

Business Games and Stock Market: An analysis of students' learning in a Business Administration course

Jogo de empresas e mercado de ações: uma análise do aprendizado dos alunos em um curso de Administração

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ABSTRACT

This paper addresses the use of experiential learning to improve knowledge about the capital market, by applying a program with business games, using an electronic simulator of the Brazilian stock market. The objective was analyzing the cognitive domain of the participants after application of an educational program about the capital market, using a business game tailored for stock market trading. The descriptive study, with a quantitative approach, used the quasi-experiment technique to collect data on the learning of undergraduate business administration students at a federal university located in the state of Rio de Janeiro, Brazil. The data were submitted nonparametric statistical analysis with the inferential Mann-Whitney U-test as well as tests of comparison of medians. The results revealed statistically significant differences in assimilating knowledge between the groups of participants. The G1 group, whose theoretical content was exposed before the game application, showed an assimilation of superior knowledge. In this sense, it was possible to conclude that the way the educational program with the business game was applied affected the students' assimilation of knowledge.

Keywords: active learning, experiential learning, business games, stock market.

RESUMO

O estudo aborda a utilização da aprendizagem vivencial para propostas de melhoria na formação e educação financeira sobre mercado de capitais, mediante aplicação de um programa educacional com jogos de empresas, utilizando o simulador eletrônico de ações da bolsa de valores brasileira. O objetivo foi analisar o domínio cognitivo dos participantes durante a aplicação de um programa educacional sobre mercado de capitais, utilizando um jogo de empresas voltado para o mercado de ações. A pesquisa descritiva, com abordagem quantitativa, utilizou o procedimento técnico, denominado quase-ex-

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perimento, para a coleta de dados, sendo este realizado com estudantes de graduação do curso de Administração de uma universidade federal no estado do Rio de Janeiro. Os dados foram submetidos à análise estatística não paramétrica U-Mann Whitney inferencial, testes de variância e comparação de mediana. Os resultados apontaram para diferenças estatisticamente significativas na assimilação do domínio cognitivo entre os grupos participantes da pesquisa. O grupo G1, cujo conteúdo teórico foi exposto antes da aplicação do jogo, apresentou uma assimilação de conhecimento superior. Neste sentido, foi possível concluir que a forma como o programa educacional com jogo de empresas foi aplicado afetou a assimilação de conhecimento dos alunos.

Palavras-chave: método ativos, aprendizagem vivencial, jogo de empresas, mercado de ações.

Introduction

This article examines the effectiveness of experiential learning (KOLB, 1984; KONAK; CLARK; NASEREDDIN, 2014) through the use of business games to improve learning about the capital market, with emphasis on stock trading.

The capital market discipline covers complex topics that are best learned through practical experience. Despite this characteristic, these topics are usually taught through the traditional model in which theoretical exposition of concepts in the classroom and through assigned reading predominates (CARENYS; MOYA, 2016; ALSHEHRI, 2017). This practice produces inert learning, unable to prepare students to apply their theoretical knowledge in real contexts (LAINEMA; NURMI, 2004; WOLFE, 2016; GOI, 2019). Cases like this, where complex contents are covered, can benefit from the creation of educational programs that integrate theory with practice within the classroom context, to enhance learning (LAINEMA; NURMI, 2004; SALAS; WILDMAN; PICCOLO, 2009; BEN-ZVI, 2010; WOLFE, 2016).

The utilization of experiential learning (KOLB, 1984; KONAK; CLARK; NASEREDDIN, 2014) through application of the business games technique is a feasible proposal because the articulation of theoretical concepts with practical experience promoted by the games enables the students to experience situations in the classroom similar to those in the real world (LAINEMA; NURMI, 2004; SALAS; WILDMAN; PICCOLO, 2009; BOYLE et al., 2016; MOHSEN; ABDOLLAHI; OMAR, 2019).

This experience reduces the distance between theory and practice (KEYS; WOLFE, 1990; BEN-ZVI, 2010); makes students assume the leading role in their learning (BEN-ZVI, 2010) by combining concepts that are treated individually during theoretical exposition (LAINEMA; NURMI, 2004; GONEN; BILL; FRANK, 2009); promotes the development of competencies, skills and attitudes (SALAS; WILDMAN; PICCOLLO, 2009, BOYLE et al., 2016; MOHSEN; ABDOLLAHI; OMAR, 2019); and enhances understanding of concepts, especially more complex ones (ANDERSON; LAWTON, 2003, 2009; BEN-ZVI, 2010).

Despite studies using contributions from the business games, there are still few studies in Brazil and in the world that relate to the capital market (WOLFE; GOLD, 2007; FREITAS, 2007; MARRIOTT; TAN; MARRIOTT, 2015; MELO, 2015). As possible causes can be restricted to learning strategies, such as: high cost of software acquisition (OLIVEIRA; SAUAIA, 2011); inadequate infrastructure for carrying out activities in higher education institutions (OLIVEIRA; SAUAIA, 2011; BEN-ZVI, 2010); professor's difficulty in conducting this type of activity (PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016; LYN; TU, 2011).

The choice of a business game aimed at the stock market was due to threats that agents and private individuals are making for promotion, through financial education, or strengthening of the Brazilian capital market, in favor of economic development based on the incentive of the Brazilian federal government with the National Strategy for Financial Education (ENEF), with Decree No. 7,397, of December 22, 2010, which indicates the tests to educate both investors and professionals working in this market. Regarding the professional, the concern is to prepare them to deal with a much more complex environment after the advent of globalization and new technologies (SAVOIA; SAITO; SANTANA, 2007). In addition, with the increase in supply, the need for companies to raise financial resources for the expansion of industrial logic projects in the liberal market also grows (SARMA; PAIS, 2011; AUGUSTINIS; COSTA; BARROS, 2012).

In this sense, the study is justified by three main aspects:

- Few studies of experiential learning about the stock market;
- Availability of free stock exchange;
- Need for financial education due to the expansion of the capital market.

Therefore, we developed an Educational Program (EP) involving adapting the content about the capital market to an experiential learning approach by means of a business game called Stock Market Game (SMG), as a competitive environment for comparison of the performance of students or teams. This game was developed exclusively to support the EP and employed the stock trading simulator made available by internet. This choice was due to the fact this simulator is accessible at no charge over the Internet, thus reducing the cost of the program.

The study by Anderson and Lawton (2003) indicated that the optimal timing of applying a business game should be carefully considered. According to them, the game should be introduced after the students have a modicum of understanding of the content of the discipline, because otherwise they can make decisions based on unsupported perceptions. On the other hand, the early introduction of simulation can be effective by heightening students' motivation to learn, through their perception of the need to understand the underlying concepts.

Based on these considerations, the objective of the study was to analyze the assimilation of knowledge of the participants after application of the EP, considering two moments of introducing the game. This application was carried out, by means of a quasi-experiment, with two groups of undergraduate business administration students at a public university in the state of Rio de Janeiro, Brazil. In the first group, the game was introduced early, just after the introductory exposition of concepts, while in the second it was introduced after the concepts had been thoroughly covered.

This article is divided into five sections including this introduction. The next section presents a review of the theory of experiential learning with business games, highlighting the arguments in favor of their use in the academic context, mainly to teach complex topics. The method is described in the third section, and the results regarding the best moment to introduce the game are presented and discussed in the fourth section, as well as the factors observed during its application. The final considerations are presented the fifth section.

EXPERIENTIAL LEARNING AND BUSINESS GAMES

Organizations are increasingly demanding professionals who are able to deal with complexity, in turn requiring teaching institutions to adopt methods that inte-

grate theory and practice, to enable students to understand the relation between concepts in different areas, stimulating new intellectual and behavioral practices (BRAGHIROLI et al., 2016; FARASHAHI; TAJEDDIN, 2018).

Many educators in management focus on conveying cognitive aspects by the traditional teaching method. This has been criticized for not adequately meeting the needs of the job market (BEN-ZVI, 2010; VLACHOPOULOS; MAKRI, 2017; FARASHAHI; TAJEDDIN, 2018) since this type of approach can produce superficial learning (LAINEMA; NURMI, 2004; VLACHOPOULOS; MAKRI, 2017). Therefore, new teaching methods can be beneficially applied that promote an integrated vision (BEN-ZVI, 2010; OLIVEIRA; SAUAIA, 2011; BRAGHIROLI et al., 2016; FARASHAHI; TAJEDDIN, 2018), to enable students to bring articulated knowledge from different areas to bear in solving real problems (PETERS; VISSERS, 2004; BRAGHIROLI et al., 2016; VLACHOPOULOS; MAKRI, 2017), thus meeting the needs of the contemporary market (BEN-ZVI, 2010; HALLINGER; WANG, 2019).

However, this does not mean neglecting teaching by the traditional model. Instead, it means seeking ways to integrate theoretical and practical knowledge (LAINEMA; NURMI, 2004; SALAS; WILDMAN; PICCOLO, 2009; BEN-ZVI, 2010; PASIN; GIROUX, 2011; VLACHOPOULOS; MAKRI, 2017). In this respect, the theory of experiential learning of Kolb (1984) has gained space in the academic and business settings, to the point of being considered one of the most influential for training of managers (KAYES, 2002; HALLINGER; WANG, 2019; ZULFIQAR et al., 2019), by articulating concepts and experience, allowing development of the competencies currently demanded in the employment market (BEN-ZVI, 2010; PASIN; GIROUX, 2011; BOYLE et al., 2016; MOHSEN; ABDOLLAHI; Omar, 2019; ZULFIQAR; SARWAR et al. 2019).

The theory of experiential learning is based on the works of Lewin, Dewey and Piaget (KOLB, 1984; KAYES, 2002; KONAK; CLARK; NASEREDDIN, 2014; BOYLE et al., 2016; MOHSEN; ABDOLLAHI; OMAR, 2019). The word experiential is used to stress the importance of experience in the teaching-learning process and to distinguish it from other theories of learning, such as the cognitive learning theory and behavioral learning theory (KONAK; CLARK; NASEREDDIN, 2014; HALLINGER; WANG, 2019).

With the experiential learning, the student with his experience becomes able to share his understanding of events, have a critical reflection of the facts and associate with other realities and thus apply this learning in the next situations.

In the educational field, teachers at the various school levels, in an effort to increase their students' assimilation of knowledge, are adapting their classes to include experiential learning techniques (KONAK; CLARK; NASEREDDIN, 2014; WESTERA, 2017; HALLINGER; WANG, 2019), such as the case method, problem-based learning and business games (LAINEMA; NURMI, 2004; OLIVEIRA; SAUAIA, 2011; WESTERA, 2017; FARASHAHI; TAJEDDIN, 2018). In this scenario, business games are increasingly being used in college programs (GONEN et al., 2009; LYN; TU, 2011; WOLFE, 2016; RAVYSE et al., 2017). This growth can be partly attributed to the fact that through business games, students can experience, in simplified fashion, the difficulties faced in the real world, without incurring the risks of a real company (BEN-ZVI, 2010; LYN; TU, 2012; BRAGHIROLI et al., 2016; WESTERA, 2017). Besides this, other factors should be considered, such as: (1) the possibility of producing better learning results compared to conventional teaching methods (KEYS; WOLFE, 1990; BEN-ZVI, 2010; RAVYSE et al., 2017); (2) the help in reducing the fragmentation of undergraduate courses by promoting more integration between the basic areas (LAINEMA; NURMI, 2004; GONEN et al., 2009; LOVELACE; EGGERS; DYCK, 2016; HAWLITSCHKEK; JOECKEL, 2017; KORIS; ÖRTENBLAD; OJALA, 2017); and (3) the systemic treatment of students, integrating the rational and emotional sides (OLIVEIRA; SAUAIA, 2011; TAO; HUNG, 2012; BRAGHIROLI et al., 2016; LOVELACE; EGGERS; DYCK, 2016; KORIS; ÖRTENBLAD; OJALA, 2017), stimulating a change in behavior and the development of skills and competencies beyond those instilled by traditional teaching (KEYS; WOLFE, 1990; SALAS; WILDMAN; PICCOLO, 2009; FITÓ-BERTRAN; HERNÁNDEZ-LARA; SERRADELL-LÓPEZ, 2014; BRAGHIROLI et al., 2016; HAWLITSCHKEK; JOECKEL, 2017);

Notwithstanding the contributions of business games and their growing use, many institutions still face barriers to their application, among them: the high cost to acquire software licenses (PASIN; GIROUX, 2011; BURDON; MUNRO, 2017); lack of adequate infrastructure (BEN-ZVI, 2010; BURDON; MUNRO, 2017); lack of preparation of professors to conduct this type of activity (TAO; CHENG; SUN, 2009; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016; ZULFIQAR et al.,

, 2019); and the need for significant time dedicated to the use of the method (PASIN; GIROUX, 2011; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016).

The business games technique has some characteristic factors that can lead both to success or failure of learning (BURDON; MUNRO, 2017; UPPAL; ALI; GULLIVER, 2018). Thus, it is important to consider these factors in planning the use of business games in disciplines, to assure good practical results. Complexity is one of these factors (GOSENPUD; WASHYBUSH, 1996; ADOBOR; DANESHFAR, 2006; TAO; YEH; HUNG, 2012; UPPAL; ALI; GULLIVER, 2018). If the game is very easy, the participants can become easily bored or make little effort to win. On the other hand, if it is very complex, students can become frustrated by the difficulty of comprehension (ADOBOR; DANESHFAR, 2006; STANTON; JOHNSON; BORODZICZ, 2010; HAMARI et al., 2016; HERNÁNDEZ-LARA; SERRADELL-LÓPEZ, 2018).

The level of realism also influences the learning. The closer the game is to reality, the greater will be the perception of utility of the game by the participants, whetting their interest (ADOBOR; DANESHFAR, 2006; HAMARI et al., 2016; HERNÁNDEZ-LARA; SERRADELL-LÓPEZ, 2018).

The degree of involvement of the participants in the game and the effort they make to improve their results (WASHBUSH; GOSENPUD, 1994; GOSENPUD; WASHBUSH, 1996; WOLFE; LUETHGE, 2003; ADOBOR; DANESHFAR, 2006; GONEN et al., 2009; NADOLNY; HALABI, 2016; HAMARI et al., 2016), as well as their emotional state, such as euphoria, excess confidence or anxiety (GOSENPUD; WASHBUSH, 1996; ADOBOR; DANESHFAR, 2006; NADOLNY; HALABI, 2016; HAMARI et al., 2016), can influence the level of learning and competencies promoted by the game.

In this sense, the actions of the instructor are fundamental, because besides transmitting the theoretical content, he or she also will assume the role of mediator, adviser, moderator and coach in building the students' knowledge (HERNANDEZ; GORJUP; CASCÓN, 2010; FITÓ-BERTRAN et al., 2014; KRIZ; AUCHTER, 2016). The instructor has to guide and familiarize the students with the rules of the game (STANTON et al., 2010; KRIZ; AUCHTER, 2016), stimulate good interaction of the participants so they will reflect on the results obtained and apply the knowledge acquired, to assure assimilation of the content (HERNANDEZ et al., 2010; BRAGHIROLI et al., 2016; KRIZ; AUCHTER, 2016; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHAR-

TERINA, 2016), show the importance of the students in the learning process, adjust the game's levels of complexity, monitor the play and try to balance the students' feelings (STAINTON et al., 2010; KRIZ; AUCHTER, 2016). Thus, it is necessary for the teacher to be prepared to perform a variety of tasks during the game (TAO et al., 2009; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016) to keep it from becoming mere diversion, which would make the use of the business games technique innocuous regarding the didactic objectives (WOLFE; LUETHGE, 2003; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016; KE, 2016).

It is also important for the instructor to create situations where the students can articulate the content learned with real situations (BRAGHIROLI et al., 2016; KE, 2016; FARASHAHI; TAJEDDIN, 2018). For this purpose, besides the gaming rounds, it is important to conduct a debriefing session, where the participants can express their opinions (LAINEMA; NURMI, 2004; PETERS; VISSERS, 2004; STAINTON et al., 2010; KE, 2016; FARASHAHI; TAJEDDIN, 2018).

With respect to evaluation of performance, the teacher should not only base this on the results of the game, since winning is no guarantee of greater learning (WASHBUSH; GOSENPUD 1994; GOSENPUD; WASHBUSH, 1996; ANDERSON; LAWTON, 2009; TAO et al., 2012; FARASHAHI; TAJEDDIN, 2018). Therefore, it is important to consider the interaction of the participants during the game (GONEN et al., 2009; HERNÁNDEZ-LARA; SERRADELL-LÓPEZ, 2018) and to apply follow-up tests of perception and knowledge (WOLFE; LUETHGE, 2003; ANDERSON; LAWTON, 2009; KORIS; ÖRTENBLAD; OJALA, 2017; HERNÁNDEZ-LARA; SERRADELL-LÓPEZ, 2018).

The choice of the tests should take into consideration the objective of using the business game (ANDERSON; LAWTON, 2009; SALAS; WILDMAN; PICCOLO, 2009; MRTVI et al., , 2017; HALLINGER; WANG, 2019). In this context, Anderson and Lawton (2009) state that the taxonomy of Bloom (1956) is often considered, in many aspects, to assess the type and level of learning (ANDERSON, KRATHWOHL; BLOOM, 2001) achieved by playing business games. Anderson and Lawton (2009) suggest that if the teacher's objective is to verify if a particular business game improved the attitudes toward the discipline taught, instruments should be applied to obtain the participants' impressions. On the other hand, if the aim is to measure the participants' assimilation of information, then traditional knowledge tests should be

applied (UPPAL; ALI; GULLIVER, 2018; MOHSEN; ABDOLLAHI; OMAR, 2019). In this case, the questions should be suitable to the dimensions of the intended learning (BEN-ZVI, 2009; ANDERSON; LAWTON, 2009; STANTON et al., 2010; MRTVI et al., 2017; HALLINGER; WANG, 2019).

EDUCATIONAL PROGRAM, SMG AND SIMULATOR

The EP was applied to an optional subject, in which it is offered in a complementary manner and is not mandatory to students, its menu was similar to the capital market discipline of the pedagogical project of the administration course of the educational institution. The difference was the adoption of the experiential learning strategy of the business game. The educational program comprises: (a) the syllabus of the subject composed of general objective, specific objective, methodology, evaluation criteria, course program, main bibliography, complementary bibliography and websites for research; (b) lesson plan - consisting of the steps and activities of each class; (c) stock market game manual.

The game developed, SMG seeks to create a competitive environment by comparing the performance of teams, where participants can experience the situations that exist in the day-to-day of the stock market. In this scenario, they are encouraged to strategize and make decisions, to experience the emotions and tensions that many investors experience, but without incurring real risks, such as losing money.

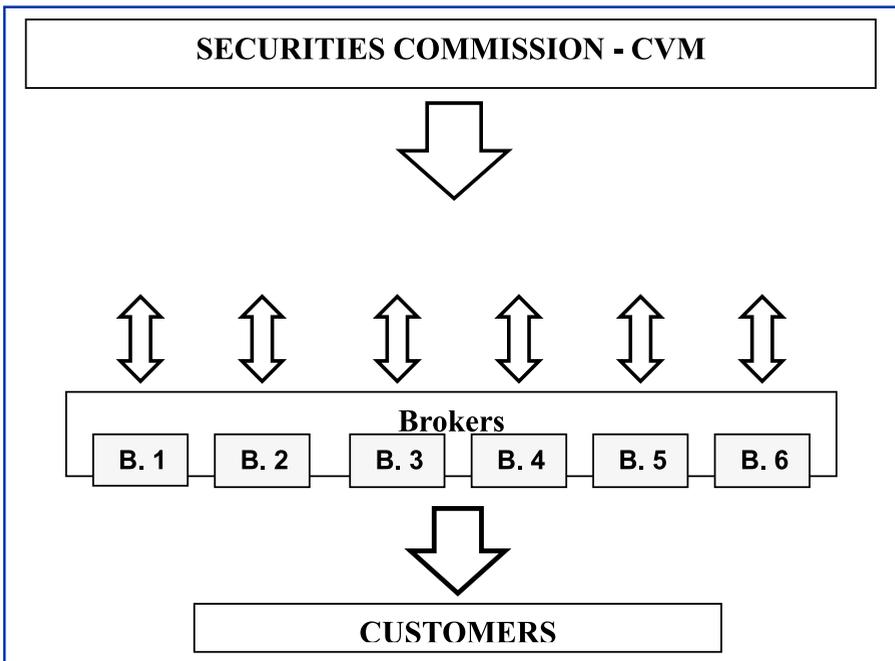
It was decided to develop a game of low complexity and with minimal cost, in order to facilitate the insertion of this technique in higher education institutions. For this, the support artifact or simulator chosen for the game was the BM&FBOVESPA Electronic Stock Simulator, available for free on the websites of Uol and Folha. In the study it was decided to use the Folhainvest Simulator, available on the website: www.folhainvest.com.br, although both simulators have the same specificities, differentiating only the colors of the layout.

The Folhainvest Simulator arose from a partnership between BM&FBOVESPA S.A. and the company Folha da Manhã S.A. ("FOLHA"). The main objective is to offer participants the possibility to get to know the stock market. Registration is free and maintained through eleven simulation cycles, where participants compete against each other.

As it is a competition system, the Folhainvest Simulator presents a regulation, available on the website, which must be respected. Therefore, the preparation of the SMG considered an adaptation to this regulation, so that the participants could participate in the game and, after its end, if there was interest, continue to compete with the other participants registered in the simulator. This simulator was available to the public until 2018, but currently the similar simulator can be used free of charge by the company Vexter, available at <https://vexter.com.br>.

After defining the support simulator, the next step was to develop the SMG, establishing its environment and the agents that compose it. Figure 1 shows how this environment was defined and how the agents interact.

Figure 1 Stock Market Game's Environment



The SMG environment is composed of the following agents

1. **CVM** – disciplines and inspects the real estate market, applying punishments to those who break the established rules. This organ is represented by the professor and the rules established for the game;

2. **BM&FBOVESPA** – Body that provides an adequate environment for carrying out share purchase and sale transactions through the electronic trading system Mega Bolsa. This organ is represented by the Folhainvest Simulator;
3. **Brokers** - Financial institutions authorized to execute their clients' purchase and sale orders, assisting them in making decisions. Represented by the groups participating in the game;
4. **Customers** - Individual or legal entity that wishes to invest its resources in the securities market, also represented by the professor.

The dynamics of this environment will follow the following steps:

- a. Brokers (groups) need to build an asset portfolio for an important client (professor);
- b. After deciding which assets will compose their client's portfolio, the brokers (groups) must execute the orders on the BM & FBOVESPA's Mega Bolsa electronic system (simulator), according to the rules established by the game. In this system, the data from the respective decisions will be processed and the respective results generated with the profitability of the stock portfolio;
- c. The stock portfolio may be modified after each result, according to the degree of customer satisfaction (professor) in relation to the presented profitability;
- d. In case the broker (group) breaches any of the established rules, it will suffer punishment imposed by CVM (professor);
- e. The brokerage firm (group) with the highest profitability to the client will win the game, which will be converted into a note through statistical standardization in order to compose the final average of the discipline.

Research Method

We initially developed the EP considering the content of a capital market course and adapting the lesson plan to include application the SMG. At the start of the

game, each participant or group receives a hypothetical portfolio of 15 stocks worth the fictitious amount of US\$ 64,000.00. Then the participants can buy and sell stocks (within the rules established for the game), observe price evolution, accompany the trading orders issued and the new composition of the portfolio, obtain account statements, among other actions. During the game the participants are stimulated to formulate strategies and make decisions, experiencing the same emotions that many investors do, without incurring the actual risk of losing money (SALAS; WILDMAN; PICCOLO, 2009). The winner is the person or team whose portfolio is worth the most (highest return) at the end of the period.

Besides presenting low operational complexity (OLIVEIRA; SAUAIA, 2011; ALSHEHRI, 2017), the application of the SMG does not require large financial or technological resources, favoring its use. For this to be possible, we chose an electronic stock market simulator made available at no cost over the internet, which has an interface similar to a home broker program but reports the market movements with a delay of 15 minutes.

The application of the EP served as a data collection instrument for a quasi-experiment, a research technique intermediate between a pre-experiment and experiment. The basic idea is that even without the possibility of randomly distributing people or groups under experimental conditions, a factor that precludes controlling what happens to whom, it is still possible to carry out a study and analyze the cause-effect relationships with groups that are not equivalent, by observing what happens to whom and when (KONG et al., 2017). The choice to use the quasi-experimental technique was due to the impossibility of randomly distributing the subjects and controlling all the variables in the sample, as well as the absence of a control group.

The experiment was conducted with two independent samples from a single population of students taking a course on capital market topics, where the content was divided between expositive classes and the business game, stimulating the students to engage in a simulated competition. The difference between the samples was the timing of the program: in group 1 (G1), called the Sequential Group—the EP was applied with content first and practical experience afterward (with four business game rounds). In turn, in group 2 (G2), called the Simultaneous Group, the EP was applied with content and practical experience together (eight business game rounds).

The participants consisted of two groups of undergraduate business students at a public university located in the state of Rio de Janeiro, Brazil, taking an elective course lasting 30 hours. The elective nature of the discipline precluded trying to maintain representativeness of the samples, so these were defined by convenience. There were 26 students in G1 and 29 in G2. In G1 there was higher concentration of students in the sixth semester, followed by those in the second semester, while in G2 the respective first and second concentrations were students in the eighth and seventh semesters (Table 1).

Table 1 Composition of the samples

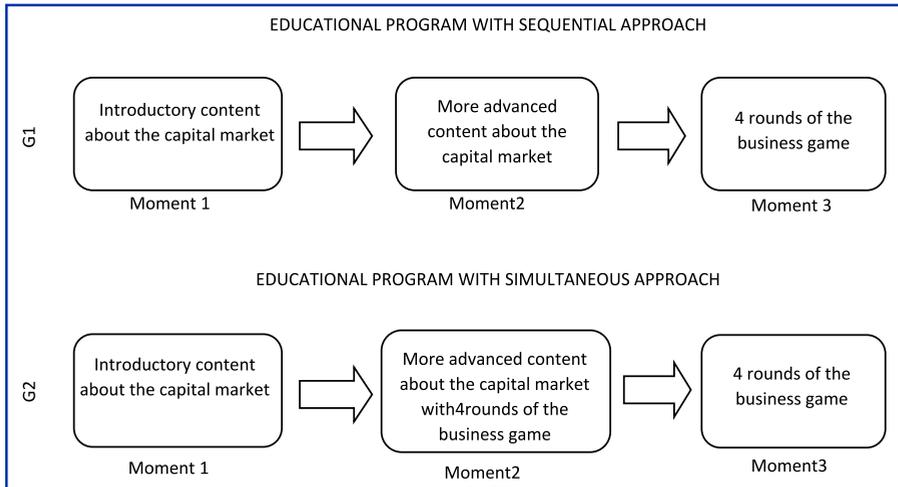
Semester of the Course	Number of Students	
	Group 1	Group 2
2nd	8	2
3rd	2	2
4th	4	0
5th	0	1
6th	10	2
7th	0	5
8th	2	17
Total	26	29

The hypotheses indicated below were formulated considering our objective of analyzing the assimilation of knowledge (cognitive domain) of the participants after the discipline, considering two moments of introducing the game.

- H_0 – The group with sequential application will present average assimilation **equal** to that of the group with simultaneous application.
- H_1 – The group with sequential application will present average assimilation **different** than that of the group with simultaneous application.

With respect to the variables, the independent variable was the type of approach adopted in the EP (Figure 2), divided into three moments so as to stimulate the cognitive concept in linear form (from simpler to more complex).

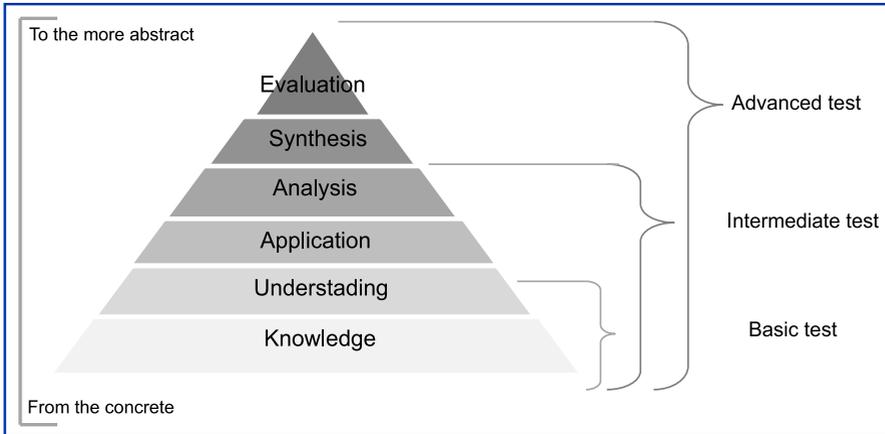
Figure 2 Independent variable: Type of approach of the educational program



Moment 1 consisted of introduction to the main concepts of the capital market, and was applied equally to both groups. In Moment 2, the concepts about the stock market were covered differently between the two groups, For G1 (sequential group), the content was applied in the traditional way in four classes lasting two hours each. For G2 (simultaneous group), the content was applied together with the business game, with the first class hour devoted to theory and the second hour reserved for the game. These first four rounds of the game were called the experimental rounds. Finally, in Moment 3, both groups took part in four rounds of the game, lasting two hours in each of four classes. In this moment the students could experience the content and the dynamics of the stock market.

The dependent variable was defined as the level of assimilation of knowledge of the content of the discipline. The measurement of this variable was the average of three tests applied during the course. These tests were prepared based on the taxonomy of Bloom of the cognitive domain (BLOOM, 1956; ANDERSON; KRATHWOHL; BLOOM, 2001), as presented in Figure 3.

Figure 3 Formulation of the tests according to the taxonomy of Bloom



The first test was composed of eight objective questions and two discursive questions. Since it was a basic level test, it only was given a weight of one. Its questions were prepared following the first and second levels of Bloom's taxonomy (1956) and Anderson, Krathwohl and Bloom (2001), to measure the students' comprehension of the basic information about the financial and capital market and its importance to a society. It was applied after Moment 1.

The second test was composed of nine objective questions and one discursive one. It was applied after Moment 2, when specific aspects of the capital market were covered, such as its functioning and types of analysis of stocks. Considering its intermediate level, it received a weight of two and its questions involved the third and fourth levels of Bloom's taxonomy, which includes applying the contents addressed in real situations and analyzing how they are related.

The third test, at the advanced level, was applied at the end of the EP, after the experience of playing the business game. The questions covered the fifth and sixth levels of taxonomy, where the objective was to ascertain the students' skill in combining the various contents covered and to evaluate them for a specific purpose. Due to the level of difficulty, this test was composed of only objective questions and weight was attributed to it of three.

The authors who research business games have already formed a consensus that the result in the game as being collective should be used as a control variable

when researching content assimilation (ANDERSON; LAWTON, 2009; FARASHAHI; TAJEDDIN, 2018; HALLINGER; WANG, 2019), as was the case with this research. Using the result of a business game is associated with analyzing improvements in behavioral aspects and soft skills (WOLFE; LUETHGE, 2003; LOVELACE; EGGERS; DYCK, 2016; MOHSEN, ABDOLLAHI; OMAR, 2019).

With respect to the statistical tests, for the univariate analysis we considered: (i) the weighted average of the three tests applied, since they had different difficulty levels, according to the levels of Bloom's taxonomy (1956) (test 1 – weight one, test 2 – weight two and test 3 – weight three); (ii) the percent variation between the tests, to verify the occurrence of progressive assimilation of knowledge by the students; and (iii) the Kolmogorov-Smirnov (KS) adherence tests, to check whether the data were normally distributed.

Since the sample in this study was obtained by convenience, and our objective was not to calculate the exact difference in the participants' assimilation, but instead whether a difference between the two groups existed, we applied the nonparametric Mann-Whitney U-test for the bivariate analysis, even though the data had been measured on a scale of 0 to 10 and the KS test had indicated a normal distribution of the observational variable. According to Chung and Romano, (2016), despite the weakening of the hypotheses, the Mann-Whitney test is almost as strong as that for two sample means. Besides this, when the distribution is normal, the asymptotic efficiency of the Mann-Whitney test is equal to 95.5% of the efficiency of Student's t-test (PECHORRO et al., 2017).

ANALYSIS AND DISCUSSION OF THE RESULTS

All told, we applied nine KS tests of normal distribution of the data, at a significance level (α) of 95%. The parameters tested were: (1) weighted mean of G1; (2) weighted mean of G2; (3) weighted mean of the two groups together; (4) percent variation of tests 1 and 2 of G1; (5) percent variation of tests 1 and 2 of G2; (6) percent variation of tests 2 and 3 of G1; (7) percent variation of tests 2 and 3 of G2; (8) percent distribution of tests 1 and 2 of the two groups together; and (9) percent distribution of tests 2 and 3 of the two groups together. The decision of all the tests was retention of the null hypothesis, i.e., non-rejection of H_0 (Table 2). This allowed concluding at 95% significance that the set of data tended to a normal distribution.

Table 2 Summary of the Kolmogorov-Smirnov (KS) tests

	Null Hypothesis	Significance	Decision
1	The distribution of the weighted average of G1 is normal with mean 4.05 and standard deviation 0.94.	0.935	Retain H_0 (null hypothesis)
2	The distribution of the weighted average of G2 é normal with mean 4.00 and standard deviation 0.85.	0.979	Retain H_0 (null hypothesis)
3	The distribution of the weighted average of G1 e G2 (juntas) é normal with mean 4.02 and standard deviation 0.89.	0.966	Retain H_0 (null hypothesis)
4	The percent variation of the weighted mean of tests 1 and 2 in G1 is normal with mean 1.76 and standard deviation 1.01.	0.709	Retain H_0 (null hypothesis)
5	The percent variation of the weighted mean of tests 1 and 2 in G2 is normal with mean 1.21 and standard deviation 0.65.	0.761	Retain H_0 (null hypothesis)
6	The percent variation of the weighted mean of tests 2 and 3 in G1 is normal with mean 0.10 and standard deviation 0.25.	0.727	Retain H_0 (null hypothesis)
7	The percent variation of the weighted mean of tests 2 and 3 in G2 is normal with mean -0.03 and standard deviation 0.37.	0.734	Retain H_0 (null hypothesis)
8	The percent variation of the weighted mean of tests 1 and 2 in G1 and G2 (together) is normal with mean 1.47 and standard deviation 0.87.	0.260	Retain H_0 (null hypothesis)
9	The percent variation of the weighted mean of tests 2 and 3 in G1 and G2 (together) is normal with mean 0.04 and standard deviation 0.32.	0.984	Retain H_0 (null hypothesis)

The Mann-Whitney U-test was applied to compare the percent variation of the tests between the two groups, to verify the existence of any differences in the assimilation of the cognitive domain resulting from the type of treatment. This comparison is carried out based on the medians of the data analyzed. The samples, determined by convenience, had different sizes: G1 had 26 students and G2 had 29. This difference was not relevant, since there is no requirement for the two samples to have the same size (CHUNG; ROMANO, 2016). The confidence level was 95%. The Mann-Whitney U-test was applied in asymptotic form, where the test statistic can be approximated to a normal one since the size of both samples was greater than 10 members (CHUNG; ROMANO, 2016).

We initially performed a diagnostic test with the scores of the two groups on test 1. Since there was no establishment of a control group and treated group, we chose to conduct the diagnostic test to define the profile of the students regarding basic knowledge of the content of the program at the end of the moment 1, during which the basic concepts of the capital market were taught equally to the two groups. The results are presented in Table 3.

Table 3 Mann-Whitney for the scores on test 1 of groups G1 and G2

Groups	N	Median	Sum of Ranks
1.00	26	23.06	599.50
2.00	29	32.43	940.50
Total	55		
Mann-Whitney U^a	248.50		
Z	-2.168		
Asymptotic Sig. (2 tails)	0.030		

a. Grouping variable: Groups, b. Significance of 5%

The significance of the bilateral test was 0.030, leading to rejection of the hypothesis of equality of the medians and showing the existence of a statistically significant difference in the assimilation of knowledge between the two groups ac-

According to the scores on test 1. The values of the medians indicated that G1 obtained a lower median than G2, i.e., G1 absorbed less knowledge than G2.

The second statistical test checked the percent variation of the weighted average of tests 1 and 2 between the groups, to measure the existence of a difference in assimilation of knowledge between moment 1 and moment 2. The results are reported in Table 4.

Table 4 Mann-Whitney test for variation of scores on tests 1 and 2

Groups	N	Median	Sum of Ranks
1.00	26	32.88	855.00
2.00	29	23.62	685.00
Total	55		
Mann-Whitney U^a	250.00		
Z	-2.141		
Asymptotic Sig. (2 tails)	0.032		

a. Grouping variable: Groups, b. Significance of 5%

The significance of the bilateral test was 0.032, leading to rejection of the hypothesis of equality of the medians. It can thus be concluded that a statistically significant difference exists in the assimilation of knowledge between the two groups from test 1 to test 2. The median of G1 was greater than that of G2, meaning that G1 outperformed G2 in assimilation of knowledge.

The third test compared the percent variation of the weighted average of tests 2 and 3 between the groups. The results are reported in 5.

In this third test, the result did not show a statistically significant difference for a confidence interval of 95%, since the significance of the bilateral test was 0.088. However, comparison of the medians of the two groups reveals that the median of G1 was higher than that of G2, suggesting better assimilation of knowledge by G1. Therefore, we chose to apply the unilateral test, which considers the exact p-value (PECHORRO et al., 2017).

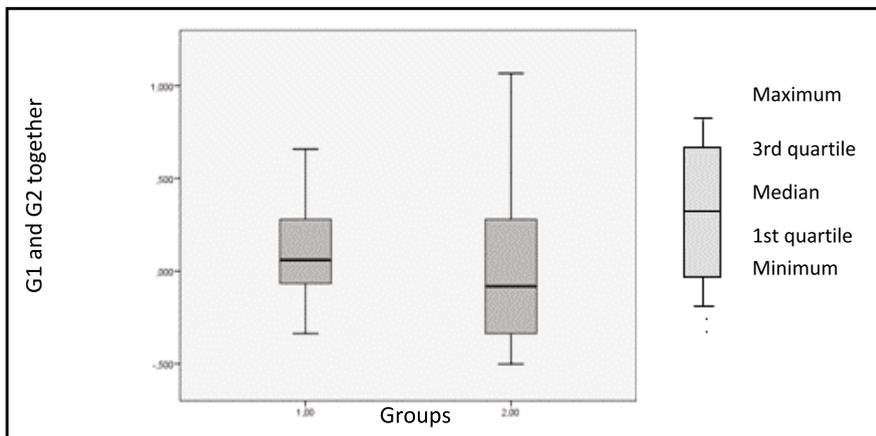
Table 5 Mann-Whitney test for variation of scores on tests 2 and 3

Groups	N	Median	Sum of Ranks
1.00	26	31.88	829.00
2.00	29	24.52	711.00
Total	55		
Mann-Whitney U^a	276.00		
Z	-1.704		
Asymptotic Sig. (2 tails)	0.088		

a. Grouping variable: Groups b. Significance of 5%

According to Pechorro et al., 2017, the use of the unilateral p-value should always be preceded by correct reading of the data by comparison of the means of the orders or by graphical representation through a box plot (Figure 4). It can be seen in the graph that the data from G1 have a higher median than those of G2. The visual comparison shows that the measure of variability or dispersion of the data is greater for G2. This dispersion is also observed by the difference between the third and first quartiles. Despite this, no outliers were detected.

Figure 4 Difference in the variation of tests 2 and 3 between the samples



After comparing the data graphically by the box plots, we applied the unilateral statistical test. Since the median of the data of G1 was higher than that of G2, the exact p-value reported for the unilateral test to the right, with variation of $G1 >$ variation of G2. Table 6 reports the results of the unilateral test.

Table 6 Unilateral Mann-Whitney test for variation of tests 2 and 3

Groups	N	Median	Sum of Ranks
1.00	26	31.88	829.00
2.00	29	24.52	711.00
Total	55		
Mann-Whitney U^a	276.00		
Z	-1.704		
Exact sig. (1 tail)	0.045		

a. Grouping variable: Groups, b. Significance of 5%

The exact p-value of 0.016 is lower than 0.05, meaning non-acceptance of H_0 , statistically verifying that the assimilation of the cognitive domain of G1 was greater than that of G2.

Therefore, the comparison of the results of the tests applied during the quasi-experiment shows superior assimilation of knowledge by G1, which received all the theoretical content before playing the business game, in relation to G2, which received theoretical content at the same time as playing the game. This superiority occurred both in the variation of tests 1 and 2 and of tests 2 and 3. Curiously, in the diagnostic test, given before the application of the game, G1 demonstrated lower assimilation than G2. This result demonstrates that in the situation in question, presenting theoretical contents before applying the game had a significantly positive influence on aspects related to assimilation of the cognitive domain. This observation allowed raising five points for discussion: (1) preparation level of the students; (2) complexity level of the game; (3) influence of emotions in trading decisions; (4) degree of involvement in the game; and (5) role of the instructor. These points are detailed in Table 7.

Table 7 Theoretical Alignment of the Results

Aspects	Theoretical Alignment
Preparation level of the students	Decisions based on personal experiences and traditional wisdom affect learning of concepts (ANDERSON; LAWTON, 2003; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016; HAMARI et al., 2016; HALLINGER; WANG, 2019).
Complexity level of the game	Besides the game's complexity, the difficulty of understanding the context can negatively affect the learning (GONEN et al., 2009; 2010; TAO et al., 2012; ZULFIQAR et al, 2019).
Influence of emotions in trading decisions	The participants' emotional state, such as anxiety, overconfidence, impulsiveness, euphoria, panic and others, can influence learning (GOSENPUD; WASHBUSH, 1996, ADOBOR; DANESHFAR, 2006; BOYLE et al., 2016; NADOLNY; HALABI, 2016; ZULFIQAR et al, 2019).
Degree of involvement in the game	The students' degree of involvement with the game and effort to improve their situation can influence learning (GOSENPUD; WASHBUSH, 1996; WOLFE; LUETHGE, 2003; ADOBOR; DANESHFAR, 2006; GONEN et al., 2009; NADOLNY; HALABI, 2016; HAWLITSCHKEK; JOECKEL, 2017; ALSHEHRI, 2017).
Role of the instructor	The instructor's role while applying the game, acting as mediator, helper and guide in the teaching-learning process, can prevent the students from having a biased view of the game's purposes, classifying it as an experience of little value, which would imply decisions without proper comprehension of the context and the information offered (LIN; TU, 2012; PANDO-GARCIA; PERIAÑEZ-CAÑADILLAS; CHARTERINA, 2016; KRIZ; AUCHTER, 2016; WOLFE, 2016; FARASHAHI; TAJEDDIN, 2018).

According to Anderson and Lawton (2003), the early introduction of business games may lead students to recognize that they know little by motivating them to learn. However the evidence found in the study suggests that early introduction may generate students' concern about competition and divert attention from the-

ory, since the level of involvement with the game (GOSENPUD; WASHBUSH, 1996; WOLFE; LUETHGE, 2003; ADOBOR; DANESHFAR, 2006; GONEN et al., 2009; NADOLNY; HALABI, 2016; HAWLITSCHKEK; JOECKEL, 2017; ALSHEHRI, 2017) and the emotions involved during play (GOSENPUD; WASHBUSH, 1996, ADOBOR; DANESHFAR, 2006; BOYLE et al., 2016; NADOLNY; HALABI, 2016; ZULFIQAR et al, 2019) may impair learning. This situation was observed in G2 (simultaneous approach). Students were so concerned about the results of the game or with what strategy they adopted that they did not pay attention to what was being taught. Thus, they had difficulties in understanding the theory and applying the knowledge in exercises that required analysis of situations close to reality.

Already in G1 (sequential approach) the structured sequence of steps facilitated the understanding of the theory for the practice and the involvement and emotions experienced during the game were positive. For example, one team developed a decision support tool, based on a spreadsheet that controlled how much capital was invested and how much to invest, not wasting time and preventing mistakes in decisions.

Another evidence observed in the study was that besides the level of complexity of the game (GONEN et al., 2009; 2010; TAO, et al., 2012; ZULFIQAR et al, 2019) one must also consider the level of complexity of the content to be given. Although the level of complexity of the SMG was considered low because it presents a simple structure and easy to understand (OLIVEIRA; SAUAIA, 2011; ALSHEHRI, 2017), the difficulty in understanding the complexity of the stock market may have impaired the cognitive domain assimilation of G2. In cases such as this it is important that the attention of the instructor during the game is important in order to identify possible decisions that are being made without a proper understanding of the context and the information that has been made available.

Discussion and Final Remarks

The business game applied here was effective by allowing the students to experience the dynamics and complexity of the capital market in the classroom, in a competitive environment that favored assimilation of complex contents.

We chose the stock market simulator made available by the internet to process the results of the participants' decisions. This choice was based on two motives: (i) the simulator has an interface like a home broker platform and the stock prices are the real ones quoted on the exchange, only with a delay of 15 minutes, assuring good realism of the game; and (ii) there is no cost, favoring its use by institutions of higher learning regardless of the condition their finances.

We applied the educational program in two versions, by means of a quasi-experiment, in an elective course in an undergraduate business administration program at a public university in the state of Rio de Janeiro, Brazil. In the first group (G1), the concepts about the capital market (introductory and advanced) were taught first, followed by the application of the SMG, while in the second group (G2), the market concepts were taught along with application of the SMG.

The results of the quasi-experiment revealed statistically significant differences in assimilation of knowledge between the students of G1 and G2. These differences allow concluding that the independent variable – the way the SMG is applied – affected the assimilation of knowledge of the students taking part in the study. Comparison of the results of the tests applied to the two groups showed that the students in G1, who received the entire theoretical content before playing the game, better assimilated the concepts than those in G2, who were exposed to the content simultaneously with the game. It should be pointed out that our diagnostic test revealed that after the first of the three tests taken by the students, those in G1 presented lower assimilation of the introductory concepts those of G2. This situation was reverted both in the scores received after test 2 and after test 3, revealing that the introduction of all the theory before application of the game had a positive and significant influence on the students of G1 regarding assimilation of the concepts.

Therefore, the results presented allow concluding that the best way to apply an EP with business games for assimilation of concepts considered complex, like those of the stock market, is to present the full theoretical content in detail before applying the game. When students are exposed to the content first, they have an opportunity to grasp information more easily and have fewer doubts (ANDERSON; LAWTON, 2003). Therefore, when starting to play the game, they will be better prepared to apply the concepts and form connections between that they studied and experienced, enabling them to analyze the results of each decision more consistent-

ly. Besides this, it is necessary to consider other factors such as the complexity of the game, the types of emotions it can produce in the players and the way it will be conducted by the teacher, since these factors can also influence learning.

This study makes relevant contributions to academics interested in promoting integration of theory and practice in undergraduate business programs, by using games as teaching tools in the classroom, in particular to impart theoretical and practical knowledge about the stock market. The complexity of this market requires particular effort by educators to find alternative methods to promote learning.

As is the case of all scientific studies, this one has several limitations, although these do not invalidate the results presented here.

1. The first limitation regards definition of the sample, since it was a convenience rather than random sample, meaning the participants were chosen because of our access to them. However, according to Anderson and Lawton (2009), Pando-Garcia, Periañez-Cañadillas and Charterina (2016), Hamari et al. (2016), Hallinger and Wang (2019), students have obligations in and outside of school (other disciplines, jobs and family commitments), making a random distribution almost impossible to obtain.
2. The heterogeneity between the samples also had a limiting effect. The students of G1 were mainly in the early semesters of the program, meaning in general they had more time to devote to the discipline, in contrast to those of G2, who were mostly nearing graduation, many of them serving internships, holding jobs and/or working on their course conclusion projects.
3. Another important limitation was the short duration of the capital market discipline (30 hours), especially in light of the lack of prior knowledge by a large portion of the students. When complex concepts are being taught with use of educational games to students who are starting with limited knowledge of a subject, 30 hours can be considered insufficient to cover the theoretical aspects and for the game playing, posing a relevant barrier to learning.
4. In relation to the objective of the study, which was to analyze the students' assimilation of knowledge (cognitive domain), the focus was on cognitive

learning based on real evidence by means of applying tests, where the questions were based on Bloom's taxonomy (1956) and Anderson, Krathwohl and Bloom (2001) . Therefore, we did not carry out assessments based on the participants' perceptions to identify any contributions in the behavioral field.

5. We also did not consider the students' perceptions about the level of complexity, realism and interest in the game, nor did we try to identify the learning styles of the students.
6. The performance by one of the authors of the role of the instructor can also be considered a limitation of the study. Although the fact the same instructor conducted the quasi-experiment with the two groups can be considered positive, Anderson and Lawton (2009); Hamari et al. (2016), Boyle et al. (2016), Hallinger and Wang (2019) warn that if the instructor has a preference for a determined teaching style, or feels more comfortable or proficient in a particular way of conducting classes, this can cause the instructor, albeit involuntarily, to create bias toward traditional expository teaching in detriment to application of learning games.

For future research, the following are some suggestions to advance the use of business games in the classroom, in particular to teach concepts of the stock market:

- Repeat the study with more homogeneous groups, such as students in the same semester, to minimize the effect of intervening variables.
- Adapt the EP for use in a course lasting 60 hours. In this case, we suggest a period for explanation of the basic concepts, followed by four experimental rounds with the possibility of consultation and explanation on the evolution of the teams, and then four more rounds of the game, with the result being considered in each student's grade, finishing with a debriefing, final presentation with final report or an article describing the situations experienced in the business game (PETERS; VISSERS, 2004; KRIZ; AUCHTER, 2016; WOLFE, 2016; FARASHAHI; TAJEDDIN, 2018).

- Conduct studies contemplating the relationship of learning with variables such as perception of the game, realism and level of complexity.
- Investigate the relationship between assessment of cognitive learning based on real evidence (tests) with evaluation of the students' perceptions (questionnaires or other qualitative tools), or also the students' self-perception of their knowledge in comparison with the test scores.
- Consider a study that relates the students' learning styles to the performance in the game and/or test scores.
- Identify through a questionnaire the students' opinion of the role of the instructor. This would provide data to improve the conduction of the game.

We hope the considerations presented in this study can contribute to the development of new studies on the teaching of capital market concepts, as well as the implementation of techniques that integrate theory and practice, to enhance learning.

References

- ADOBOR, H.; DANESHFAR, A. Management simulations: determining their effectiveness. *Journal of Management Development*, v. 25, n. 2, p. 151-168. 2006. DOI: 10.1108/02621710610645135
- ALSHEHRI, A. F. Student satisfaction and commitment towards a blended learning finance course: a new evidence from using the investment model. *Research in International Business and Finance*, v. 41, p. 423-433, Oct. 2017. DOI: 10.1016/j.ribaf.2017.04.050
- ANDERSON, L.W.; KRATHWOHL, D.R., (Eds.). *A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York, NY: Longman, Inc, 2001.
- ANDERSON, PH; LAWTON, L. The optimal timing for introducing business simulations. *Developments in Business Simulation and Experiential Learning*, v. 30, 2003. Retrieved from <https://absel-ojs-ttu.tdl.org/absel/index.php/absel/article/view/696>
- _____. Business simulations and cognitive learning *Developments, Desires, and Future Directions. Simulation & Gaming*, v. 40, n. 2, p. 193-216, Apr. 2009. DOI: 10.1177/1046878108321624
- AUGUSTINIS, V. F.; COSTA, A. de S. M.; BARROS, D. F. Uma Análise Crítica do Discurso de Educação Financeira: por uma Educação para Além do Capital. *Revista Adm.made*, Rio de Janeiro, v. 16, n. 3, p.79-102, 2012. Disponível em < <http://periodicos.estacio.br/index.php/admmade/article/view/553>>
- BEN-ZVI, T. The efficacy of business simulation games in creating decision support systems: an experimental investigation. *Decision Support Systems*, v. 49, n.1, p. 61-69. 2010 DOI: 10.1016/j.dss.2010.01.002

- BLOOM, B. S. (ed.). *Taxonomy of Educational Objectives*. Vol. 1: Cognitive Domain. New York: McKay, 1956.
- BOYLE et al.. An update to the systematic literature review of empirical evidence of the impacts and outcomes of computer games and serious games. *Computers and Education*, v. 94, p. 178-192, 2016. DOI: 10.1016/j.compedu.2015.11.003
- BRAGHIROLLI, L.F et al. Benefits of educational games as an introductory activity in industrial engineering education. *Computers in Human Behavior*, v. 58, p. 315-324, 2016. DOI: 10.1016/j.chb.2015.12.063
- BRASIL. Decreto no 7.397, de 22.12.2010. *Presidência da República*. 2010. Disponível em: <http://www.planalto.gov.br/ccivil_03/_Ato2007--2010/2010/Decreto/D7397.htm>
- BURDON, W. M., MUNRO, K.. Simulation – is it all worth it? The impact of simulation from the perspective of accounting students. *The International Journal of Management Education*, v.15, n.3 , p. 429-448, Nov. 2017. DOI: 10.1016/j.ijme.2017.07.001
- CARENYS, J.; MOYA, S.. Digital game-based learning in accounting and business education. *Accounting Education*, v. 25, n. 6, p. 598-651, Oct. 2016. DOI: 10.1080/09639284.2016.1241951
- CHUNG, E.; ROMANO, J. P. Asymptotically valid and exact permutation tests based on two-sample U-statistics. *Journal of Statistical Planning and Inference*, v. 168, p. 97-105, Jan. 2016. DOI: 10.1016/j.jspi.2015.07.004
- FARASHAHI, M.; TAJEDDIN, M. Effectiveness of teaching methods in business education: a comparison study on the learning outcomes of lectures, case studies and simulations. *International Journal of Management Education*, v. 16, n.1, p. 131-142, Mar. 2018. DOI: 10.1016/j.ijme.2018.01.003
- FITÓ-BERTRÁN, A; HERNÁNDEZ-LARA, A.B.; SERRADELL-LÓPEZ, E. The effect of competences on learning results an educational experience with a business simulator. *Computers in Human Behavior*, v. 51, Part. B, p. 910-914, 2014. DOI: 10.1016/j.chb.2014.11.003
- FREITAS, C. C. G. *Aprendizagem experimental e jogos de empresas no estudo do mercado de capitais: uma aplicação*. 2007. 239 f. Dissertação (Mestrado em Administração), Programa de Pós-graduação em Administração. Universidade Estadual de Londrina, Londrina, 2007. Disponível em <<http://repositorio.uem.br:8080/jspui/handle/1/3212>>
- GOI, C. L.. The use of business simulation games in teaching and learning. *Journal of Education for Business*, v. 94, 55, p. 342-349, Dec. 2018. DOI: 10.1080/08832323.2018.1536028
- GONEN, A.; BRILL, E.; FRANK, M. Learning through business games – an analysis of successes and failures, *On the Horizon*, v. 17, n. 4, p. 356-367, 2009. DOI: 10.1108/10748120910998434
- GOSENPUD, J.; WASHBUSH, J. Correlates of learning in simulations. *Developments in Business Simulation & Experiential Exercises*, v.23, p. 43-48, 1996. Retrieved from <https://absel-ojs-ttu.tdl.org/absel/index.php/absel/article/view/1159>
- HALLINGER, P.; WANG, R.. The Evolution of Simulation-Based Learning Across the Disciplines, 1965–2018: A Science Map of the Literature. *Simulation & Gaming*, 2019. 104687811988824. DOI: 10.1177/1046878119888246
- HAMARI, J. et al.. Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning. *Computers in Human Behavior*, v. 54, p. 170-179, Jan. 2016. DOI: 10.1016/j.chb.2015.07.045

- HAWLITSCHKEK, A., JOECKEL, S.. Increasing the effectiveness of digital educational games: The effects of a learning instruction on students' learning, motivation and cognitive load. *Computers in Human Behavior*, v.72, p. 79-86, Jul. 2017 . DOI: 10.1016/j.chb.2017.01.040
- HERNÁNDEZ-LARA, A. B., SERRADELL-LÓPEZ, E.. Student interactions in online discussion forums: their perception on learning with business simulation games. *Behaviour and Information Technology*, v. 37, n. 4, p. 419-429, Feb. 2018. DOI: 10.1080/0144929X.2018.1441326
- HERNÁNDEZ, A.B.; GORJUP, M.T.; CASCÓN, R. The role of the instructor in business games: A comparison of face-to-face and online instruction. *International Journal of Training and Development*, v.14, n. 3, p. 169-179, 2010. DOI: 10.1111/j.1468-2419.2010.00350.x
- KAYES, C. Experiential learning and its critics: preserving the role of experience in management learning and education. *Academy of Management Learning and Education*, v. 1, n. 2,p. 137-149, Dec. 2002. <https://doi.org/10.5465/amle.2002.8509336>
- KE, F.. Designing and integrating purposeful learning in game play: a systematic review. *Educational Technology Research and Development*, v. 64, n. 2, Dec. 2015. DOI: 10.1007/s11423-015-9418-1
- KEYS, B.; WOLFE, J. The role of de management games and simulation in education and research. *Journal of Management*, v. 16, n. 2, p. 307-336, 1990. DOI: 10.1177/014920639001600205
- KOLB, D.A. *Experimental Learning: experience as a source of learning and development*. New Jersey: Prentice Hall, 1984.
- KONAK, A., CLARK, T.K.; NASEREDDIN, M. Using Kolb's Experiential Learning Cycle to improve student learning in virtual computer laboratories. *Computers & Education*, v. 72, p. 11-22, 2014. DOI: 10.1016/j.compedu.2013.10.013
- KONG, X. T. et. al.. Ubiquitous auction learning system with TELD (Teaching by Examples and Learning by Doing) approach: A quasi-experimental study. *Computers & Education*, v. 111, p. 144-157, Aug. 2017. DOI: 10.1016/j.compedu.2017.04.009
- KORIS, R., ÖRTENBLAD, A.; OJALA, T.. From maintaining the status quo to promoting free thinking and inquiry: Business students' perspective on the purpose of business school teaching. *Management Learning*, v. 48, n. 2, Set. 2017. DOI: 10.1177/1350507616668480
- KRIZ, W. C.; AUCHTER, E.. 10 Years of Evaluation Research Into Gaming Simulation for German Entrepreneurship and a New Study on Its Long-Term Effects. *Simulation & Gaming*, v.47, n. 2, p. 179-205, 2016. DOI: 10.1177/1046878116633972
- LAINEMA, T., NURMI, S. Applying an authentic, dynamic learning environment in real world business. *Computers & Education*, v. 47, n. 1, p. 94-115, 2006. DOI: 10.1016/j.compedu.2004.10.002
- LIN, Y.-L.; TU, Y.-Z. The values of college students in business simulation game: A means-end chain approach. *Computers & Education*, v. 58, n. 4, p. 1160-1170, May 2012. DOI: 10.1016/j.compedu.2011.12.005
- LOVELACE, K. J.; EGGERS, F; DYCK, L. R.. I Do and I Understand: Assessing the Utility of Web-Based Management Simulations to Develop Critical Thinking Skills. *Academy of Management Learning & Education*, v. 15, n. 1, p. 100-121, 2016. DOI: 10.5465/amle.2013.0203
- MARRIOTT, P.; TAN, S. M.; MARRIOTT, N. Experiential learning–A case study of the use of computerised stock market trading simulation in finance education. *Accounting Education*, v. 24, n. 6, p. 480-497, 2015. DOI: 10.1080/09639284.2015.1072728

- MELO, N. H. da S. *Educação financeira para mercado de capitais: a utilização dos jogos de empresas para aprendizagem sobre o mercado de ações*. 2015. 175 f. Dissertação (Mestrado em Gestão e Estratégia). Instituto de Ciências Sociais Aplicadas, Universidade Federal Rural do Rio de Janeiro, Seropédica, RJ. 2015. Disponível em <<https://tede.ufrj.br/jspui/handle/jspui/3067>>
- MOHSEN, K.; ABDOLLAHI, S.; OMAR, S. Evaluating the educational value of simulation games: Learners' perspective. *Innovations in Education and Teaching International*, v. 56, n.4, p. 517-528, 2019. DOI: 10.1080/14703297.2018.1515646
- MRTVI, V. D. O. et al. Jogos de Empresas: Abordagens ao Fenômeno, Perspectivas Teóricas e Metodológicas. *RAC - Revista de Administração Contemporânea*, v. 21, n.1, p. 19–40, 2017. DOI: 10.1590/1982-7849rac2017150212
- NADOLNY, L.; HALABI, A. Student Participation and Achievement in a Large Lecture Course With Game-Based Learning. *Simulation & Gaming*, v. 47, n. 1, 2016. DOI: 10.1177/1046878115620388
- OLIVEIRA, M. A.; SAUAIA, A. C. A. Impressão Docente para Aprendizagem Vivencial: um estudo dos benefícios dos jogos de empresas. *Administração: Ensino e Pesquisa*, v. 12, n. 3, p. 355–391, 2011. DOI: 10.13058/raep.2011.v12n3.159
- PANDO-GARCIA, J.; PERIAÑEZ-CAÑADILLAS, I.; CHARTERINA, J. Business simulation games with and without supervision: An analysis based on the TAM model. *Journal of Business Research*, v. 69, n. 5, p. 1731-1736, May 2016. DOI: 10.1016/j.jbusres.2015.10.046
- PASIN, F.; GIROUX, H. The impact of a simulation game on operations management education. *Computers & Education*, v. 57, n. 1, p. 1240-1254, 2011. DOI: 10.1016/j.compedu.2010.12.006
- PECHORRO, P. et. al. The Reactive–Proactive Aggression Questionnaire: Validation among a Portuguese sample of incarcerated juvenile delinquents. *Journal of Interpersonal Violence*, v. 32, n. 13, 2017. DOI: 10.1177/0886260515590784
- PETERS, V.A.M.; VISSERS, G.A.N. A simple classification model for debriefing simulation games. *Simulation & Gaming*, v. 35, n. 1, p. 70-84, Mar. 2004. DOI: 10.1177/1046878103253719
- RAVYSE, W. S. et. al. Success factors for serious games to enhance learning: a systematic review. *Virtual Reality*, v. 21, n. 1, p. 31-58, 2017. DOI: 10.1007/s10055-016-0298-4
- SALAS, E.; WILDMAN, J.L.; PICCOLO, R.F. Using simulation-based training to enhance management education. *Academy of Management Learning and Education*, v. 8, n. 4, p.559–573, 2009. DOI: 10.5465/amle.8.4.zqr559
- SARMA, M.; PAIS, J. Financial inclusion and development. *Journal of international development*, v. 23, n. 5, p. 613-628, 2011. DOI: 10.1002/jid.1698
- STANTON, A.J.; JOHNSON, J.E.; BORODZICZ, E.P. Educational validity of business gaming simulation: A research methodology framework. *Simulation & Gaming*, v. 41, n. 5, p. 705-723, 2010. DOI: 10.1177/1046878109353467
- SAVOIA, J. R. F.; SAITO, A. T.; SANTANA, D. F. Paradigmas da educação financeira no Brasil. *Revista de Administração Pública-RAP*, v. 41, n. 6, p. 1121-1141, 2007. Disponível em <<http://bibliotecadigital.fgv.br/ojs/index.php/rap/article/view/6620>>
- TAO, Y.H.; CHENG, C.J.; SUN, S.Y. What influences college students to continue using business simulation games? The Taiwan experience. *Computers & Education*, v. 53, n. 3,p. 929-939, 2009. DOI: 10.1016/j.compedu.2009.05.009

- TAO, Y.H.; YEH, C.R.; HUNG, K.C. Effects of the heterogeneity of game complexity and user population in learning performance of business simulation games. *Computers&Education*, v.59, n.4, p.1350-1360,2012. DOI: 10.1016/j.compedu.2012.06.003
- UPPAL, M. A., Ali, S.; GULLIVER, S. R.. Factors determining e-learning service quality. *British Journal of Educational Technology*, v. 49, n. 3, p. 412-416, May. 2017. DOI: 10.1111/bjet.12552
- VLACHOPOULOS, D.; MAKRI, A. The effect of games and simulations on higher education: a systematic literature review. *International Journal of Educational Technology in Higher Education*, n. 22, July 2017. DOI: 10.1186/s41239-017-0062-1
- WESTERA, W.. How people learn while playing serious games: A computational modelling approach. *Journal of Computational Science*, v. 18, n. 1, p. 32-45, 2017. DOI: 10.1016/j.jocs.2016.12.002
- WOLFE, J. . Assuring Business School Learning with Games. *Simulation & Gaming*, v. 47, n. 2, p. 206–227, 2016. DOI: 10.1177/1046878116632872
- WOLFE, J.; GOLD, S. A study of business game stock price algorithms. *Simulation & Gaming*, v. 38, n. 2, p. 153-167, 2007. DOI: 10.1177/1046878107300444
- WOLFE, J.; LUETHGE, D.J. The impact of involvement on performance in business simulations: An examination of Goosen's "know little" decision-making thesis. *Journal of Education for Business*, v. 79, n. 2, p. 69-74, 2003. DOI: 10.1080/08832320309599091
- ZULFIQAR, S.. An Analysis of Influence of Business Simulation Games on Business School Students' Attitude and Intention Toward Entrepreneurial Activities. *Journal of Educational Computing Research*, v. 57, n. 1, 2018. DOI: 10.1177/0735633117746746