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Explaining students' perception of knowledge acquisition and motivation in business games: The influence of group processes

Explicar la percepción de los estudiantes sobre la adquisición de conocimientos y su motivación en los juegos de negocios: La influencia de los procesos grupales

Explicando a percepção dos alunos sobre a aquisição de conhecimento e sua motivação em jogos de negócios: A influência dos processos de grupo

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Abstract

In this study, we investigate how factors associated with social-contextual constraints to the deployment of business games can affect students' perception of knowledge acquisition, and thereby, their motivation to face coursework challenges and obtain a bachelor degree in Business Administration. We propose that Management knowledge acquisition through business games is influenced by group efficacy beliefs developed during the game, which depend on the quality of intra-group processes, such as positive team interactions, communication and collaboration to reach game goals. Our hypotheses are tested with data collected during a game ran with 376 undergraduate students from a top Brazilian business school. The results generated in a structural equations modeling (SEM) analysis confirmed the relevance of group processes on student's attitudes and learning outcomes. Our findings can be used by Brazilian and Latin American schools to guide their efforts to increase the efficacy of their learning processes.

Keywords: Higher Education; Learning; Business Games; Group Processes; Efficacy Beliefs

Resumen

En este estudio, investigamos cómo los factores asociados con las restricciones socio-contextuales para la implementación de juegos de negocios pueden afectar la percepción de los estudiantes sobre la adquisición de conocimientos y, por lo tanto, su motivación para enfrentar los desafíos de los cursos y obtener una licenciatura en Administración de Empresas. Proponemos que la adquisición de conocimientos de gestión a través de juegos de negocios está influenciada por las creencias de eficacia grupal desarrolladas durante el juego, que dependen de la calidad de los procesos intragrupales, como las

interacciones positivas del equipo, la comunicación y la colaboración para alcanzar los objetivos del juego. Nuestras hipótesis se prueban con datos recopilados durante un juego realizado con 376 estudiantes de pregrado de una de las mejores escuelas de negocios brasileñas. Los resultados generados en un análisis de modelos de ecuaciones estructurales (SEM) confirmaron la relevancia de los procesos grupales en las actitudes de los estudiantes y los resultados del aprendizaje. Nuestros hallazgos pueden ser utilizados por escuelas brasileñas y latinoamericanas para guiar sus esfuerzos para aumentar la eficacia de sus procesos de aprendizaje.

Palabras clave: educación universitaria; aprendizaje; juegos de negocios; procesos grupales; creencias de eficacia

Resumo

Neste estudo, investigamos como os fatores associados às restrições sócio-contextuais à implantação de jogos de negócios podem afetar a percepção dos alunos sobre a aquisição de conhecimento e, portanto, sua motivação para enfrentar os desafios do curso e obter um diploma de bacharel em Administração de Empresas. Propomos que a aquisição de conhecimento em Gestão por meio de jogos de negócios seja influenciada por crenças de eficácia de grupo desenvolvidas durante o jogo, que dependem da qualidade dos processos intragrupo, como interações positivas da equipe, comunicação e colaboração para atingir os objetivos do jogo. Nossas hipóteses são testadas com dados coletados durante um jogo executado com 376 alunos de graduação de uma importante escola de negócios brasileira. Os resultados gerados em uma análise de modelagem de equações estruturais (SEM) confirmaram a relevância dos processos de grupo nas atitudes dos alunos e nos resultados de aprendizagem. Nossos achados podem ser usados por escolas brasileiras e latino-americanas para orientar seus esforços para aumentar a eficácia de seus processos de aprendizagem.

Palavras-chave: ensino superior; aprendizagem; jogos de negócios; processos de grupo; crenças de eficácia

1 Introdução

Business simulation games became quite popular in the last decades. They have been used in undergraduate and graduate-level programs to help students learn and experience business matters before facing real-world challenges. Although reviews have observed some ambivalent results (Vandercruysse, Vandewaetere, & Clarebout, 2012), in general, business games are said to boost individual academic outcomes (e.g., Fitó-Bertran et al., 2014; Ranchhod et al., 2014). In this article, we propose that simulations might affect other student outcomes besides their specific, intended learning targets. Since Business games present students with an opportunity to sample the practical routines of managerial decision-making, they can also influence students' attitudes towards the undergraduate business coursework and business administration as a profession.

When simulations are played in teams, students should learn through collaboration while working the game out. Nevertheless, since variations in team characteristics and processes tend to affect group performance (Einstein and Scott, 2005; Tao et al., 2012), gaming experiences and outcomes are likely to vary across teams, particularly in competitive games. Even though knowledge acquisition in a business simulation should not be directly tied to team performance in the game (Whiteley and Faria, 1989), the experiences students have during a game are likely to influence their beliefs and attitudes. Drawing on frameworks of psychosocial group processes (Cohen and Bailey, 1997; Lepine et al., 2008) and Bandura's Social Learning Theory, we posit that group processes during the game can influence students' efficacy beliefs, and through them, affect their motivation to face academic challenges, and their certainty regarding career choice. To the best of our knowledge, such implications have not yet been investigated by academic research.

We develop a causal model that incorporates the propositions above and present the statistical test results of the corresponding hypotheses. Our analysis relies on data collected during a business game ran with

students from a top Brazilian Business school during their first term in the program. Results from structural equation modeling confirm our hypotheses.

In our conclusion, we discuss the theoretical and practical implications of our findings, offering recommendations that can help educational institutions avoid pitfalls and make the best use of business games in their programs. Latin American higher-education institutions, in particular, should benefit from our suggestions as they usually face more substantial restrictions as far as the availability of resources is concerned. Moreover, in many Latin American countries, the shortage of a well-prepared workforce has been seen as a bottleneck for attracting investments, developing the economy, and providing better services and products for the population. Thus, consistent guidance for improving the quality and quantity of high-level professionals in the labor market may help not only to strengthen the competitiveness of educational institutions but also, although indirectly, to support the sustainable development of the region.

2 Theoretical Background and Hypotheses

2.1. Business Games and Knowledge Acquisition

Although game-based learning has been long applied in various contexts (Leemkuil & de Jong, 2012), the increasing offer of computer-assisted games for education and training has spun considerable research interest on games as learning tools. The so-called "serious games" have education, rather than entertainment, as their primary goal (Michael & Chen, 2005), and take advantage of the technological features that made console-based and web-based games popular across generations of players, with particular appeal to current student cohorts (Proserpio & Gioia, 2007).

Wilson et al. (2008) defined games as a competitive activity with a specific goal, in a specific context, which follow a set of rules and constraints and vary in emotional tones, from humorous to violent. The authors differentiate games and simulations, suggesting that while the latter are also interactive and involve given goals and contexts, they also try to model a real-life phenomenon accurately. Simulations are frequently used as teaching and training tools in health care, the military, emergency management, and Business (Michael & Chen, 2005; Wilson et al., 2008).

While games seem to promote learning, motivation, and performance (e.g., Egenfeldt-Nielsen, 2007; Vogel et al., 2006), research on these topics still lacks conceptual developments to connect particular game attributes to specific learning outcomes (Bedwell, Pavlas, Hayne, Lazzara & Salas, 2012). Based on recent reviews, issues regarding the effects of game-based learning on learning performance are not entirely settled, as research findings have been ambivalent (e.g., Vandercruysse, Vandewaetere, & Clarebout, 2012).

Business simulation games are often used in undergraduate and graduate-level programs to foster the learning of core business and management concepts while also nurturing decision-making skills (Blažič, Ribeiro, Fernandes, Pereira, Arh, 2012). They can be played in single or multiplayer modes. Multiplayer games are said to serve behavioral purposes because they create a context where participants can "learn to work in groups, deal with conflicts, communicate, motivate others, and exercise leadership" (Blažič et al., 2012).

Researchers have observed that specific conditions are likely to affect the effectiveness of games as learning tools. The amount of student support provided during a simulation is one factor that can influence such outcomes (Jong, 2006; 2010). In their study, Pasin and Giroux (2011) concluded that learning operations management through a game was more effective than traditional teaching when learners could develop decision-making abilities to manage complex and dynamic situations. That would be so because when interdependence among team members increases, team coordination, i.e., communication and support behaviors within the team, is more likely to be intertwined with the tasks to be handled, and thereby more heavily influence effective functioning and performance outcomes (Nahrgang et al., 2013). Nevertheless, because many complex business games are often played with little supervision or facilitation of within-team interactions, such social constraints related to intragroup processes are likely to influence gaming experience and game outcomes.

2.2. The Role of Internal Group Processes

Cohen and Bailey (1997) define workgroups as sets of individuals who have interdependent tasks, who share responsibility for work outcomes, and who see themselves and are seen as part of a social entity embedded in a broader social system. In general, the greater the mindfulness or complexity involved in a

task, the stronger the role played by team processes in regards to task accomplishment and team outcomes (Lepine et al., 2008).

In their model of group effectiveness, Cohen and Bailey (1997) suggest that factors associated with the formative structure of groups (number, capacities, and diversity of team members) directly influence the quality of group interaction processes. Such processes, defined as the way interactions, relationships, communication, and conflict resolution occur in a group, then influence group results (e.g., team performance), attitudes of group members (e.g., satisfaction with the work done), and their future behavior (e.g., voluntary turnover intentions). Lepine et al. (2008) refer to this approach as the input-process-outcome heuristic (IPO), a prevalent framework in the team effectiveness literature.

Besides team member task competencies (i.e., knowledge, skills), teamwork competencies (i.e., team leadership, adaptability) also seem to influence group outcomes (McIntyre & Salas, 1998). Teamwork has been conceptualized as "dynamic, simultaneous and recursive enactment of process mechanisms which contribute to or inhibit team performance and performance outcomes" (Salas, Stagl, Burke & Goodwin, 2007, p.190). It has been empirically associated with team performance and member satisfaction, independent of process type (transition, action, or interpersonal processes) and level of task specificity (Lepine et al., 2008).

Besides, teamwork processes seem to have implications for group cohesion and group potency (see Lepine et al., 2008). Group cohesion has been defined as the level of group integration and individual member attraction to the group (Carron & Brawley, 2012). Group potency, a generalized version of collective efficacy, is a group's belief that it can handle specific tasks (Stajkovic, Lee & Nyberg, 2009). Research on student teams has indicated that groups that receive pre-game training initially outperform their competitors. However, as the other groups develop their cohesiveness, performance differences significantly lessened over time (Ritchie et al. 2013). These observations suggest that intragroup processes that can spontaneously emerge during a game can have implications for team outcomes.

Since settings in which specific game goals are set more strongly restrict team coordination, i.e., communication and support behaviors within the team, than those without specific performance targets (Nahrgang et al., 2013), team processes and outcomes in games are likely to be significantly intertwined in competitive simulations, where the specific target is to outperform the other teams. In this article, we focus on two specific dimensions of team coordination associated with group cohesion and can also mobilize group potency, namely group collaboration and communication.

2.3. Group Collaboration and Communication

Games are a learning tool the ideally should facilitate cooperative learning, or the process of learning by working together and helping each other out (Murray, 1990). Collaboration, i.e., the "coming together" of diverse interests to achieve a common purpose through interactions and coordinated activities (Jassawalla & Sashitatal, 1998), is fostered by group cohesion. LePine and colleagues (2008) have observed that cohesion boosts efforts among team members not only to fulfill individual obligations but also to help teammates perform their tasks. The authors suggest that the level of cooperation observed among group members can be strengthened through monitoring and backup behaviors in the groups, which can take different forms, such as coaching initiatives, when group members serve as mentors to one another. In addition, we believe that a high level of integration and cooperation in a group also favors knowledge sharing, as positive interactions and synergetic collaboration create opportunities for positive peer exchanges, which seems to be particularly relevant in the context of game-based learning.

Theoretically, games should also provide equal opportunities for every team member to be involved in the activity (Benek-Rivera & Mathews, 2004). Communication is the mechanism that allows teams to convert individual level cognitions into team level coordinated actions (Cooke, Salas, Kiekel & Bell, 2004). Communication in workgroups is essential to control and guide coordinated group activity, especially in complex settings. In teamwork, information exchange allows a group to collaborate more effectively to achieve a given goal, be it a target set in the workplace or a target set in a business simulation. While ineffective communication in teams is often an outcome of poor social interaction patterns, effective communication unfolds from group interactions that promote trust (Druskat & Wolff, 2001). Indeed, support

and trust have been considered essential elements to foster team communication and learning (Edmondson, 1999).

Given the above, as well as research evidence that increased cohesion and identification in teams can affect team communication and performance in simulations (Einstein & Scott, 2005), we propose that:

H1: positive group interactions during a simulation is associated with group communication

H2: positive group interactions during a simulation is associated with group collaboration

H3: group communication is positively associated with group collaboration

2.4. Efficacy Beliefs

Jourden and Bandura (1991) used simulations to study the influence of socio-cognitive factors in group decision-making processes and performance. They observed that, when dealing with complex problems, the resources and capabilities of group members are delimited by multiple levels of interdependence, so that more substantive results require that individuals act together to generate an aggregate product. In Social Cognitive Theory, collective efficacy is defined as people's shared perception that a group has the necessary resource allocation, coordination, and integration capacity and skills to effectively respond to a specific, contextual demand and achieve its goals (Bandura, 1986; Zaccaro et al., 1995). The locus of collective efficacy assessment is the minds of individual group members, given that there is no physical entity such as a group mind (Bandura, 1986).

Collective efficacy has been pointed out as an essential element in workgroups since it tends to affect the attitudes, motivation, and behaviors of group members (Bandura & Jourden, 1991; Zaccaro et al., 1995). In longitudinal studies, researchers have observed that workgroup processes (communication and cooperation) can change efficacy beliefs overtime (Lester, Meglino & Krosgaard, 2002), especially in the context of highly interdependent tasks. That is so because interdependency requires more frequent interactions among team members, who can monitor each other's performances and, thereby, better assess the availability of competencies and knowledge necessary to achieve the intended outcomes (Stajkovic et al., 2009). Thus, given the high degree of interdependence usually involved in business simulations decision-making, it is reasonable to expect that workgroup processes such as cooperation and communication will affect individuals' perceptions of collective efficacy in a team. Therefore, we propose:

H4: group collaboration during the simulation is positively associated with group efficacy beliefs

H5: group communication during the simulation is positively associated with group efficacy beliefs

Collective efficacy developed through team interactions can also influence participants' motivation to engage effectively in team activities. Such beliefs, which can emerge quite early in a group's history, are likely to impact individuals' assessments of their prospects of winning the game. Therefore, it can influence the amount of time and effort team members will invest in the exercise, particularly in simulations with explicit competition schemes.

Business simulations require team members to work together in order to achieve better results. Santos (2003) argues that the learning process in business games is enhanced by dynamic information exchange, that is, by participants' sharing of points of view, ideas, and past experiences. Hence, participants' attitudes and involvement in a simulation may be more relevant for knowledge acquisition than the complexity and quality of the simulation itself (Arbex, 2005). Thus, although team performance may not be directly tied to knowledge acquisition in business simulations (Whiteley & Faria, 1989), individual functioning, group functioning, and group results can become deeply entangled in such context (Lindsley, Brass, & Thomas, 1995). This suggests that there may be spillover effects between collective efficacy and self-efficacy in business simulations.

Based on the above ideas and empirical evidence observed in the literature, it is reasonable to expect that students' beliefs regarding collective efficacy in business games can influence his/her perceptions of knowledge acquisition in a simulation. In this particular context, knowledge refers not only to simulation-specific business decisions and how they should be made but also to the particular individual abilities and

competencies necessary to make these decisions effectively. Therefore, we propose the following hypothesis:

> *H6: students' group efficacy beliefs are positively associated with their level of knowledge acquisition in the simulation*

2.5. Business Knowledge Acquisition and Student Outcomes

As students develop a better understanding of the tasks, decisions, and competencies involved in a career in Management and the necessary components an undergraduate program should have in order to develop those competencies, it should become more evident to those who participate in a simulation whether their decision to pursue a degree and later a career in Business was fitting for them. Hence, we propose that:

> *H7: students' level of knowledge acquisition in the simulation is positively associated with their confidence regarding their career choice.*

It is also reasonable to expect that Business students that are more certain of their career choice will tend to set intrinsic goals for themselves regarding the development of their managerial competencies. Since intrinsic goals related to the satisfaction of growth needs (Ryan and Deci, 2000) can "promote deeper processing of the learning material, greater conceptual understanding of it, and both short-term and long-term persistence at relevant learning tasks" (Vansteenkiste et al., 2006, p. 28), we also propose that:

> *H8: students' confidence regarding their career choice is positively associated with their motivation to complete the BA in Business.*

On the other hand, students' motivation to face the challenges involved in obtaining a degree in Business may also derive from their desire to achieve extrinsic goals of financial success and other external manifestations of worth (Ryan and Deci, 2000; Vansteenkiste et al., 2006). As suggested above, business simulation participants tend to develop a better understanding of what an undergrad program and a career in Business entail. Therefore, such understanding should make the connections between competency acquisition (i.e., academic achievements) and future career success more visible to them. Consequently, we propose that:

> *H9: students' level of knowledge acquisition in the simulation is positively associated with their motivation to complete the BA in Business*

3 Method

To assess our hypotheses, we conducted a quantitative study with first-term students of a top-5 Brazilian Business school. Data on members' perceptions of group dynamics and the results of their learning experiences were collected with a questionnaire composed of psychometric scales available in the literature. Statistical analyses based on Partial Least Squares (PLS) structural equation modeling were performed to evaluate the validity and reliability of our measure model and the statistical significance of the proposed effects.

3.1. The Business Simulation Setting

Students enrolled in the first-term of the undergraduate Business Administration program of a renowned Brazilian Business school provided the data analyzed in this study. In that particular institution, new students are required to enroll in a mandatory Principles of Management course, which involves participation in a computer-mediated business simulation game called OnService (Cesim, 2013). In the game, students manage a small hotel and experience the challenges faced in the service sector. The goal of the game is to maximize the value to shareholders, which is given by the difference between the market value of the company before the first round and after the last round of the simulation. To increase value, students make decisions "on human resources, investments, service quality, pricing, marketing, and revenue management through sales channels" (Cesim, 2013). The pedagogical purpose of introducing the game in the first term of the program was to expose students to the types of decisions and problems managers face in their day-to-day activities to help them acquire a more tangible understanding of the professional path they chose to follow.

A total of 376 undergraduate students took part in the simulation game. At the beginning of the term, they were purposively divided by the researchers into groups of five students with different numbers of male and female members to obtain a balanced set of groups with different compositions. This was done to control

for the influence of gender diversity on group communication and cohesion, as reported by Einstein and Scott (2005).

Three weeks after classes started, students were allowed to familiarize themselves with the game and go through two decision rounds with no impact on the final simulation results. Afterward, the groups engaged in the actual game and were required to input their managerial decisions periodically. Two joint feedback sessions were scheduled by the teachers to allow students to compare their performances and adjust their strategies. Before the final results were announced, all students were asked to fill in the research questionnaire. They were informed that participation was not mandatory and that the confidentiality of their answers was assured.

In total, students engaged in seven decision-making rounds for approximately three months. They were allowed to use whatever means of collaboration they preferred to reach their decisions. It is essential to highlight that, as freshmen, they initially had little theoretical or practical managerial knowledge. However, over the term, as they played the game, they were taught basic principles of management (e.g., main organizational theories, organizational design, and the essential activities performed by managers), microeconomics, calculus, and organizational psychology and sociology in different mandatory courses. Students were expected to apply the competencies they acquired in these areas when making decisions in the game. The faculty in charge of the Principles of Management course sections acted as a facilitator and helped students establish connections between the concepts being discussed in other courses and the context of the simulation game. On the fourth and the final rounds of the game, students were required to turn in a paper explaining how they made their decisions up to that point in time.

3.2. Operationalization of Constructs

Riordan and Shore (1997) developed a team cohesiveness and commitment scale to assess the degree to which group members had a good relationship with each other, the general morale of the group, and how well members coordinate their tasks and collaborate to achieve group goals. We adapted the corresponding original items to measure the quality of group interactions and the level of group collaboration, respectively, the relationship (REL) and the collaboration (COL) dimensions of their construct.

Communication (COM) was measured with the scale developed and validated by Einstein and Scott (2005). Their items assess "how open the team was to hearing opinions and ideas from all members" (p. 8). The measurement of collective efficacy (CE) was performed with a scale based on the instrument developed by Riggs et al. (1994) to assess self-efficacy at the group level.

Three other scales were developed for this study. The first one was composed of three items and measured how much playing the business simulation game helped the student develop a better understanding of what a manager does and how the undergraduate program contributes to the development of the competencies that are necessary to do well in such a career (UND). The second scale measured how sure the student was of his career choice, that is, choosing to enroll in a Business undergraduate program (CHO). The third scale intended to measure how motivated students were to complete an undergraduate program in Business (MOT) and consisted of three items.

We followed the original authors as far as the number of levels in their respective Likert scales. Five-point or seven-point measures were used when appropriate, all of them ranging from "strongly disagree" to "strongly agree." A seven-point Likert scale was used for the three scales we developed in our study.

3.3. Sample Characteristics

Of the 376 students enrolled in the Principles of Management course at the beginning of the term, only 300 were still registered when the simulation was concluded. This is not surprising given that dropout rates in undergraduate programs in Brazil are usually high, especially at the beginning of a program (Nogueira, 2011; Silva, 2013).

A total of 129 questionnaires were returned and could be used in our analyses – a 43% response rate. Around 64% of the participants were male, and 36% female. Their ages ranged from 16 to 28 years old, with an average of 18.6 and a standard deviation of 1.4. These results reflected quite accurately the characteristics of the whole set of students enrolled in the Principles of Management course.

Forty-five groups were represented in the sample, 62% with three members, 31% with four members, and 7% with five members. Each of these groups had at least three students and at most five students in the sample. The differences in group size can be explained by the fact that most groups had lost members by the end of the term. In fact, despite the researchers' initial efforts to create a similar number of groups of the

same size for each degree of gender diversity, 70% of the participants reported being a member of an all-male or an all-female group. Table 1 provides the percentage of students in groups according to size and degree of gender diversity.

Group Size	Gender Diversity (% female students)					Total
	0%	33%	50%	66%	100%	
3	33%	16%	-	8%	5%	62%
4	15%	-	6%	-	10%	31%
5	-	-		-	7%	7%
Total	48%	16%	6%	8%	22%	100%

Table 1. Group membership by size and gender diversity

4 Results

A structural equation modeling (SEM) method based on PLS (Partial Least Squares) was employed to test the model (Hair et al., 2014; Lohmöller, 1989; Mateos-Aparicio, 2011). As covariance-based SEM, PLS can assess the theory represented in a structural model and the collected data simultaneously (Chin, 1998). Nevertheless, it has certain advantages in relation to the former method, such as: (1) its robustness to deviations from the assumption of multivariate normality; (2) smaller sample size requirements, given the complexity of the model being tested; and (3) a straightforward treatment of reflexive and formative constructs, as well as moderations (Chin, 1998, 2010; Hair et al., 2014; Hair Jr et al., 2013; Urbach and Ahlemann, 2010). Given that our data violated the multivariate normality assumption of covariance-based SEM and our sample size was reasonably small compared to the number of parameters to be estimated in the proposed model, PLS seemed to be the best multivariate statistical method available to perform the tests of our hypotheses. To measure the significance of all estimated parameters, we used the bootstrapping method with a sample size equal to 129 and 5,000 re-samplings.

The first step in our analysis was the evaluation of the measurement model. Reliability and convergent and discriminant validity of the scales used to measure the constructs involved in our hypotheses were assessed using the confirmatory factor analysis (CFA) methods and standards described by authors such as Chin (2010), Gefen (2005), and Hair et al. (2014). As the results of our initial analysis failed to meet all criteria, items were removed in successive, iterative CFA analyses. Overall, one item of the communication scale and three items of the collective efficacy scale had to be eliminated. In the final CFA analysis, all item loads on their corresponding latent variables were statistically significant ($p<0.01$) and substantially greater than their loads on other latent variables. As Table 2 shows, the other criteria were also met, which attests to the convergent and discriminant validity of the measurement model. Also, the values of composite reliability and Cronbach's alpha (αC) for all variables were above 0.81 and 0.70, respectively. This suggests that our final scales had high internal consistency.

Variables	Items	Loads	CR[a]	α_C	1	2	3	4	5	6	7
1. Choice (CHO)	2	0,92 - 0,95	0,94	0,86	**0,94**[b]						
2. Communication (COM)	4	0,62 - 0,77	0,81	0,70	0,06[c]	**0,72**					
3. Collaboration (COL)	4	0,78 - 0,92	0,93	0,90	-0,02	0,64	**0,88**				
4. Collective efficacy (CE)	4	0,78 - 0,86	0,90	0,85	0,19	0,56	0,62	**0,83**			
5. Motivation (MOT)	2	0,89 - 0,90	0,89	0,76	0,76	0,22	0,17	0,31	**0,90**		

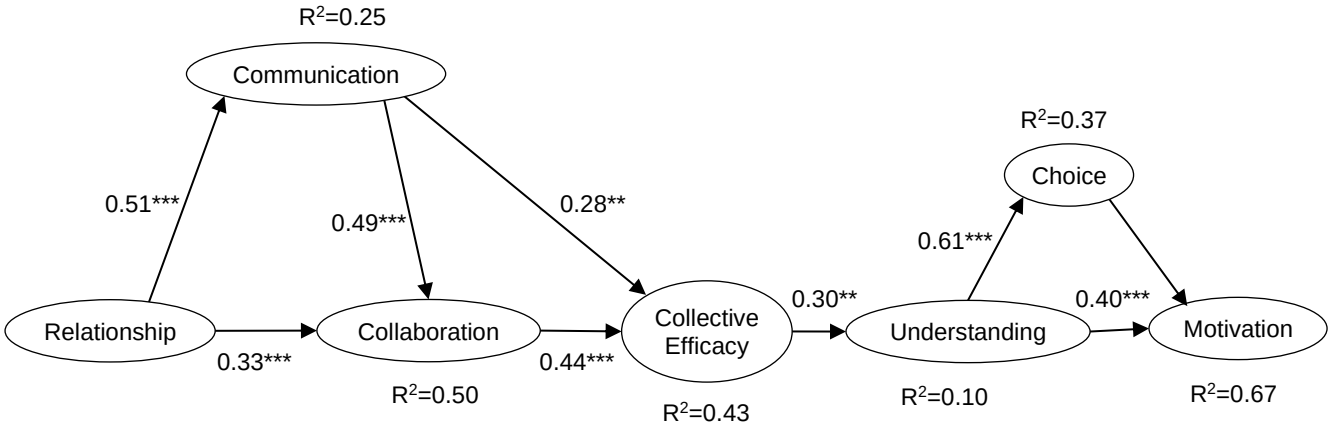
Variables	Items	Loads	CR[a]	α_C	1	2	3	4	5	6	7
6. Relationship (REL)	3	0,88 - 0,91	0,92	0,87	0,20	0,51	0,57	0,39	0,25	**0,89**	
7. Understanding (UND)	3	0,72 - 0,93	0,89	0,81	0,61	0,27	0,14	0,30	0,71	0,25	**0,85**

N = 129
[a] Composite reliability
[b] Square root values are reported on the diagonal
[c] Correlations between latent variables

Table 2. Measurement model results

Figure 1 shows the PLS estimates we obtained with the structural model. The overall predictive power of the model can be considered adequate, as indicated by the proportions of explained variance for each latent variable (R2). In particular, the model explained approximately 67% of the variance in students' motivation to complete an undergraduate program in Business and 37% of the variance in their certainty regarding their career choice. Although individual perceptions of the quality of group processes (COM and COL) and collective efficacy (CE) could be reasonably predicted with the model, the same was not true for the development of a better understanding of managerial work and how the undergraduate program contributes to the acquisition of relevant competencies (UND). Indeed, the proportion of variance explained for the latter variable was only 10%.

As shown in figure 1, all path loads estimated with the bootstrapping method were statistically significant and positive (p<0.001 to 0.05). Therefore, we conclude that the corresponding hypotheses obtained empirical support.



N = 129; * p < .05; ** p < .01; *** p < .001

Figure 1. Results for the structural model

We used the loads generated in the bootstrapping procedure to calculate the total effects of each group process latent variable on UND, CH, and MOT. As expected, all effects were positive and statistically significant (p<0.001 to 0.05). Communication and collective efficacy seem to be the variables with the

strongest influence on students' understanding and attitudes toward the undergraduate program in Business. Table 3 presents the results.

Variables	Understanding (UND)	Choice (CHO)	Motivation (MOT)
Communication (COM)	0,14**	0,09**	0,10**
Collaboration (COL)	0,13*	0,08*	0,09*
Collective efficacy (CE)	0,30**	0,18**	0,21**
Relationship (REL)	0,11*	0,07*	0,08*

N = 129; * p < .05; ** p < .01; *** p < .001

Table 3. Total effects

5 Conclusion

Our empirical results provide support to all hypotheses defined in the study. The overall proportion of explained variance suggests that our model can adequately account for individual differences in participants' perceptions and outcomes of the business game.

Our findings suggest that employing computer-mediated simulations as early as in the first term of an undergraduate program in Business can have significant benefits for students and their institutions. Participation in such games, when associated with favorable group processes, tends to strengthen positive individual beliefs about future academic and professional activities, thereby increasing students' motivation to complete their undergraduate program. As a result, institutions that employ such learning tools and foster appropriate teamwork should benefit from lower dropout rates. This result is especially important, given the paucity of research on game participation effects on students' resilience and motivation. Hence, this relationship should be further investigated in different academic contexts. Researchers should also assess which educational games' features seem to have the strongest effects on those two outcomes.

Although our findings indicate that students' understanding of a career in Management and their undergraduate program are only weakly related to collective efficacy, group processes did have significant effects on that particular result. Therefore, institutions should invest efforts to nurture productive, positive interactions among team members when they engage in business games. This would be even more important when students have recently been accepted to their programs, as they would have not yet developed fruitful social relationships with their peers. With this in mind, faculty should run team development activities before engaging students in the business game itself. Besides, they should monitor team interactions periodically to detect relationship issues and intervene accordingly.

Although research on group dynamics is extensive, there seems to be a lack of research on this topic in the specific context of educational games. In our literature review, we found only one paper that addresses group processes in this setting (Proserpio & Magni, 2012). Given the well-established connections between group processes and team attitudes and outcomes, the fact that business simulations are often played in teams, and the educational benefits that these activities tend to generate for students, such paucity is surprising and should be addressed by scholars in the near future.

Gender	Age	Comment
Female	19	"*The business game showed us how to apply the concepts we learned and will learn in our program. It was a new and fantastic experience."*
Female	19	"*It was interesting to take part in the business game. Students had a small taste of what Business Administration is about. I would do it again to practice even more applying the theories that are taught in the classroom*."
Male	18	"*The business game was undoubtedly a good experience. It helped me understand that we are still at the beginning of our path to becoming managers.*"

Gender	Age	Comment
Male	18	"*The game was a great idea. With it, I understood a little better how organizations work and what their basic concerns are*".
Male	22	"*A handy tool to help me assimilate Organizational Theory concepts. Despite the short time, the game has been an extremely positive experience*."

Table 4. Students' comments about their experiences in the business game

Finally, it is important to highlight that our statistical results are in line with the comments made by participants in an optional open question that was included at the end of our survey instrument. Although their remarks were usually brief, they reinforced the ideas expressed in our hypotheses regarding the importance of playing the game to increase their understanding of Management and their motivation. Table 4 presents prototypical excerpts of students' comments. It should be emphasized, however, that our intention when presenting them is merely illustrative. We encourage researchers to conduct more studies based on sound qualitative methods to adequately assess the validity of and complement the findings described heretofore.

6 References

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