GAMIFICATION IN ACCOUNTING AND STUDENTS' SKILLSET

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Abstract: Accounting literature suggests the growing need for educational strategies that are more engaging and effective and this research explores students' skillset development with the introduction of a gamified course in an Accounting undergraduate program. This study innovates by focusing on the teaching and learning process mediated by serious games, based on goal-setting theory (specific goals and better performance) and self-determination theory (autonomy and inner motivation). We conducted a survey with 118 accounting students, on their last term, from a large public University in Brazil. Using a quantitative approach, research results indicate that students consider that many skills have been developed in the course, such as: curiosity, leadership, initiative, persistence, adaptability, collaboration and critical thinking. The familiarity with tools present in the online game context and the perception of usability of the software used for this gamification experience were positively and significant correlated with the perception of the development of these skills. Despite these positive findings, some students did not like the complexity of the game and the elements of chance (barely) present in the software. These findings contribute to the academic literature and to educators who are interested in introducing gamified strategies to transform the classroom and address a professional skillset better aligned with the current demand.

Keywords: Gamification, Serious Games, Accounting Education, Professional Skillset.

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GAMIFICAÇÃO EM CONTABILIDADE E COMPETÊNCIAS DOS ESTUDANTES

Abstract: Esta pesquisa explora o desenvolvimento de competências em discentes a partir da introdução de uma disciplina gamificada em um programa de graduação em Ciências Contábeis. Para isso, foi realiza uma survey com 118 estudantes matriculados no último semestre de uma universidade pública brasileira. Por meio de uma abordagem quantitativa, os resultados da pesquisa indicam que os discentes consideram que muitas competências foram desenvolvidas durante a disciplina gamificada, como: curiosidade, liderança, iniciativa, persistência, adaptabilidade, colaboração e pensamento crítico. A familiaridade com as ferramentas utilizadas no contexto de jogos online e a percepção de usabilidade do software utilizado para essa experiência de gamificação apresentaram correlações positivas e significativas com a percepção do desenvolvimento das competências. Apesar dos resultados positivos, alguns estudantes declararam não gostar do excesso de competição apresentada pela disciplina e das decisões randômicas do software. Esses achados contribuem para a literatura acadêmica e para os educadores interessados em introduzir estratégias gamificadas no contexto da sala de aula.

Keywords: Gamificação; Jogos Sérios; Educação Contábil; Competências.

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1. INTRODUÇÃO

Accounting literature has been exploring new teaching and learning strategies, and the introduction of new educational technologies is receiving a considerable degree of attention (Apostolou, Dorminey, Hassell, & Rebele, 2015). Traditional lectures, which are still prevalent in higher education (Watty, Mckay, & Ngo, 2016), have been questioned, whereas approaches that aim at maximizing learning for students based on motivation are gaining momentum. Gamification, an approach that seeks to create a dynamic, interactive education environment (Buckley, & Doyle, 2016), is among them. The benefits of this methodology can be noted beyond the classroom (Kim, 2012), and include the fact that it can influence behavior (McGonigal, 2011). Regarding education, those advantages can enhance the learning experience and provide a more attractive environment, as well as more significant learning. Gamification is defined as the use of game characteristics in non-game contexts to encourage certain types of behavior (Kapp, 2012; Landers, 2014; Richter, Raban, & Rafaeli, 2014). In this sense, the main aim of gamification is to foster the individual's motivation and performance in some task (Sailer, Hense, Mayr, & Mandl, 2017).

Gamification adopts common game strategies to bring together a group of individuals for the solution of a specific problem. In this way, according to Moncada and Moncada (2014), gamification in the educational context is linked to the application of games with the objective of making the learning experience more interesting and engaging. In a fictitious environment, students are involved in challenges related to a particular educational goal, in order to develop their knowledge, skills and attitude. It could be said, then, that the main benefit of adopting gamification in teaching might be the fact that it not only increases student engagement with the content taught, but it also makes them more productive (Kim, 2012). Making education more attractive to students is becoming a bigger challenge for educators. Nowadays, educators compete for students' attention with many other things inside classroom (Kuznekoff & Titsworth, 2013). In this context, gamification arises as an important tool, able to help in the teaching and learning process, boosting students' motivation and consequently developing their skillset (Clark, Tanner-Smith, & Killingsworth, 2015).

On the other hand, Hung (2017) raises criticisms and drawbacks of gamification to education, including the fact that (a) typically one may not find a perfect match of a game to the concept or skill at hand, (b) too much focus on rewards and points may act as a distractor, and (c) shallow learning may occur, or no proper depth and details, as the participants become satisfied with the tasks of the game.

In order to successfully introduce gamification in the educational process, however, some conditions must be met. Among them is the need for the rules of the game to be well defined and for feedback to be given quickly, so that learners can quantify the achieved results (Kapp, 2012). In this scenario, it is observed that most of the time the process of gamification in teaching is concomitant with the introduction of educational technologies. It should be noted, however, that the addition of a course based on gamification does not assume the existence of sophisticated technologies (Rosmalen & Westera, 2014). The adoption of some simple procedures that seek to create a typical gaming environment in the classroom may already be able to generate the educational benefits of gamification.

A wide number of studies indicate that the gamification process can improve the development of students' skillset (Domínguez, Saenz-de-Navarrete, de-Marcos, Fernández-Sanz, Pagés, & Martínez-Herráiz, 2013; Cain, & Piascik, 2015; Dias, 2017; Tsay, Kofinas, & Luo, 2018). Such literature supports that the student could be more captivated, motivated and involved at classroom with the gamification process. This can occur because of the existent pressure to learn becomes more invisible and more natural with

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the game mechanisms introduced in the classroom environment. Additionally, gamification in education has the potential to improve the intrinsic motivation of students (Buckley, & Doyle, 2016; Banfield, & Wilkerson, 2014; Siemon, & Eckardt, 2017), what makes the involvement with the educational process stronger, in accordance with the Self-Determination Theory (Ryan & Deci, 2000; Deci & Ryan, 2008). In similar line, gamification in education tends to improve both clarity and difficult levels of goals, while also adding to the immediate feedback on task effort and performance, in accordance with Goal-Setting Theory (Locke, 1968). Despite the growth of scientific publications about gamification in the last years (Hamari, Koivisto, & Sarsa, 2014; Clark, Tanner-Smith, & Killingsworth, 2015; Gentry et al., 2019), Landers, Bauer, Callan, and Armstrong (2015) argue that more studies are needed to explore how gamification can improve the learning process. According to these authors, it is not a consensus in the literature how individuals can improve their learning with the gamification strategy.

In this sense, trying to contribute with the literature, the research question of this study is: To what extent are student skills developed with the introduction of a gamified course in an Accounting undergraduate program? Therefore, the present study aimed at a gamified strategy and its elements that may interfere with skills development of students enrolled in an Accounting undergraduate program of a large Brazilian public university. The results of this investigation are therefore useful for programs and educators that seek to introduce gamification in their curriculum, either in the Accounting area or related fields

2 LITERATURE REVIEW

2.1 Motivation, Goals, Feedback and Games

According to Landers (2014, p. 2), the gamification process "has become a popular technique used across a variety of contexts to motivate people to engage in particular targeted behaviors." Such idea, behind gamification, is well aligned with what is present at the core of Self-Determination Theory and also links with the main claim behind Goal-Setting Theory. Self-determination Theory (Ryan & Deci, 2000; Deci & Ryan, 2008) claims greater benefits from intrinsic motivation and autonomy bringing relevant explanation to phenomena in education. Goals are naturally explored by Self-Determination Theory, as they strongly evolve from elements of motivation. Additionally, Goal-Setting Theory (Locke, 1968) assumes the relevance of motivation and links it to performance, by claiming that specific and challenging goals, with proper elements of feedback, will lead to better performance. In this study, we are influenced by both theories as they have important claims when considering the selected gamified strategy and our accounting education scenario.

Education can be one of many environments where gamification is applicable (Cardador, Northcraft, & Whicker, 2017). Landers et al. (2015) argue that the improvement on learners' engagement can be understood as the main goal of gamification strategy or this psychological engagement can also be understood as a tool to promote behavioral change in the learning process. This last view considers that gamification process "can be seen to have three main parts: 1) the implemented motivational affordance, 2) the resulting psychological outcomes, and 3) the further behavioral outcomes" (Hamari, Koivisto, & Sarsa, 2014, p. 3026).

According to Landers et al. (2015), one of many theories that are applied to gamification studies in the educational context is the Goal-Setting Theory, developed in the 1960 by Locke (1968) and Lock and Latham (2002). This theoretical framework tries to explain causes of individuals' performance on certain tasks. The Goal-Setting Theory has the goal as the key to comprehend performance and argues that pe-

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ople's goal will help them to achieve better performance through four moderators. The first moderator is individual commitment, which is directly related to performance. In this sense, greater commitment is associated with better performance. People highly committed to a goal will have more chances to attain it when compared with less committed individuals. Thus, the gamification process can improve individuals' commitment with specific goals while making the task more enjoyable and the learning moment more meaningful (Kolb, & Kolb, 2009).

The second moderator is feedback. In many educational contexts, feedback is an important tool in the learning process (Buckley & Doyle, 2016; Hattie & Timperley, 2007; Nicol, Thomson & Breslin, 2014). Feedback allows for students to understand what they need in order to improve their performance. Studies also highlight that both feedback type and format are important to reach the educational goals, or to address the four levels of feedback as proposed by Hattie & Timperley (2007): (a) task or product (FT), (b) process (FP), (c) self-regulation or confidence (FR), and (d) self or attitude (FS). Feedback about the learning process should be an opportunity for deep understanding of learning, involving "the construction of meaning … [linked] to relationships, cognitive process, and transference to other more difficult or untried tasks" (Hattie & Timperley, 2007, p. 93). In other words, showing what needs to be done to ameliorate student performance or as stated by them, "reducing the discrepancy between current and desired understanding or performance" (p.86). According to Attali and Areli-Attali (2015), to have a positive effect on the learning process, the feedback need to bring a cognitive impact to students, as such restructuring comprehension, ensuring that students will understand why they are correct or incorrect, and/or showing an alternative way to grasp specific information.

According to Landers et al. (2015), the third moderator is task complexity. This moderator means that as more complex the task becomes, students will need to use other abilities and strategies to cope with such challenges. That is why the goal effect decreases when task complexity increases (Wood, Mento & Locke, 1987). This may occur because when the task become complex, the benefit of completing it can become lower than the effort to do so. In this context, the gamified strategy can play an important role. The introduction of well-developed games in the learning process can improve students' commitment, as said before, and consequently change students' goal. In this process, it is also important for students to be familiar with the tools needed to properly play the game used in the classroom. If the introduced game has online strategies, for example, students with prior contact with computer, internet, online games and so on, are likely to have less difficulty completing a task compared to students without a prior contact. In other words, the familiarity with tools necessary to play the game can reduce the complexity of completing a task. In this scenario, the trade-off between the benefit and effort of some complex task can become better to the learning process (Sailer, Hense, Mayr & Mandl, 2017). The reason behind this is linked to the fact that greater commitment tends to improve how students perceive benefits from tasks, therefore acting upon their goals. In this sense, a student with an improved commitment due to the gamification strategy may adjust the established goals and develop more effort to perform a task if compared to a non-game situation (less committed).

Finally, the last moderator is the situational constraints that can be represented by time limitation or role overload for example (Landers et al., 2015). Everybody has demands in life and the time allocated to a goal will be decisive for the success in the task. In the educational field this means that students will divide their time between academic demands and external responsibilities. For undergraduate students, many external factors can demand time. One of them, which is important to the context where this research is conducted, is the job market. For many reasons students from higher education work and

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study at the same time in Brazil (Peleias, Petrucci, Garcia, & Silva, 2008; Durso, Cunha, Neves, & Teixeira, 2016; Peleias, Guimarães, Chan, & Carlotto, 2017). In this sense, the use of gamification in the classroom may make students direct more extra-class time to academic demands since the gamification makes the learning process more enjoyable (Hamari, Koivisto, & Sarsa, 2014).

For the purpose of this study, we relied on an award-winning business game and it is important to highlight the attributes of the adopted game in light of game attributes from the specialized literature. As attributes of games, Huizinga (1950) described six: (a) voluntary, (b) pretending (not real life), (c) immersive, (d) time and place limits, (e) rules-based, and (f) social, while having all of these attributes revolving around the final goal of entertainment. Michael & Chen (2006) advocates that serious games bear similar attributes of typical games, not having entertainment as the main goal, but some cognitive, skill or attitude element to be learned.

The literature on serious games has build on the large pool of studies looking at games. After acknowledging the relevance of the study developed by Garris and Ahlers in 2001, Wilson et al. (2009) revised it and added more, developing a central claim on game attributes. In their study, they discussed 18 game attributes: adaptation, assessment, challenge, conflict, control, fantasy, interaction (equipment), interaction (interpersonal), interaction (social), language and communication, location, mystery, pieces or players, progress and surprise, representation, rules and goals, safety, and sensory stimuli. They expanded Huizinga's list by adding critical attributes that are central to serious games used in business environment leading to improved development of knowledge, skills and attitude, by being "heavily linked to instructional objectives" (p. 227). This is the case of the game adopted in this study.

Beck & Wade (2004) addressed the gamer generation from a business standpoint, as one of the first of its kind, discussing the specifics of the generation (profile) and how it was about to reshape the business world, supporting what they called "critical business thinking." In that study they claimed attributes of games such as (a) goal-based (sense that things could be better), (b) direct control of the situation by the player, (c) designed to absorb all the player's attention, (d) responsive to the wishes of the player, (e) rewards technical skills, (f) fosters strategic thinking in a chaotic world, and (g) simplified and limited versions of reality (making the experience perfect to develop skills).

The adopted game in this study has its own set of attributes, highly aligned with the ones aforementioned, which are: learning oriented by a set of skills, decision-based, rules-based, goal-based, first-person managerial experience, collaborative (within teams), market competition (between teams), responsive to players, simplified model of reality, detailed feedback, control by the player, location (virtual world), narrative, layered progress, mystery (gap between existing and unknown information), elements of surprise, safety (safe way to experience reality) and conflict (solvable problems). With this set of attributes this study is exploring their influence on learning outcomes, as games and their mix of attributes "can lead to better cognitive, skill-based and affective outcomes" (Wilson et al., 2009, p. 259).

2.2 Related Empirical Studies

Cornacchione (2012) has investigated if business game and simulations can provide students with meaningful learning experiences associated with their managerial development, based on heightened fidelity levels. To do this, the researcher used a survey conducted with 31 students enrolled in a MBA program in Brazil. After comparing two games with different levels of fidelity, the study gathered evidence

2 Badges are signals or signs indicating certain accomplishments and facilitating immediate comprehension about those receiving them. Leaderboards represents a ranking of players of any particular game, based on performance, skills or inventory related to the game. Performance graphs are used in games as visual aids to support players when monitoring their actions and results while tackling specific tasks and challenges. Avatars are visual representations of the character of the game, such as the actual player, connecting more intrinsically with the player. Meaningful stories are powerful narratives at the core of games, playing a central role in serious-games and triggering motivational outcomes.

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that the business games analyzed have a potential to bring positive aspects to the learning process in this area, such as when dealing with (a) strategies, (b) business and market models, (c) business pace, and (d) elements of real world performance.. All these aspects singled out by the aforementioned study are critical and aligned with the game-based solution adopted in this study.

Hamari et al. (2016) aimed at investigating the impact of flow, engagement, and immersion in learning using a game-based program. The data of this study was collected from 173 high school students in the United States. Results show that engagement in the game has a positive effect on learning. The authors also found that the game challenge had a positive and both direct and indirect (via increasing engagement) effect on learning. Additionally, students who had previous contact with games presented more engagement. This may indicate that familiarity with tools and mechanisms needed to play the game in the classroom context might help students become more involved in the learning process.

Sailer et al. (2017) conducted an experiment to analyze the impact of game design elements to meet individuals' basic psychological needs. A total of 419 participants (balanced in terms of gender) were recruited online. The results show that game design elements[2] like badges, leaderboards, and performance graphs are positively related to individuals' satisfaction. On the other hand, avatars, meaningful stories, and teammates were important to meet the experience of social relatedness. According to these authors, findings support the hypothesis that gamification is not effective per se. In other words, the success of gamification depends on the game design.

Fragelli (2018) aimed at analyzing the benefits of the introduction of gamified strategies in three courses from different periods of the undergraduate program in Physiotherapy at the University of Brasilia, Brazil. In total, the author relied on sample of 90 students. The study was based on gathering evidence about faculty perception and on results of an end-of-course survey with students. The results from the survey show that students were more motivated and engaged in these three different courses when the gamified strategy was used.

The study of Barna and Fodor (2018) evaluates the effectiveness of a gamification platform during an Information Technology (IT) course at Corvinus University, Budapest. To do this, the authors analyzed the students' willingness to participate in voluntary online tests, as well as a survey used to evaluate the students' satisfaction with the course. The study analyzed data from more than 2,500 students who attended the course between 2015 and 2016. The results indicate that gamification was able to improve course quality, but it could not solve all the problems (such as quality content and teaching skills) that normally appear in IT courses.

Tsay, Kofinas and Luo (2018) developed an experiment to evaluate the benefits of gamification in the student-centered learning environment. In this sense, the authors relied on information from 136 students who attended the second year of a personal and professional development course at a university from United Kingdom. After using gamified strategies in an online program, the researchers evaluated the subsequent information of the cohort, with 136 students. The results show that students who participated on the gamified course had better performance when compared to students who had the traditional model. The significance of results persisted after controlling by gender, attendance, and previous performance. Despite the belief of women being less likely to use IT tools, the authors found that women had a better academic performance in this sample. But this result was significant only in the first model, which did not control by student engagement. Additionally, the study found that women and students with jobs participated more in online learning activities.

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All these reviewed studies show that the introduction of gamification in the most different classroom contexts may bring benefits to the learning process. As presented earlier in literature review, gamified strategies may change students' goal and thereafter modify their motivation to learn. The studies consulted also present some factors that may affect the benefits of introducing gamification in classroom. The design of game, student background with games and personal engagement with the course can all influence the learning process. In this sense, trying to extend the literature, this research investigates to what extent the student skills are developed with the introduction of a gamified course in an Accounting undergraduate program. To do this, a survey was conducted with students from a large Brazilian public university who was enrolled in a gamified mandatory course from Accounting undergraduate program.

3 METHOD

The research question of this study is: to what extent are student skills developed with the introduction of a gamified course in an Accounting undergraduate program? Therefore, to answer the research question, it was conducted a survey with Accounting students from a large public university in Brazil who has experienced a gamified course. The data collected was processed and analyzed by estimation of correlation and linear regressions. In this sense, the present study can be characterized as quantitative, explanatory, and supported by a survey (Smith, 2003)

3.1 The Gamified Course

The gamified course analyzed in this research is named "Business Game I" and is taught as part of the Accounting undergraduate program at a large public university in Brazil. This course is mandatory for all Accounting majors. As a teaching strategy, the "Business Games I" course uses "The Business Strategy Game" (from McGraw-Hill Education) that simulates a company operating in a global marketplace providing an opportunity for teams to perform environmental and company analyses to support top-level decisions covering a wide range of topics with the goal of providing a rich experience in a business context. The course is entirely taught with the support of such software, which offers a robust online educational solution, including (a) fully tested solution with partner-institutions around the globe, (b) cloud-based platform, (c) controlled access of participants and teams, (d) group-paced rounds of decisions, (e) planning-execution-control-feedback cycle, (f) electronic book support, (g) simulated global business environment (using English as the business language across the entire solution, including all the financial and operational reports), and (h) detailed dashboard for the instructors to monitor, at the individual decision-level, students' engagement and performance. The educational institution provides all the required licenses of the software (at no cost for the students) and access to computers for all students in that course.

Each week, students meet in groups of 4 or 5 (that need to remain the same until the end of the semester) and face challenges that pertains to the (simulated) business world. Thus, from given situations, they make decisions that can result in a positive or negative consequence for the fictitious company (according to multiple micro and macro-variables affecting the individual companies and the overall market). Each round (week), a ranking with the best and worst companies/groups is announced to all participants. Every week students should analyze their company's result as a mandatory activity of this course.

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At the end of the set number of rounds (emulating years of operation), the course is concluded and the final ranking, with performance of all companies/teams is presented. The student performance in the "Business Games I" course considers the result obtained by the team and the individual participation of each student in the course virtual classroom. In this sense, to reach the goal proposed by this study, the authors applied a questionnaire to all students that have completed the "Business Game I" course in 2016 and 2017.

3.2 The Business Strategy Game® (BSG) Software

The software used to simulate the business environment in the "Business Game" course is the Business Strategy Game® (BSG). The objective of this program is to reflect (with high fidelity levels) the reality of a company in the sports footwear sector. In this context, all the challenges, difficulties, and specifications of this market are brought to the simulation settings through BSG. Nowadays, BSG is used by more than 500 higher education institutions from 52 different countries. By the time this research was developed, in Brazil, only the public university focused by this study used this solution to teach at the undergraduate level (BSG, 2019).

By simulating the reality of the business world, this software constitutes a practical exercise, representing a laboratory to students from all business fields. In this sense, students in the Accounting area can apply the knowledge acquired throughout the course in situations as close as possible to the real world. Among the advantages established by this game is the preparation of management reports to support decision-making, a feature that has extreme importance for future professionals in the Accounting area. In addition, it is important to mention, again, that all students enrolled in the Business Game I course (the course that uses BSG) receive a license at no cost to them. This initiative is part of a larger research project focusing on educational technology in Accounting, held at that university for more than seven years, reaching almost one thousand students.

3.3 Population and study sample

The target population defined by the present study was formed by Accounting undergraduate students who were enrolled in their last term at University of São Paulo between 2016 and 2017. Almost 350 students (balanced by gender) were eligible by this criterion. Before applying the research instrument to collect data, the authors developed a pre-test of the instrument. Textual changes were done after the pre-test.

The data collection was done both virtually (with Google Docs® platform) and in person. The strategy to achieve the study population was to apply the questionnaire in students enrolled with the Business Game II. To be eligible to attend this course students must have successfully completed Business Game I. Thus, all students from this sample have had completed the Business Game I course when they answered the questionnaire. Students enrolled in Business Game II in 2016 answered the questionnaire using the online version and students from 2017 answered in person. The final sample of this study consists of 118 students, who completed the instrument correctly, representing 33% of the population. It is important to highlight that the instrument had a consent form stating that participation in this research was voluntary and not related to student development in the undergraduate course.

3.4 Survey instrument

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The instrument has four parts. In the first part, characteristics of the students were collected. We collected data such as age, whether Accounting is their first postsecondary program and whether they worked while attending the "Business Games I" course. All these elements tend to signal business acumen and professional experience, which could drive higher performance in the game. Additionally, the first part of the instrument had questions on students' experience level with tools such as computers, the Internet, social media, and games (e.g., electronic, board, and card games). These questions were used to measure students' prior contact with tools that can help them properly manage the software used to simulate the business context. Respondents should indicate the prior contact with these elements in a scale from 0 to 10, where the maximum value indicates higher contact with the tool. In this way, the first stage of the questionnaire provided useful insights about the students that compose the sample and also helped building the Familiarity Index (FI) with important tools for the development of the student along the "Business Games I" course. According with the literature (Hamari et al., 2016), the greater the familiarity of the individual with the tools described earlier, the easier the acceptance of the software by the student and, consequently, the higher the development of skills that are vital to the professional performance in the accounting area (first hypothesis of this study – H1).

The second part of the instrument aims to understand students' perception about the usability of software used for gamification proposes. Sailer et al. (2017) found important aspects about game design that can influence the learning process in a game-based course. If the software is difficult to operate or does not represent the reality it should represent, students may feel less engaged in playing the game, for example. Therefore, this part of the questionnaire was based in Cornacchione (2012) and deals with students' perceptions regarding the usability of the adopted software. In this context, students answered questions related to the system operation, evolution and pace of the game, applicability of the software to the accounting area, and its fidelity level (degree of approximation to the real world). With the five questions of this part of the questionnaire, therefore, it was possible to create the Usability Index (UI) for the software used in following "Business Games I" course (following academic semester). According to the literature (Sailer et al., 2017), the greater the software usability, the more the student will be able to develop essential skills for the professional performance in Accounting (second hypothesis of this study– H2). This situation would occur to the extent that greater usability generates a greater identification between the individual and the program, creating higher student engagement and, consequently, causing them to develop the skills intended by the course.

The third part of the questionnaire, in turn, aimed at identifying the perception of skills development by the student throughout the "Business Games I" course. Some studies highlight the role of higher education in developing students' skills, which are important in preparing them to work in 21th century context where high complexity tasks and fast change are constant (Andrews & Higson, 2008; Villiers, 2010; Duncan & Dunifon, 2012). According with Moore and Morton (2015, p. 591) "Such skills, also referred to as soft skills, or twenty-first-century skills, include such abilities as communication, critical thinking, team-work, creativity, and the like". In these circumstances, we surveyed some of the skills mentioned by the World Economic Forum as important to the 21th century (World Economic Forum, 2016) which were deemed applicable to the professional accounting market. So, this part of the instrument had ten different abilities for which students should indicate the degree of development based on the Business Game course. From these ten abilities, a Skills Index (SI) was built. This index was used as the dependent variable in this study.

Finally, the last part of the instrument presented open questions, as a form of triangulation, or enhancing validity of research by using various complementary methods of data collection (Gall, Gall

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& Borg, 2003), so that the students could express positive and negative issues related to the experience and adopted software itself. Also, we questioned the importance of software fidelity for the development of managerial competencies to be applied in the real world. In this sense, these open questions were used to collect student perception about the importance of the proximity of the software with the market reality (fidelity).

In sum, it is noteworthy that all questions presented in the questionnaire were created in such a way as to be possible to treat them using quantitative analyses, except for the open questions inserted in the fourth part of the questionnaire. Table 3 (presented along with the results) shows all assertions used to create the three indexes described above. We used correlations and simple regressions to test the two hypotheses of this study.

The correlations estimated for all variables used in this study show the first directions and power about the students' perception of skills development. In this sense, we compared the relationship of Skills Index and Familiarity Index (that is the H1 of this study), Skills Index and Usability Index (that is the H2 of this study) and all the index with control variables like Age, Graduate and Work (three proxies used in this study to measure students' engagement). After that, linear regressions were estimated to confirm the first directions founded by Pearson correlation.

To H1 we expected to find a positive correlation between Skills Index and Familiarity Index: the greater the familiarity of the individual with important tools to play the software properly, the easier the acceptance of the software by the student and, consequently, the higher the development of important skills (Hamari et al., 2016). To H2 we also expected to find a positive correlation between Skills Index and Usability Index: the greater the software usability, the more the student will be able to develop essential skills for the professional performance in Accounting (Sailer et al., 2017).

Finally, about the control variables, we expect that "age" and "graduate" and "work" have negative correlation with Skills Index showing that less engagement could affect the perception of skills development. Older students, students who work and study at the same time and students who already have graduated before starting the Accounting undergraduate program are likely to have many other commitments in life that reduce the time to dedicate to the course. Less time to study could mean less engagement and probably less perception of skills development (Tsay, Kofinas, & Luo 2018).

4 RESULTS

Driven by our research question ("To what extent are student skills developed with the introduction of a gamified course in an Accounting undergraduate program?"), we now present the results of the selected elements of the study sample, after processing data collected from participants of the aforementioned course. Such evidence will support the goals of the study, related to exploring accounting programs improvement by means of gamified strategies.

Tables 1 and 2 show the descriptive analysis of the study sample. As observed, 96 (81.4%) of the respondents stated that the program was their first postsecondary degree. Among those who had already started a program before entering Accounting, one student indicated a bachelor's degree in History; one in Architecture and Urbanism; one in Electrical Engineering; one in Administration; one in Physics; and one in Veterinary Medicine. Also, one of the respondents declared two years in Dentistry (did not graduate) before entering Accounting. Finally, another student mentioned another degree before Accounting, but without informing which one.

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Table 1 also shows that only 16 students (13.6%) stated that they did not work when undertaking the "Business Games I" course. All others, 102 students (86.4%), reported that, at some level, they had a link with the labor market when taking the course. This evidence faithfully represents the situation of Accounting students in Brazil (Peleias, Guimarães, Chan, & Carlotto, 2017). That is because the survey respondents were enrolled in the last semester of the program. In this situation, it is quite common for Accounting students in Brazil to enter the labor market, either through internships or effectively hired (Peleias, Petrucci, Garcia, & Silva, 2008; Durso, Cunha, Neves, & Teixeira, 2016).

Table 1. Descriptive analysis of the sample

Variable	Meaning	Number of answers	Frequency	Percentage
"Graduate"	Students who have attended another undergraduate course before entering Accounting	118	22	18.6%
"Work"	Students that presented a connection with the job market when enrolled in the Business Games I course	118	102	86.4%

Regarding the respondents' age, as shown in Table 2, the youngest was 20 years old when the survey was carried out, and the oldest was 60 years old. The mean age of the sample was 25.3 years (SD = 5.1). It can be observed, therefore, that the research sample shows considerable heterogeneity concerning the age of the respondents. Attitude towards technology may vary across distinct generations over time, however, it has been claimed that with time the so-called generation gap in this dimension tends to get narrower. Beck & Wade (2004) analyzed how the technological affordance, from the perspective of access to videogames, was able to reshape an entire generation with relevant impact in business. Almost two decades after that study, society has witnessed massive amounts of technology been part of daily lives of those in the workplace, as well as those outside it. It is important to mention that our finds represent a typical accounting undergraduate class in Brazil. As shown by previously studies (Peleias, Petrucci, Garcia, & Silva, 2008; Durso, Cunha, Neves, & Teixeira, 2016; Peleias, Guimarães, Chan, & Carlotto, 2017), accounting students tend to be older than students in other fields. The presence of non-traditional students in accounting undergraduate programs in Brazil may have many reasons such as: (a) possibility to work and study at the same time (since many accounting undergraduate classes are held in the evening), (b) complementarity of accounting themes to other fields such as economics and law (what brings to accounting undergraduate programs many students that have graduated before) and (c) large supply of job positions (making the undergraduate program attractive to students who started working after high school and did not go straight to college). For these reasons, despite the heterogeneity of sample, all observations were kept in the analysis.

Table 2. Average age of respondents

Variable	Meaning	Number of answers	Average	Standard deviation	Minimum value	Maximum value
"Age"	Age of respondent	118	25.3	5.1	20	60

Table 3 shows the descriptive analyzes about all the questions that were used to create the three indexes (SI, FI and UI). As it can be noted, among the questions related to the respondent's familiarity with the tools that can assist him/her in "Business Games I" course (such as familiarity with computers, the Internet, social networks, and games), the lowest average was presented for games (electronic, board, deck, among others). Also, it should be pointed out that the mean displayed for the gaming tool (M=

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7.52, SD= 1.82) can be considered high, having in mind the heterogeneity of the sample concerning the variable age. On the opposite side, the highest average, which also presented the lowest standard deviation, was given by the assertion related to the Internet access. This resonates with the social reality in Brazil in which middle-class and upper-middle-class individuals, such as the student profile of the analyzed educational institution, have broad access to the Internet, mainly via smartphones. Thus, the Familiarity Index (FI), calculated from the simple average of the scores attributed to each of the four assertions related to the intimacy of the students with some valuable tools for their development in the course, presented an average of 8.49 (SD= 0.99). Considering this high average of FI and also its low standard deviation, it can be said that, generally, students in this sample had a great contact with important tools that allow them to deal with the software used in the Business Game I course. According to Hamari et al. (2016), previous contact with games can be important to keep students engaged in a gamified course, which is important for the learning process (Tsay, Kofinas, & Luo 2018) and, consequently, for the development of student skills.

Regarding the assertions dealing with the usability of the software adopted in the "Business Games I" course, we highlight the results presented to the question about the complementarity of the simulation with other courses taught during the undergraduate Accounting program, whose average was 8.43 (SD= 1.57), the largest for the usability-related issues group. The lowest mean, however, was presented for assertions that dealt with the clarity of the operability of the system, whose value was equal to 7.29 (SD= 1.67). According to Sailer et al. (2017), a success key in a gamified course is game design. In this sense, the results may indicate that the roles of the software could be better explained and clearer. The difficulties perceived by students may impact in their motivation with the course, affecting the learning process (Landers et al., 2015) and consequently the development of important skills. Despite this point, it should be noted that a good software used to simulate the business context must have attributes of surprise and mystery to enhance players' involvement in the game (Wilson et al., 2004). In this sense, it is possible that the result found for this assertion may reflect students' perception about factors that they cannot control in the software. Another possible explanation for this result may be the language gap. The software used in this course uses English as the official language. Therefore, the player guide and all the system commands are not available in Portuguese (the official language in Brazil), which can make it difficult for students to correctly understand the software rules.

Table 3. Familiarity Index, Usability Index, and Skills Index

Variable	Question	Number of Answers	Average	Standard deviation	Median	Mode	Min.	Max.
Familiarity with important tools	1. In a scale from 0 to 10, how do you describe your prior skills regarding use of computers?	118	8.50	1.31	8	8	5	10
	2. In a scale from 0 to 10, how do you describe your prior skills regarding Internet access?	118	9.14	0.99	9	10	5	10
	3. In a scale from 0 to 10, how do you describe your prior familiarity regarding social networks and communication apps (Facebook, LinkedIn, WhatsApp, among others)?	118	8.79	1.33	9	10	4	10
	4. In a scale from 0 to 10, how do you describe your prior familiarity regarding games (electronic, board, and card games, for example)?	118	7.52	1.82	8	8	1	10
	Familiarity Index	118	8.49	0.99	8.50	8.25	5	10

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Software usability*	1. System operation is clear and objective	118	7.29	1.67	7	7	2	10
	2. There are good conditions for testing strategies	118	7.80	1.64	8	8	3	10
	3. Representations of the business and the market are good	118	8.09	1.46	8	8	3	10
	4. The experience complements well the Accounting course	118	8.43	1.57	9	9	2	10
	Familiarity Index	118	8.49	0.99	8.50	8.25	5	10
	1. System operation is clear and objective	118	7.29	1.67	7	7	2	10
	2. There are good conditions for testing strategies	118	7.80	1.64	8	8	3	10
	Skills developed**	118	8.09	1.46	8	8	3	10
	4. The experience complements well the Accounting course	118	8.43	1.57	9	9	2	10
	5. The pace of the game stimulates learning	118	7.83	1.76	8	8	3	10
	6. The level of fidelity favors real-world performance (fidelity = how close it is to reality)	118	7.41	1.72	8	8	1	10
	Usability Index	118	7.81	1.30	8.00	7.50	3	10
Skills developed**	1. Curiosity	118	7.78	1.68	8	8	2	10
	2. Initiative	118	7.90	1.48	8	8	3	10
	3. Persistence	118	7.89	1.57	8	7	3	10
	4. Adaptability	118	8.12	1.45	8	8	2	10
	5. Leadership	118	7.58	1.81	8	8	1	10
		118	7.11	1.64	7	7	2	10
	7. Communication	118	7.76	1.54	8	8	2	10
	8. Social and Cultural Awareness	118	6.21	2.38	7	7	0	10
	9. Critical Thinking	118	8.08	1.54	8	8	4	10
	10. Collaboration	118	8.12	1.77	8	10	0	10
	Skills Index	118	7.66	1.20	7.90	7.90	4.50	10

*For these sentences the student was asked to assign a grade from 0 to 10 where the maximum value meant greater agreement
**The student was asked to assign a score from 0 to 10 for the level of skill development, where the maximum value means that the ability was strongly developed

Also, it should be noted that the software fidelity - i.e., how close it is to the real world - was the statement with the second lowest average. It may indicate that, even if the program aims at bringing the corporate environment to the classroom, there are still some issues that keep it away from the real world. It was possible to compare the result of this assertion between working and nonworking students. Since working students have direct contact with the market, it is expected that they can evaluate better the fidelity characteristic. Therefore, the working group (n= 102) presented an average of 7.36 and the nonworking group (n= 16) an average of 7.68. The Kruskal-Wallis mean test returned a Chi^2 of 0.24. In this sense, it is not possible to affirm that these two groups have different perceptions about the fidelity of the software. The Usability Index (UI), created from the simple mean of the values assigned by the respondents to the six statements presented in Table 3, showed an average of 7.81 (SD= 1.30). The minimum value of the Usability Index was 3 and the maximum was 10. Despite the result to the minimum value presented to Skills Index, it is important to note that median and mode follow the average and present a result of 8 and 7.50, respectively.

Concerning the perception of developed abilities, according to Table 3, the one with lowest average was associated with social and cultural awareness (M= 6.21, SD= 2.38). In contrast, the ability with the highest average was adaptability (M= 8.12, SD= 1.45) and collaboration (M= 8.12, SD= 1.77). Most likely, this result reflects the operational mechanism of the adopted software, where in each round a new event impacts the environment in which the companies are present. It is also important to differentiate

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findings related to collaboration and social awareness. The "Business Game I" course is based on teams of 4 to 5 students (the ideal size, according to BSG manual) to work together during the semester. In this sense, the perceived collaboration may reflect this cooperation (each week, students need to work together in order to achieve good results). On the other hand, social and cultural awareness is related issues such as: (a) human trafficking, (b) modern slavery and (c) gender inequalities, for example. Despite the BSG software inputs about company's image, the sample of this study did not perceive the social and cultural awareness as well developed by the game. In this sense, the result of collaboration is not divergent of the result of social awareness.

Six other skills presented averages below eight: curiosity (M= 7.78), initiative (M= 7.90), persistence (M= 7.89), leadership (M= 7.58), creativity (M= 7.11), and communication (M= 7.76). On the other hand, besides adaptability and collaboration, critical thinking presented average higher than 8 (M= 8.08). In this context, the Skills Index, created from the simple average of the values assigned by the respondents to each of the ten skills listed in Table 3, obtained an average of 7.66 and a standard deviation of 1.20. The minimum value of the Skills Index was 4.5, whereas its maximum value was 10. Despite the result to the minimum value presented to Skills Index, it is important to note that median and mode follow the average and present a result of 7.90.

Table 4 shows the correlation between the Skill Index, Usability Index, and Familiarity Index and between them and the control variables related to Age, Graduate, and Work (from Table 1). The Skills Index presents a high correlation (r(116)= 0.70, p< .01) with the Usability Index. The result of Sailer et al. (2017) shows that the design of the gamified course is fundamental to motivate students. In this sense and considering that the correlation between Skill and Usability Indexes was strong and positive, the result indicates that the user's perception of software usability may be important for developing skills required for the professional performance, what is in line with the second research hypothesis.

Through Table 4, we also can note that the Skills Index presents a moderate correlation (r(116)= 0.20, p< .05) with the Familiarity Index. In this sense, the result indicates that differences in familiarity with tools that are essential to student achievement, in some degree, are important to the perception of skill development required for professional performance in the Accounting area (considering the context of the present sample). This result is aligned with the findings of Hamari et al. (2016). The Familiarity Index also presented a positive correlation with work (r(116)= 0.24, p< .01). This may indicate that working students have had contact with more tools that are important when taking a course that uses software to provide a gamified experience, what is aligned with the results of Tsay, Kofinas and Luo (2018). Despite this result it is important to note that Age, Graduate and Work, three proxies to students' engagement, had no significant correlation with Skill Index.

Table 4. Pearson correlations

	Skills Index	Usability Index	Familiarity Index	Age	Graduate	Work
Skills Index	1.00					
Usability Index	0.7020***	1.00				
Familiarity Index	0.2027**	0.1451	1.00			
Age	0.0844	0.0705	-0.1720*	1.00		
Graduate	-0.0165	0.0723	-0.0863	0.5637***	1.00	
Work	-0.0623	-0.0502	0.2444***	-0.1895***	-0.0011	1.00
*Significant at 10%, **significant at 5%, ***significant at 1%						

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Table 4 also presents interesting data related to the Familiarity Index and Age. Despite being low (r(116)= -0.17, p< .1), the correlation shown between these two variables was negative, what may indicate that older students tend to be less familiar with necessary tools for the development of the Business Game I course. This direction was expected according to the literature, but at the same time due to a weak correlation, it is possible to claim that despite age, students from this sample have homogeneity in relation to previous knowledge required to deal with a gamified course (Familiarity Index).

Table 5 presents the mean of Familiarity Index by age quartile. As it is shown, means of all groups are close and the confidence interval indicates that it can be the same at 95% of confidence.

Table 5. Familiarity Index by percentile of Age

Quartile (Age)	Mean (Familiarity Index)	Standard Deviation	95% Confidence Interval	
			Minimum	Maximum
1st (25%)	8.5333	0.1580	8.2204	8.8462
2nd (50%)	8.6316	0.1811	8.2730	8.9901
3rd (75%)	8.5865	0.1670	8.2559	8.9172
4th (100%)	8.0833	0.2105	7.6665	8.5002

Table 6, in turn, presents results found for the estimated linear regression between the Skills Index (dependent variable) and the Familiarity Index (independent variable). As it can be noted, the coefficient (0.2458) founded for the variable was statistically significant at 0.05. This result, as previously described when analyzing correlations, shows that the familiarity of the sample with some valuable tools for the course, in some degree, may explain the perception of development of essential skills for professional performance in the accounting area. Despite this result, it is important to mention that the R^2 was not strong between these variables (4.11%) and the F test was significant only at 10%. This may represent the effect of a certain homogeneity of the previous contact with important tools to run the BSG game (see analyzes of Table 5). In this scenario, we cannot reject the first hypothesis of this study, since there was an acceptable statistical significance to the coefficient found (Familiarity Index).

Table 6. Simple Linear Regression – Familiarity Index

Variable	Coefficient	Standard deviation	Significance
Constant	5.5692	0.9420	0.000
Familiarity Index	0.2458	0.1103	0.028
R^2	0.0411		
Number of Observations	118		
F Test	0.09		

Table 7 presents the result of the estimated linear regression between the Skills Index (dependent variable) and the Usability Index (independent variable) perceived by the survey respondents. The coefficient (0.6521) found for this variable presents was statistically at 0.01. This result indicates that the 1-point increase in that Usability Index generate an increase of 0.6521 in the Skills Index. This positive impact shows that the higher the perception of usability of the software used in the context of this course, the higher the development of skills required for professional performance. In this scenario, we also cannot reject the second hypothesis of this study, since there was an acceptable statistical significance to the coefficient found (Usability Index).

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Table 7. Simple Linear Regression – Usability Index

Variable	Coefficient	Standard deviation	Significance
Constant	2.5651	0.4859	0.00
Usability Index	0.6521	0.6142	0.00
R²	0.4928		
Number of observations	118		
F Test	0.00		

The analysis of the answers to the open questions of the questionnaire corroborates some of the results previously found. Regarding fidelity, a student reported as a negative aspect of the software the fact that "Because it is a game, players can adopt strategies that they would not take in the real environment." In this context, knowing that it is a game and that there is a competition among the different teams can cause students to maximize the immediate result of the game, which would not necessarily reflect decision-making in the real world. Despite this point it is important to note that the gap between the game and the real world is important because it allows students to try and experiment new things without harming or depleting their real assets. In relation to the operation of the system, another student reports as a negative point the fact that "Instability of [currency] exchange variations end up hindering a lot of strategies, since the game is very complex and full of variables." In the view of this specific individual, the presence of several variables and the instability of currency exchange end up making the game difficult to operate. In this sense there is a trade-off. The complexity of the game reflects the real world (fidelity), but it may reduce the usability of the software, which is an important variable to consider in gamification strategies (Cornacchione, 2012; Sailer et al., 2017). As pointed before, a possible explanation about the perception of complexity may be the student language gap. The software adopted in this Accounting course uses English as the official language and do not have a player guide translated to Portuguese. Additionally, this perception might be the result of the attributes of surprise and mystery, two characteristics needed in a simulation of a business context (Wilson et al., 2004).

On the other hand, some students consider the complexity of the game as a positive point, considering that this would bring the educational environment closer to the business world (fidelity). This is evident in the following statements: "The game gives the real opportunity to feel how the market works and to make financial decisions based on it,"and "The game brings Forex impacts based on the real-world oscillations, which is quite interesting and brings dynamics that approximate the challenges companies face in this area." Other positive points were also identified in the respondents' sentences. Some have reported the fact of working with currency exchange situations as something positive, whereas others emphasize the decision-making mechanism as something important for the development of skills required for accounting professionals; finally, some students reported the competitiveness developed in the course as a motivating factor for their engagement, what reflects the possibility of improvement of student's commitment by gamification strategies as predicted by the literature (Kolb, & Kolb, 2009).

When it comes to relating the perception of the importance of software fidelity to the development of managerial competencies, it can be said that the vast majority of the respondents considered it as being vital for the learning environment. This is clear in sentences such as: "If the game has a didactic purpose and proposes to train the participants to act in the market, it should be as faithful as possible," "To me, fidelity makes the game useful and interesting, and really develops management skills,"and, finally, "In today's world it is imperative that such management games are based on actual behavior

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and movement, otherwise, people can make random decisions that happen to have a good result and believe that that strategy works."

5 CONCLUSION

The present study aimed at identifying the extent of student skills development with the introduction of a gamified course in an Accounting undergraduate program of a large Brazilian public university. A survey was used with students enrolled in the last semester of the Accounting program of the aforementioned institution and taking the "Business Game" course, which uses a gamification approach. A total of 118 (33%) valid questionnaires were collected. The main result is that all of the ten skills explored by this study were strongly developed with the introduction of the gamified strategy. In addition, we highlight these three skills that were highly developed: adaptability, critical thinking and collaboration. These are all key skills when considering the new professional environment often anticipated by experts in our field and organizations. Gamified strategies show potential to affect such skills that are deemed to be of complex development.

From the analyses carried out in this study, some conclusions could be reached. The first one is the fact that the usability perception of the adopted software is important for the perception of skill development for the professional performance in the accounting area. This highlights the importance, for courses using software to create game environments, of thinking about how usability can help students to better relate to the software and, consequently, improve skill development.

On the other hand, it was possible to perceive, in the context of the sample of this study, that student familiarity with tools relevant for their development throughout the course (e.g., computer, Internet, social networks, and games) does not have a strong correlation with skill development. Although the regression showed a significant correlation between Skills Index and Familiarity Index, the determination coefficient was small ($R^2 = 0.0411$), when compared to Usability Index regression ($R^2 = 0.4928$). Additionally, the coefficient estimated to independent variable on Familiarity Index regression is smaller ($\beta\_1 = 0.2458$) than the coefficient found to Usability Index regression ($\beta\_1 = 0.6521$). These results indicate that to the development of students' skills of this sample, the familiarity with important tools was less important than the usability perception about the software used in the course. A possible explanation for this is the fact that the respondents' familiarity with the tools is relatively homogeneous. In this context, it was not feasible to identify the influence that different levels of familiarity can generate in the perception of skill development. Also, in present days, the target population of the study (individuals from the Brazilian middle and upper middle class) have a close contact with most of the mentioned tools.

Finally, a significant finding of this study was to verify the importance that students attribute to the teaching and learning process when guided by gamification and bearing higher fidelity levels. As evidenced by the answers to the open questions of the instrument, students consider simulation very important for real learning, but only if it reliably reflects the reality of the market (fidelity). This shows that the introduction of gamified courses in the curriculum presents an attractive potential for accounting students. This is because gamification, when correctly developed, is an important strategy to bring the real-world specificities to the educational environment, which is practically absent in traditional classes, held in the traditional lecture mode.

As a primary limitation, the study presents the fact that the vision of only one course of the institution was analyzed. Also, it is necessary to consider that Accounting students present a profile of

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their own that may be quite different from the profile of those in other areas of knowledge. Thus, even if the findings of this study can be applied to other undergraduate programs, one must consider possible specificities of each area of knowledge. In this context, for future studies, it is recommended the analysis of skill development in gamified courses in other settings, both in higher education and other educational levels.

This paper may be important to many actors involved with accounting profession. First, it highlights the importance of gamification to transform the classroom environment. In this sense this paper addresses all the academic community concerned with improving the Accounting undergraduate programs. It is also important to Accounting professional bodies since the results present a strategy that is efficient to prepare accounting students to work in companies in the 21th century. This research also helps instructional designers to reflect about the mechanisms that can be added to serious games in order to improve the learning process. Finally, the student community may also have interest in these results, since it brings an active methodology that can be introduced in the Accounting undergraduate programs to ameliorate the learning process.

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