students to learn more and strive to overcome them. When facing and overcoming challenges, students feel a sense of accomplishment that motivates their continued engagement and their pursuit of knowledge.

In the sense of cooperation, the authors agree that between groups and teams, where each student plays a role that values their competences, promotes the sharing of experiences and collective learning, allowing students to learn from each other while collaborating to achieve common goals. This approach reinforces the importance of teamwork and collaboration in solving problems.

For the search for motivation within the activity, these authors state that it is essential that gamification provides pleasure to students, instigating their desire to learn and being perceived as an achievable and fun challenge. The intrinsic motivation generated by gamification keeps students interested and engaged, making the learning process more enjoyable and effective.

About the socialization among the participants through the proposed gamification challenges stimulates the construction of social bonds. By collaborating and competing, students build social bonds, strengthening group cohesion and fostering a sense of community. These social ties are key to a positive and collaborative learning environment.

The element of productivity linked to pleasure, it is essential that students are able to visualize the fruits of their contribution, perceiving the impact of their effort. Regular monitoring through assessments helps students reflect on the learning process and actions taken in the classroom. This positive feedback loop reinforces the connection between productivity and enjoyment, encouraging continuous and satisfying performance.

The last element is about the Meaning in the completion or achievement of objectives, and can be signaled by rewards, which are essential to motivate students to want to continue and continue until the end of learning. By providing significant rewards upon completion or achievement of goals, gamification keeps students focused and determined to complete their tasks, ensuring continuous and successful learning.

Despite the importance of these elements pointed out by Costa and Geron, (2018) during learning in gamification, the study carried out by Silva (2016), pointed out other aspects that define a well-applied gamification: Freedom to fail, Feedback, Progression, Narrative. Where the author brings a little more of the playful aspects. We will detail the elements according to Silva (2016).

The freedom to fail is an essential component of gamification that encourages students to take on challenges without the fear of being penalized for mistakes. This approach shifts the focus from performance appraisal to learning and process, allowing students to experiment and learn from their failures. The absence of severe penalties for errors increases students' willingness to engage in challenging activities. Consequently, this more permissive and encouraging learning environment promotes greater engagement and active participation of students.

Feedback needs to be objective and constant, showing the individual their evolution within the gamified experience. In this context, feedback can be provided through badges, points, or other progress indicators, which help students visualize their achievements and areas for improvement, motivating students to continue progressing, but also provide them with a clear understanding of their development, which allows for adjustments in study strategies and more effective learning.

Progression, represented by levels or phases within the game, facilitates the learning process by clearly indicating where the student is in their educational journey and where they can return if

they feel lost. This progression system provides an organized framework for learning, helping students better understand what they have mastered and what they still need to study. Additionally, the feeling of advancing through levels or phases provides a sense of achievement and ongoing motivation, keeping students engaged and committed to their studies.

The narrative of a story or context within gamification makes learning more playful and engaging, arousing students' interest in the narrative associated with the content taught. Thus, this compelling narrative can transform the educational experience, making students feel part of a larger and more meaningful story. This emotional involvement not only facilitates the retention of information, but also makes learning more enjoyable and meaningful, promoting greater engagement with the content of the discipline.

Therefore, these elements signify the necessary aspects for the application of gamification, it was necessary to detail the points of both researches because despite being distinct they demonstrate complementarity as facilitators of the teaching-learning process.

Challenges and cooperation between groups promote a dynamic that encourages overcoming obstacles and valuing individual skills in a collective context, while the search for motivation and the construction of social bonds ensure that learning is perceived as pleasurable and socially enriching.

Productivity linked to pleasure and the importance of meaning in achieving objectives reinforce the need for tangible and intangible rewards that encourage the continuity of students' efforts. Complementing these points, the freedom to fail creates a safe environment for experiential learning, while constant feedback provides guidance and acknowledgment of progress, essential elements for maintaining engagement.

Progression structured by levels or phases offers clarity on the learning path, and the inclusion of a contextualized narrative makes the process more engaging. Together, these elements form a robust conceptual framework, where gamification is used not only as an engagement tool, but as a means of making the educational process more effective, meaningful, and pleasurable.

CONCLUSION

The present research aimed to identify what are the advantages of applying the gamification strategy in the discipline of Entrepreneurship in the Computer Science course in Brazil. The study revealed that the application of the gamification strategy offers a number of benefits.

First, gamification stood out as an effective approach to increase student engagement and motivation. The use of playful elements and game mechanics, such as challenges, constant feedback, and the possibility of progressing through levels, makes the educational process more dynamic and attractive. These aspects not only keep students interested, but also encourage active participation and engagement with the content of the Entrepreneurship discipline.

Additionally, gamified tools allow students to monitor their progress and identify areas that need more attention, which facilitates more autonomous and targeted learning. This ability to self-assess and prompt feedback are crucial for adjusting study strategies and improving understanding of entrepreneurial concepts.

Another positive point is the promotion of essential entrepreneurial skills, such as creativity, innovation, and problem-solving. The challenging nature of games and the need to find solutions to problems within the gamified environment help to develop these skills in a practical and contextualized way. This is particularly relevant in the Computer Science course, where the practical application of theoretical concepts is fundamental for the training of professionals prepared for the market.

Gamification also facilitates the construction of social bonds and teamwork. Gamified activities often involve cooperation among students, fostering a collaborative environment and the exchange of knowledge. This social dynamic not only enriches the learning experience, but also prepares students for teamwork and effective communication, essential skills in the world of business and technology.

The integration of gamification in the teaching of Entrepreneurship provides a more inclusive and adaptable educational environment. The freedom to fail, coupled with a framework that rewards progress and overcoming challenges, creates a space where students feel safer to experiment and innovate, which is vital for developing a robust entrepreneurial profile.

In summary, the application of gamification in the discipline of Entrepreneurship in the Computer Science course in Brazil proves to be an effective and advantageous strategy. Not only does it engage students and improve knowledge retention, but it also fosters entrepreneurial skills and effective collaborations.

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