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# Investigating the Effect of Learning Method and Motivation on Learning Performance in a Business Simulation System Context: An Experimental Study

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# Investigating the Effect of Learning Method and Motivation on Learning Performance in a Business Simulation System Context: An Experimental Study


## Abstract

With the proliferation of business simulation systems used in business education, an understanding of the factors of a simulation-based learning environment that contribute to learning performance within instructional settings is essential. This study aims to explore the effect of learning method (individual mode vs. collaborative mode) and learning motivation (low vs. high) on learning performance in a simulation-based business learning context by conducting an experiment with a 2x2 factorial design. Virtual Business-Retailing (VBR) software, a business simulation system for convenience store operation, is adopted to build a retailer simulation-based learning environment. Our results reveal that the difference in students' learning performance between individual mode and collaborative mode is significant. However, learning motivation does not have a significant impact on learning performance. Further, learning motivation is an important moderator for the effect of learning method on learning performance. These findings provide several important theoretical and practical implications for the educational use of business simulation systems.


***Keywords:*** simulations; applications in subject areas; learning strategies; collaborative learning

## 1. Introduction

Modern ICTs (information and communications technologies) have introduced many new educational applications and challenges leading to dramatic changes in lecturing and studying styles. Compared to traditional learning environments, the development of ICTs has led to many innovative learning methods. Simulation-based learning, one reformatory educational approach, has been proven to exert a significant influence on learning behaviors (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012) and promote: general spelling and reading skills, domain-specific learning outcomes (e.g., physics, health, biology, mathematics, medicine, and computer science), and cognitive abilities (spatial visualization, divided attention, and knowledge mapping) (Tobias, Fletcher, Dai, &Wind, 2011). Mayo (2009) reported 7-40% enhancements in terms of achieving learning outcomes with a well-designed game compared with traditional teaching methods. As Lateef (2010) mentioned, simulation systems can

facilitate learning due to: (1) the feedback provided; (2) opportunities for repetitive practice; (3) curriculum integration; and (4) various difficulty levels. In addition, Tan, Tse, and Chung (2010) proposed four advantages of games that support learning: (1) make knowledge accessible; (2) make thinking visible; (3) make learning fun; and (4) promote autonomous learning. With recent technological advances, simulation systems used in learning contexts are becoming more realistic in terms of both attractive visual content and immediate learner interaction within highly realistic virtual worlds.

Within the business education context, applying theoretical subject knowledge to real life, handling complex and uncertain problems, and understanding business processes consistently and holistically are all difficult and challenging (Nurmi & Lainema, 2002). Aram and Noble (1999) opined that insufficiencies associated with traditional teaching methods probably result in business management graduates who are unable to cope with complexity, ambiguity and uncertainty in terms of the problems they face in the real business world. Business simulation systems provide opportunities for problem-based learning that include unknown outcomes, multiple paths to a goal, construction of problem contexts, collaboration (in the case of multiple learners), and elements of competition and chance (Liao, Huang, & Wang, 2015). These systems imitate the real world and thereby create authentic and collaborative learning environments (Chang, Wu, Weng, & Sung, 2012), which helps students acquire the skills and competencies they need in their careers (Pivec, 2007).

Students' interpersonal and internal motivations are both potentially stimulated in game-based learning contexts (Mozelius, 2014). From a pedagogical aspect, collaborative learning enabled by social interaction is defined as an instructional method in which students work together in small groups or pairs toward a learning goal. Collaborative learning concepts been applied in multiple disciplines including science, social science, medical education, and English, among others (Chen, Wang, & Lin, 2015). Collaborative learning in simulation-based learning contexts can help students to think reflectively and solve problems effectively by increasing their understanding regarding the content (Mikropoulos & Natsis, 2011). In addition, collaborative learning as a learning method enabled by social interaction in computer supported learning environments leads to several additional benefits (Arvaja, Häkkinen, & Kankaanranta, 2008), such as development of new ideas and investigations of complex concepts and skills through the sharing of opinions, experiences, and understanding (Leemkuil, De Jong, De Hoog, & Christoph, 2003).

On an individual level, learning motivation can be conceived of as a type of intrinsic motivation that persists in learners themselves, which may exert an influence

on learning performance by interacting with the learning method. Prior researchers have suggested that the learning performance associated with collaborative learning in game-based learning contexts is mixed, and likely depends on different contexts that require further investigation (Chen et al., 2015; Oksanen, 2014). Given that business simulation systems have become popular in business education, a better understanding of the factors within instructional settings can contribute to learning performance; in turn, this study explores the relationships between learning method, learning motivation, and learning performance in a simulation-based learning context. Virtual Business-Retailing (VBR) software, a business simulation system associated with convenience store operations, is adopted to build a retailer simulation-based learning environment. The results of this empirical study provide several important theoretical and practical implications for retailer business simulation systems used in business education.

This remainder of this study is organized as follows: Section 2 presents the literature review and hypotheses development. Sections 3 and 4 outline the research methodology and the results of the data analysis, respectively, followed by a discussion of these results along with their implications in Section 5. Finally, Section 6 denotes limitations and directions for further research.

## 2. Theoretical Background and Hypotheses Development

### *2.1 Collaborative learning in business simulation systems*

Collaborative learning has been used in schools in various forms such as group problem solving, debates, or other team activities (Wendel, Gutjahr, Göbel, & Steinmetz, 2012). Collaborative learning can be defined as an instructional strategy in which students work together in small groups toward a common goal to reciprocally improve their knowledge (De Toni & Nonino, 2013; Prince, 2004). Collaborative learning also can be conceived as a construction of shared knowledge with others who have common goals (Dillenbourg, 1999). Compared to individual learning, in which students progress toward a learning goal by themselves at their own pace, collaborative learning allows students the opportunity to discuss and explore new topics, clarify their ideas, and refer to answers with others (Koschmann, Kelson, Feltovich, & Barrows, 1996; Yang, Lee, & Chang, 2016). Therefore, the core element of collaborative learning is the emphasis on interactions, in contrast to learning as an individual activity (Arvaja et al., 2008; Prince, 2004; Yang et al., 2016).

Previous studies indicated that collaborative learning can help students learn

(e.g., Slavin, 1996; Teasley, 1999). Winne, Hadwin, and Gress (2010) suggested each group member brings three key elements to a collaborative situation: (1) prior knowledge that can benefit the others; (2) information that may be processed to become joint knowledge through collaborative knowledge construction; and (3) different types of learning methods that can complement each other. In addition, Dillenbourg (1999) suggested that some principles can facilitate the formation of collaborative learning and the enhancement of the process: (1) role-based scenarios: problems that need to be solved using multiple types of knowledge; (2) interaction rules: free communication vs. predefined communication patterns; and (3) monitoring and regulation of interactions: the need for specific tools for the facilitator. Furthermore, previous studies suggested that implementing collaborative learning effectively should take into account the following five elements: (1) positive interdependence: the perception of linking with other members in a way so that individual students cannot succeed unless they do; (2) individual accountability: individual assessment of each student's performance, and the group and the individuals of the results; (3) face-to-face promotive interaction: individuals encouraging and facilitating each other's efforts to complete tasks in order to reach the group's goals; (4) social skills: interpersonal and small group skills are vital for the success of a cooperation effort; and (5) group processing: a discussion of members' actions with respect to what is helpful and unhelpful to achieving their goals and maintaining effective working relationships (Johnson & Johnson, 1994; Wendel et al., 2012). As suggested by Oksanen (2014) and many prior studies, game-based learning is considered an appropriate collaborative learning support (e.g., Rauterberg, 2002; Voulgari & Komis, 2008; Wendel et al., 2012) that enables social relationships to develop (Bruckman, 1998), and offers learners chances to explore, expand, and reflect on different perspectives (Turkle, 1995).

Utilizing simulation systems to support education is also referred to as simulation-based learning. Simulation systems can be utilized in many ways with different learner types for practical or academic purposes (Lateef, 2010). Previous studies indicated that simulation- and game-based learning can affect learners' behaviors and increase their critical thinking and problem-solving skills (Papastergiou, 2009; Vos, van der Meijden, & Denessen, 2011). Lateef (2010) also proposed that the use of simulation systems can increase (1) professional skills in terms of technique and function; (2) problem-solving and decision-making abilities; and (3) interpersonal communication skills and collaborative competencies. Furthermore, learning through simulation systems is one way to enhance learners' ability to deal with challenges (Salpeter, 2003), especially when collaborative learning is supported by technology (e.g., Whitton, 2010). However, some researchers have reported that simulation-based

learning does not always result in successful collaborative learning due to a lack of learning support during game play (e.g., Dillenbourg et al., 2009).

Although previous studies have contributed to our knowledge regarding the influence of simulation systems on collaborative learning, little research has provided empirical evidence on the impact of collaborative simulation-based learning on learning performance. Peng and Hsieh (2012) indicated that in a computer game context, playing in a group often leads to higher performance as compared to playing alone. In contrast, Vogel et al. (2006) revealed that compared to conventional teaching methods, single users showed higher cognitive gains than groups in simulation-based teaching methods. However, the impact of collaborative simulation-based learning on learning performance has not yet been empirically verified in a simulation-based retailer business learning context. Following the work of Dillenbourg (1999) and Wendel et al. (2012), the current study defines collaborative learning as a situation in which two or more students work together to pursue a common goal. The goal is to further investigate the impact of collaborative simulation-based learning on learning performance using a retailer business simulation system in a marketing course. Based on the above, this study proposes following hypothesis:

*H1: In a business simulation system context, students' learning performance will be higher when the learning method is collaborative learning, compared to when the learning method is individual learning.*

*2.2 Learning motivation*

Motivation can be distinguished into intrinsic and extrinsic forms based on the different reasons or goals that give rise to an action. Intrinsic motivation refers to motivation that comes from inside an individual rather than from any outside rewards, while extrinsic motivation refers to motivation induced by tangible rewards or punishments, dependent upon success or failure in a task (Liao et al., 2015; Ryan & Deci, 2000). Learning motivation in this study is considered as students' motivation to learn, conceptualized from the perspective of intrinsic motivation. Moreover, it refers to students' desire to apply themselves to possess knowledge and skills on a continuing basis (Brophy, 1987). Through this perspective, learning motivation is associated with being curious, and wanting to challenge and master content (Chyung, Moll, & Berg, 2010). As a motivational factor, it is believed to be an important element of self-regulated learning and associated with deep learning in students (Yukselturk & Bulut, 2007), leading to higher levels of student success (Lepper,

Corpus, & Iyengar, 2005; Pintrich, 2004). Students also are more likely to be aware of the complexities, inconsistencies, and unexpected possibilities associated with what they learn, develop more positive attitudes about what they learn, and be more willing to use it in the future (Kapp, 2012; Malone, 1981).

Prior research has provided a variety of applications within the game-based learning context, and discussed the influence of games on the learning motivation. For example, Kuo (2007) designed a science-learning experiment to investigate whether students' learning achievement could be enhanced by increasing their engagement and motivation within an online game-based learning environment. Kuo's findings suggest that game-based learning can significantly motivate students to explore science and engage in learning activities; however, no significant results were found in terms of improved learning achievement. This result is consistent with those from many other studies (e.g., Maushak, Chen, & Lai, 2001; Squire, 2003; Yang, 2012), and indicates that the utilization of simulations and games in learning can be effective supports. However, Tüzün, Yılmaz-Soylu, Karakus, Ðnal, and Kızılkaya (2009) found that students not only exhibited higher learning motivation but also significant learning achievement in game-based learning environments. In addition, previous studies argued that game-based learning provides students with a more interesting and motivational environment for learning that engages students through activities to further influences their game performance (Admiraal, Huizenga, Akkerman, & Ten Dam, 2011; Paraskeva, Mysirlaki, & Papagianni, 2010). Another study found that web game-based learning can improve student content knowledge (Miller, Chang, Wang, Beier, & Klisch, 2011).

Furthermore, a previous study indicated that students with a high level of learning motivation tend to have higher expectations regarding learning performance in the context of business simulation systems (Liao et al., 2015). However, few studies have investigated the impact of learning motivation on learning performance (Tao, Cheng, & Sun, 2009), especially in the simulation-based retailer business learning context. In order to better understand the influence of learning motivation on students' learning performance within this type of context, this study proposes the following hypothesis:

*H2: In a business simulation system context, students who have a high level of learning motivation will exhibit higher learning performance than those who have a low level of learning motivation.*

Furthermore, a meta-analysis of serious game research conducted by Wouters,

van Nimwegen, van Oostendorp, and van der Spek (2013) indicated that the effect of serious games (including simulation systems) on learning performance and motivation is enhanced when supplemented with other pedagogical techniques, such as collaborative learning. Thus, in addition to the main effect between learning method, learning motivation, and learning performance, this study also explores the interaction effect of learning method and learning motivation on learning performance. According to the research mentioned above, both learning method and learning motivation are influential predictors of learning performance. As such, the relationships between learning method, learning motivation, and learning performance require further examination in a simulation-based retailer business learning context that includes highly motivated players and intense interactions. Therefore, the following hypothesis is proposed:

*H3: In a business simulation system context, there will be an interaction effect of learning method and learning motivation on learning performance.*

To build a useful instructional setting in a simulation-based retailer business learning environment, this study further designs and validates an experiment based on the research model in Figure1.

**Place Figure 1 Here**

## 3. Research Methodology

### *3.1 Experimental design*

This study adopted a 2x2 factorial design. The reasons for the adoption of the simulation method are as follows. First, simulations save both time and money compared to field experiments, and can reduce subjects' memory bias (Smith & Bolton, 1998). Second, simulations can improve internal validity and statistical conclusion validity (Churchill, 1995; Cook & Campbell, 1979), and also control for the effect of exogenous variables (Cooper & Schindler, 2003).

For the experiment, we first manipulated the learning method to explore its impact on learning performance. The learning method variables included individual mode and collaborative mode. In addition, we investigated the impact of learning motivation on learning performance, as well as the moderating effect of learning motivation on the relationship between learning method and learning performance. There were also two learning motivation variables: low and high.

*3.2 Experimental tool and construct measurement*

The quantitative method was used to collect data. The instruments for collecting data included experimental scenarios, an achievement test and a motivation scale. To measure learning method, VBR was chosen to conduct the experiment. This study assigned the simulated scenario to determine the effect of learning method on learning performance over the learning activities via the VBR software. In addition, to measure learning performance, VBR was administered as an achievement test, which allowed the system to generate the profit figure (game score) achieved by students. A final profit score from the VBR software was used to indicate learning performance.

VBR, a retailer business simulation system, has become popular in Taiwan for contexts connected with students' business-related education and learning. It allows for informational richness in terms of charts and graphs for analysis, trend spotting, future predictions for project design, and business decision making, as well as mathematical richness in terms of calculations regarding costs, profits and purchasing volumes. Through experiencing the simulation, students can learn business terminology and concepts in a highly engaged way that allows them to engage in the virtual world and interact with each other while making marketing-related decisions.

To measure learning motivation, we used a questionnaire related to learning motivation, for which we adopted items primarily from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991). The MSLQ measures students' motivational orientations and their learning strategies. As proposed by Pintrich et al. (1991), the different MSLQ sub-scales can be used together or separately. This study adopted the items belonging to motivational aspects (Artino, 2005) to represent the proposed learning motivation concept. These four items were designed to estimate the extent of "participating in a task for reasons such as challenge, curiosity, and mastery" using a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

*3.3 Participants and experimental procedures*

All the participants in our experiment were obtained using a convenience sample of two classes of undergraduate students majoring in marketing. The marketing course was taught by an experienced professor who was seeking innovative learning and teaching techniques. In the current study, a simulation-based learning environment was designed and developed to support lectures in a marketing course.

The educational goals were set as: (1) understand how to start a business, (2) describe the element of profit earning, (3) understand the impact of the external environment on businesses, and (4) master the operation of a retail store. For the experimental design, a simulation-based learning environment suitable for the participants was constructed using VBR software. None of the participants had any experience with VBR software. In order to avoid the influence of different instructors or materials on the experimental results, the two classes had the same teacher, used the same learning materials and learning tools, and required all students to complete the same assignment: open a convenience store, run it for one simulated year, and evaluate the cumulative profit at the end.

Participants were randomly assigned to the individual or collaborative group and then led to different classrooms. For the collaborative condition, two or three participants were randomly chosen for each collaborative group; they were then required to provide a group name in order to identify their group. Furthermore, following the suggestion from previous researchers (Arvaja et al., 2008; Dillenbourg, 1999; Johnson & Johnson, 1994; Prince, 2004; Wendel et al., 2012), the teacher provided the group participants with the following sequence of instructions to introduce the rules and skills associated with this collaboration learning experience. First, group participants were informed that they would require joint efforts to accomplish their common goals: getting the highest profit and winning the game. Second, group participants had to realize that they could not be successful by working alone: everybody in the group had voice their opinions and support the other members to solve the problem. Third, group participants were told that a scoreboard would depict the profit scores of all groups at the end of the game, which helped each group member judge their overall success (e.g., by comparison with other groups). As a result, group members needed to contribute to the group performance. Finally, group participants were informed that they could more effectively help and promote their collective success by helping, encouraging, or praising the other members.

Before experiment began, the teacher introduced the participants to the VBR software, outlined the gaming task, and provided time for participants to think about their gaming strategy. The VBR allowed participants to make decisions about store location, store opening and closing times, product lines to carry, physical inventory levels, shelf space arrangement and allocation, pricing and promotion, market research, staffing levels, purchasing, and borrowing, among others (see Figures 2-4). Participants were informed that each of their decisions would affect the final result (i.e., the profit figure). The experimental design was not disclosed to the participants until the end of the experiment. During the experiment, individual participants sat

alone in front of an individual computer, learned individually using the VBR system, and had their earned profit figure recorded at the end of the game; collaborative group participants shared a computer while playing the VBR game, discussed the gaming task together, and had their game score recorded at the end. After the end of the experiment, participants responded to a questionnaire about their learning motivation. In addition, the game score was coded into a measureable format to represent learning performance.

**Place Figures 2-4 Here**

## 4. The Results of the Data Analysis

### *4.1 Sample*

In this study, 96 valid responses were collected from the 97 participants who took the marketing course. There were 49 responses from the individuals, and 47 responses from the collaborative groups (i.e., there were 23 groups with two or three responses obtained from each). In addition, the median served as the cut-off point for learning motivation to divide responses into two groups (i.e., 48 responses were designated as the high motivation group, and the other 48 as the low motivation group). Respondents were 50% sophomores and 50% juniors majoring in marketing, and had similar backgrounds. The valid responses had the following characteristics: 76% were female, 59.4% were 16-20 years of age, and 75% had an average monthly income of less than $US 330.

### *4.2 Measurement*

This study used Cronbach's alpha (α) to assess measurement reliability. The results showed that the learning motivation α was 0.95 (see Table 1), which is above the suggested value of 0.7 (Hair, Anderson, Tatham, & Black, 1998; Nunnally & Bernstein, 1994), and indicates good reliability. In addition, because all the items were developed based on previous literature, the content validity of the measure was ensured.

**Place Table 1 Here**

### *4.3 Hypotheses testing*

Based on the 2 (learning method: individual mode; collaborative mode) x 2 (learning motivation: low; high) factorial design in this simulation-based retailer business learning context, we tested the main and interaction effects of learning method and learning motivation on students' learning performance. A two-way ANOVA was used to analyze the sample data with SPSS software. In addition, because age may affect learning gains (Wouters et al., 2013), this study treated age as covariate in order to control for any confounding effects during subsequent ANOVA analyses.

*4.3.1 Main effects*

We first performed an independent-sample t-test to examine whether a significant difference existed between the low groups and the high groups in terms of learning motivation. The results show that students in the high learning motivation groups (M= 6.55, SD= 0.40) scored significantly higher than those in the low learning motivation groups (M= 5.16, SD= 1.22).

Next, we tested the main effect of learning method on learning performance. After controlling for the effect of age, the *p-value* for the effect of learning method on learning performance was less than 0 (see Table 2). In terms of H1, we expected that learning performance for individual learning and collaborative learning would significantly differ, with the latter expected to exhibit higher learning performance; however, the results show that students in the individual groups exhibited significantly higher learning performance than those in the collaborative groups (see Table 3). Therefore, H1 is not supported.

Furthermore, we tested the main effect of learning motivation on learning performance; the *p-value* for this effect exceeded 0.1 (see Table 2). In terms of H2, we expected that students with a high level of learning motivation would exhibit higher learning performance than those with a low level of learning motivation; however, the results show no significant difference between the two groups. Therefore, H2 is not supported.

**Place Table 2 Here**

**Place Table 3 Here**

*4.3.2 Moderating effects*

We further tested the moderating effect of learning motivation on the

relationship between learning method and learning performance. As shown in Table 2, the *p-value* for this interaction effect was less than 0.1. Therefore, H3 is supported. More specifically, as shown in Figure 5, students with a high level of learning motivation exhibited higher learning performance than those with a low level of learning motivation under the collaborative mode. Further, no matter whether learning motivation was low or high, the learning performance for the individuals was higher than for the collaborative group.

**Place Figure 5 Here**

## 5. Conclusions and Implications

### *5.1 Discussion*

#### *5.1.1 The main effect of learning method on learning performance*

Our findings about the differences between the individual learning method and collaborative learning method in terms of learning performance within a simulation-based retailer business learning context are as follows. First, learning performance between the two modes is significantly different. Furthermore, our findings indicate that compared with the collaborative mode, the individual mode resulted in a higher learning performance.

A plausible explanation for this results is that the individual students tended to pay more attention to the development of the retailer business simulation system. Although these students were unfamiliar with the learning activities associated with the retailer business simulation system at the beginning of the course, they were absorbed and used their own perspective and knowledge to make marketing decisions. After they became familiar with and diligent in practicing the learning activities, their learning performance increased.

In contrast, students in the collaborative groups benefited from their diverse perspectives while making marketing decisions and solving problems together; however, compared to the individuals, the students in collaborative groups were required to participate in additional activities, such as explanations, disagreement, and mutual regulation. Although building an explanation together contributes to learning and the construction of knowledge, it can become detrimental in the case of cognitive over-load. Moreover, when mismatched personalities must work together, or there is a discrepancy in knowledge or viewpoints among group members, emotional regulation processes may be challenged. Another possible explanation is that most of the

students in the collaborative groups interacted mainly to clarify how to complete the learning tasks in an effective manner: more thoughtful members had no residual force to help other members to learn, while less thoughtful members even displayed free-rider tendencies. This finding is consistent with the arguments of Dillenbourg, Järvelä, & Fischer (2009), who pointed out that although members of a group may co-operate, they does not always construct mutually shared cognitive and social processes of collaboration.

*5.1.2 The main effect of learning motivation on learning performance*

A surprising finding in this study was that learning motivation (i.e., low vs. high) did not have a significant impact on students' learning performance in the given context. A plausible explanation is that learning motivation comes from students who make an effort to acquire satisfaction in the learning process, which leads them to set higher goals and perform better (Leow, Neo, & Hew, 2016). Therefore, even when students have a high level of learning motivation, they may not possess enough knowledge to proceed with the learning tasks called for in the retailer business simulation system, leading to dissatisfaction with their learning and a lack of confidence that they can improve their performance.

Another possible explanation is that even when students are highly motivated to learn, if they do not have a positive attitude towards the design of the simulation system (i.e., feel that it is challenging and entertaining), with the passage of time, they are likely to get bored, and form low expectations for the learning activities. This finding is consistent with the arguments of Tao et al. (2009), who suggested that the motivation theory of behavior implies that motivation comes from learning; to maintain motivation during game play, learning should be continually reinforced during the game.

*5.1.3 The moderating effect of learning motivation on the relationship between learning method and learning performance*

Findings regarding the moderating effect of learning motivation on the relationship between learning method and learning performance in this context are as follows. There was a significant interaction between learning motivation and learning method for learning performance, which suggests that learning motivation is an important moderator variable for the relationship between learning method and learning performance. More specifically, a comparison of the two learning methods

suggests that students in the individual group exhibited higher learning performance than those in the collaborative group, whether they had a low or high level of learning motivation. One potential reason for finding is that the students who worked individually exhibited higher involvement and commitment to the learning tasks, leading to better learning performance, while students in the collaborative groups needed to deal with additional activities, such as suppressed cognition or emotion associated with peer interaction, or excessive dependence on the efforts of others, which may have reduced or impeded the efficiency or effectiveness of collaborative learning.

In addition, the findings indicate that for the collaborative groups, students with a high level of learning motivation exhibited higher learning performance as compared to those with a low level of learning motivation. It is probable that students with a high level of learning motivation invested more time and effort into the learning tasks, and sought out diverse perspectives from other members to assist them in judging and evaluating their thinking, to help them make correct decisions and solve problems. In addition, because students had never used the retailer business simulation system before, their poor skills resulted in many believing that they could not complete the learning tasks on their own. In contrast, students with a high level of motivation for learning were more likely to rely on assistance from other members to gain some inspiration or confirm that their decisions were correct.

### *5.2 Managerial implications*

Retailer business simulation systems, which represent a novel teaching and learning approach, provide a link between abstract concepts and real world problems; they enable students to experience an entrepreneurial start-up in a virtual setting, practice making decisions, and accumulate experience in terms of strategy application.

The use of business simulation systems has become popular in business education, so the main purpose of this study was to explore the main and interaction effects of learning method (individual mode vs. collaborative mode) and learning motivation (low vs. high) on learning performance within a retailer simulation-based business learning context using an experimental design.

#### *5.2.1 Enhancing a high sense of ownership in the retailer simulation-based business learning system*

The results show that learning method (i.e., individual mode or collaborative mode) had a significant impact on students' learning performance, in that the individual mode resulted in higher learning performance than the collaborative mode. The retailer business simulation systems provided students with an initial set of problems; students attempted to solve these problems by making decisions based on their own perspectives and knowledge. In order to promote effective learning and increase engagement levels, system developers are suggested to enhance the interactivity levels, and provide an attractive user interface that improves students' sense of ownership in this student-centered learning environment, which can lead to higher learning performance.

### *5.2.2 Interactive training and building a shared interface in the retailer simulation-based business learning system to promote joint efforts by all members*

In addition, to ensure the potential benefits of collaborative learning are realized, instructors should change their roles from knowledge providers to learning facilitators for simulation-based business learning environments. For instance, instructors should assist students to establish effective help-seeking and help-giving behaviors, and support students as they develop social skills (e.g., facial emotional expressions) that can enhance a group's ability to work together. In addition, retailer business simulation system developers are suggested to design shared graphical representations (i.e., awareness tools) and the visual identification of individual contributions or viewpoints to help group members construct shared understanding that can assist in making available and visible for reflection in an efficient manner.

### *5.2.3 Developing retailer business simulation system applications (APPs) and integrating them with social networking functions*

The rapid development and acceptance of mobile devices and Internet applications has expanded the landscape of student experiences and educational technologies, leading to more chances for ubiquitous learning. Student levels of digital literacy ensure they are more capable of enriching their learning experience by creating learner-generated content and constructing their own knowledge. Therefore, retailer business simulation system developers are suggested to develop APPs that allow their systems to be accessed on mobile devices, leading to increased autonomous learning anytime and anywhere, which can help students apply conception into practice to achieve greater learning efficiency. In addition, the

systems should also integrate with social networking functions to promote collaborative learning through increased social engagement leading to better mutual understanding, which can help students find collaborative practice opportunities, exchange knowledge, and clarify their own ideas with each other, leading to greater learning effectiveness.

*5.2.4 Building a sustainable incentive for retailer simulation-based business learning*

The results suggest that learning motivation did not have a significant impact on students' learning performance within the retailer simulation-based business learning context. To promote learning and maintain motivation during simulation system play, the link between stimulation and reaction must be strengthened, such that students approach the learning tasks with more confidence and excitement, and become more determined to set higher learning goals. System developers should establish some functions to help students recognize when they have gained new capabilities, skills, and knowledge as a result of game playing.

In addition, developers can design a more attractive interface and sustainable content including rewards, as well as strengthen interaction rules and engagement in the collaborative tasks, and integrate story scenarios or location-based real business dynamics into their systems to encourage prolonged student involvement.

Moreover, student uncertainty regarding the simulation system may also have hindered their efforts and performance. Therefore, instructors should obtain information on student goals associated with using these systems so that developers can integrate these values into the systems.

## 6. Limitations and Directions for Future Research

There are some limitations that present avenues for further research. First, due to time, manpower, and other resource restrictions, the results are only applicable to the sample examined in this study. Further studies could adopt larger and more diverse samples. Second, this study explored students' learning performance in a simulation-based learning environment. Although simulation systems provide students with chances to practice their decision-making, further studies could investigate students who have entered real business environments. Third, this study explored the impact of learning method on learning performance within a retailer simulation-based business learning context. To fully address the complexity of

collaborative learning, future studies could develop a more elaborate instrument to better understand and measure collaborative learning in terms of components such as team interaction and team cohesion. Finally, the sample of the current study was collected in Taiwan. Because Taiwan/Asian learning contexts tend to focus more on the individual ability to memorize material and regurgitate instead of collaborative learning. Asking students to suddenly work together to solve problems is a novel concept. In the future, teachers can provide some mechanisms to ensure that the collaborative learning conditions proposed by the current study can be implemented in a thorough manner when students are engaged in collaborative learning. In addition, future studies could collect data from students in different countries to verify research results. Furthermore, the collaborative learning conditions as defined and implemented in the current study do not suffice for all conditions proposed by previous studies. It is suggested that future research can take into account more exhaustive conditions. Moreover, this study utilized a random assignment for the collaborative condition; future studies could form groups based on participants' grades and/or personality traits.

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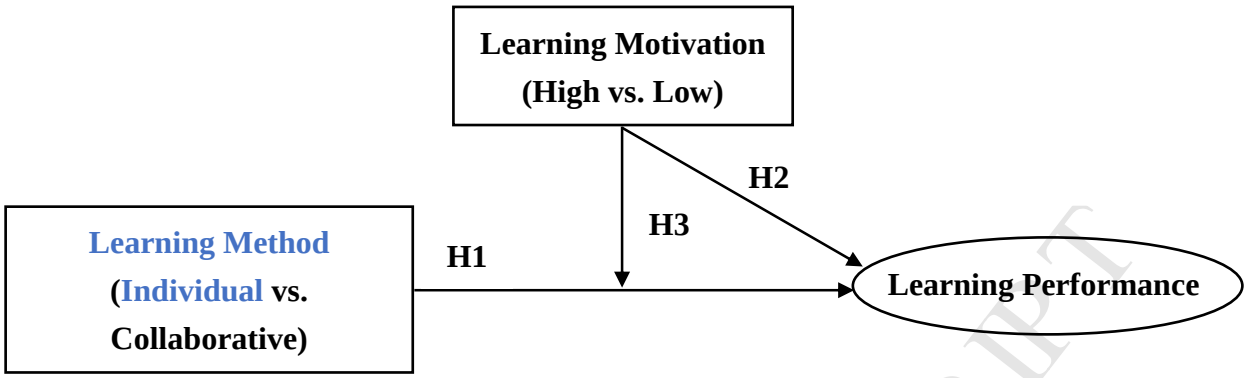


**Figure 1: Research Model**

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**Figure 2: City and Streets in VBR**

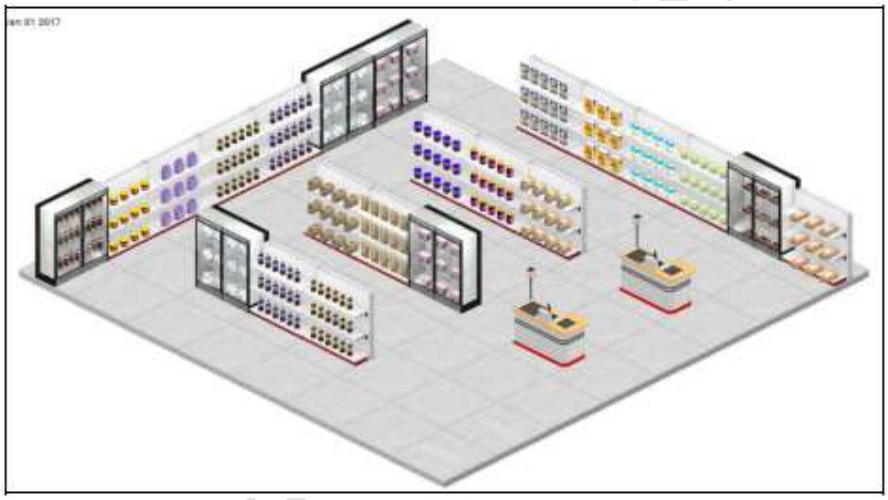

**Figure 3: Storefront in VBR**

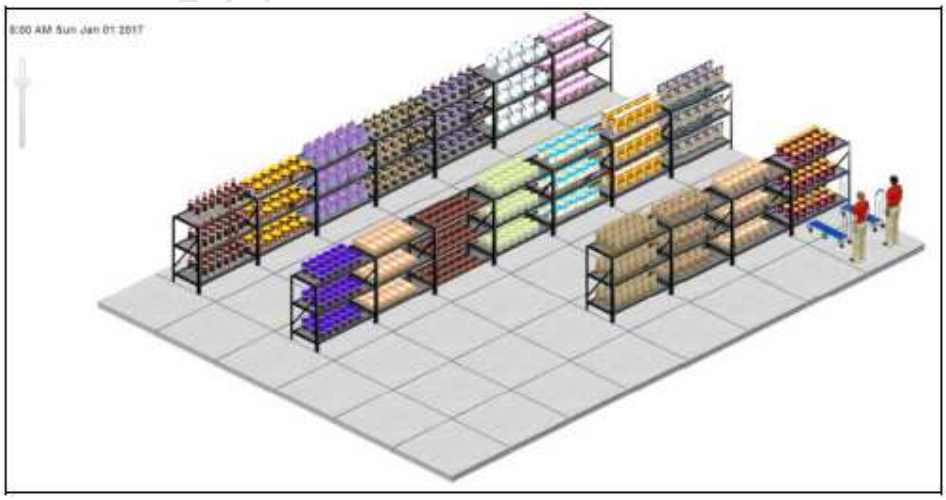

**Figure 4: Store Backroom in VBR**

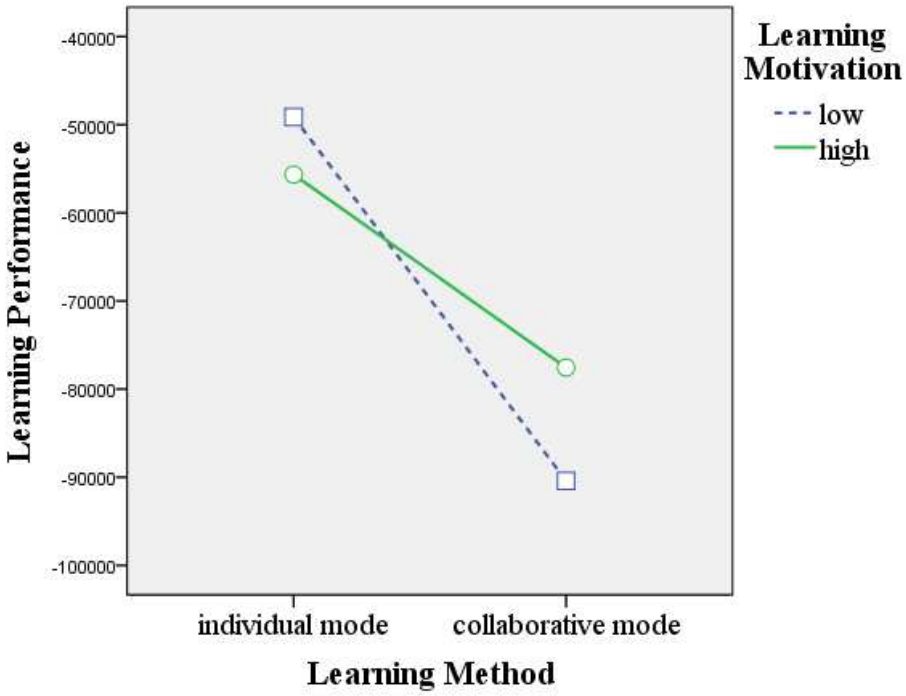


**Figure 5: Interaction Effect of Learning Method and Learning Motivation on Learning Performance**

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**Table 1: Reliability of Learning Motivation Measurement**

| Independent variables | Items | Cronbach's alpha |
|---|---|---|
| learning motivation | 1. In a class like this, I prefer course material that really challenges me so I can learn new things.<br>2. In a class like this, I prefer course material that arouses my curiosity, even if it is difficult to learn.<br>3. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.<br>4. In this class, when I have the opportunity, I choose course assignments that I can learn from, even if they don't guarantee a good grade. | 0.95 |

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**Table 2: ANOVA Results of the Effects of Learning Method and Learning Motivation on Learning Performance**

| Independent Variables | Type III Sum of Squares | Degrees of Freedom | Mean Square | F-Statistic | P-Value |
|---|---|---|---|---|---|
| age | 2306742656.00 | 1 | 2306742656.00 | 3.272 | .074* |
| learning method | 9818701490.00 | 1 | 9818701490.00 | 13.928 | .000*** |
| learning motivation | 236691319.90 | 1 | 236691319.90 | .336 | .564 |
| learning method × learning motivation | 2226585996.00 | 1 | 2226585996.00 | 3.159 | .079* |

*Note:* *** significant at p<0.01; ** significant at p<0.05; * significant at p<0.1

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**Table 3: Main Effect Means for Learning Performance Comparing Two Types of Learning Method and Learning Motivation**

| Variables | Learning Performance |
|---|---|
| learning method (individual / collaborative) | -52389.14 / -83987.64*** |
| learning motivation (low / high) | -69768.91 / -66607.87 |

*Note:* *** significant at p<0.01; ** significant at p<0.05; * significant at p<0.1

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# Highlights

- ► We explore the effect of learning method and learning motivation on learning performance in a business simulation context.
- ► The difference in students' learning performance between individual mode and collaborative mode is significant.
- ► Learning motivation is an important moderator for the effect of learning method on learning performance.
- ► The findings provide important theoretical and practical implications for educational use of business simulation systems.

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