

## PAPER

# Enhancing Finance Students' Learning Effectiveness and Motivation: Application of Financial Simulation Game

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[R88101013@gs.ncku.edu.tw](mailto:R88101013@gs.ncku.edu.tw)**ABSTRACT**

Financial issues have been the source of divorce, psychological diseases, and unhappiness in the past few years. A person with good financial literacy ability could therefore avoid and effectively solve financial problems. Simulation and games have been gradually emphasized by educators in the past years, stressing active learning and learner-centeredness and expecting to help learners understand complicated ideas and effectively promote learning effectiveness. The simulation game materials and multimedia interactive web materials for financial education are designed and compared to the effects on students' financial learning effectiveness and motivation in this study. College students in southern Taiwan were selected as the research objects for the 16-week experimental teaching. The total number of valid samples is 168. "Nonequivalent group design in quasi-experimental design" is adopted in this study, where the teaching model, including "simulation game materials" and "multimedia interactive web materials", is the independent variable and financial learning effectiveness and learning motivation are dependent variables. Research findings reveal that (1) financial simulation games are an effective teaching strategy, (2) students with financial simulation games present higher learning effectiveness, and (3) students using financial simulation games show higher learning motivation. Finally, suggestions are proposed in this study, expecting to apply such characteristics to design game software for learning finance and effectively improve the dilemmas of practicing financial teaching in class.

**KEYWORDS**

financial simulation game, interactive multimedia, learning effectiveness, learning motivation

## 1 INTRODUCTION

The international economic downturn in the past few years has caused people to stress about personal financial issues. Governments therefore propose education policies to cope with it. Nevertheless, financial problems have been

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at the root of divorce, mental illness, and various unhappy experiences. People with good financial literacy could therefore avoid and effectively solve financial problems. Some scholars consider the importance of financial knowledge and behavior to young students, as early behavior would lay the foundation of future financial behavior and happiness [1]. Those who lack financial literacy could easily make mistakes about credit during their youth; such mistakes might result in bad results in life and cause deep influence. The importance of financial education is responded to in various countries; however, it is disappointingly indicated in many studies that school-based financial curricula do not appear to provide obvious assistance in financial literacy. Past research revealed that people who had financial education in senior high schools or colleges, with the financial behaviors of saving, price parity, and considering budgets before shopping, were not superior to those without experience in financial curricula and did not necessarily present higher investment knowledge or financial literacy [2]. It is therefore inferred that traditional school-based financial education does not help much with financial literacy. Unfortunately, a teaching style to effectively enhance financial literacy has not been discovered so far.

In the past few years, a lot of domestic teachers and researchers in social studies devoted to the design and planning of financial curricula have discovered the significant and positive effect of situational teaching strategies on students' financial concept learning. Simulation and games are gradually emphasized by educators, stressing active learning and learner-centeredness and expecting to help learners understand complicated concepts and effectively promote learning effectiveness. Y-generation and net-generation students often contact digital games and spend a lot of time on them as a leisure activity. Learning through games and simulation could therefore better induce learning interests [3]. Many studies indicated that simulation game-based learning could effectively make up the shortage of traditional teaching and enhance learners' learning ability, attitude, and behavior. Learners could test hypotheses and explore possible outcomes in various situations in simulation games for learning through experimentation, exploration, and cooperation with others [4].

It was discovered in the literature review of the past two decades that simulation games have been broadly applied to various disciplines, particularly higher business education. Traditional business education reveals comparatively dispersed teaching styles; students lack opportunities to plan budgets and plan income and cannot experience the possible results caused by different decision-making; they can hardly connect and integrate the learned knowledge with true situations. The simulation could copy dynamic and real economic, market, and business events, provide students with management of complicated company policies, business models, and actions, as well as help students understand, expand, and experience the relationship between management concepts and various business functions so that they could actively participate in the business decision-making process and learn skills to deal with real problems [5]. A lot of relevant studies support applying simulation games to business education and affirm the teaching benefits of business education. However, most of such studies are restricted to management-related business lessons, e.g., marketing management, inventory management, and principles, but seldom apply to finance. This study therefore attempts to explore the effect of the application of financial simulation games on the learning effectiveness and motivation of students in the Department of Finance. It is expected to well apply such characteristics to design game software for learning finance and effectively improve the dilemmas in financial teaching.

## 2 LITERATURE REVIEW

Hwang et al. [6] defined simulation as the possible result of copying reality and attempting to observe an assumed situation that occurred in the real world. Li et al. [7] defined simulation as an exercise that could present real functions, and such an exercise was generated in an artificial environment. Digital games could create a fantastic and imaginary virtual world in which learners follow rules, curiously accept various challenges, and compete with others in the game world to move towards the goal. Furthermore, safety was out of consideration in any learners' actions in games so that they could heartily be involved in and enjoy them. The combination of games and learning contents could trigger learners' intrinsic motivation for active exploration to immerse themselves in them. It was why simulation game-based learning was emphasized by education researchers. Nevertheless, the emergence of simulation game-based learning was not to replace traditional teaching but to assist. The simulation could deepen students' comprehension of knowledge, reinforce their interests, and expand their learning coverage. In comparison with traditional teaching, simulation games could integrate various concepts into a game [8]. Moreover, it could specifically reappear in real situations and provide operation opportunities for learners to acquire knowledge from interaction and promote the comprehension of abstract concepts. Compared to traditional learning styles of reading articles and recitation, it allowed learners to receive more experiences and learn knowledge from actions and decision-making [9]. The following hypothesis is therefore proposed in this study:

H1: Financial simulation games present significant and positive effects on learning motivation.

Kuo et al. [10] indicated that contents in some materials were hardly connected with students' life experience or expressed in a way that students could comprehend the experience, such as blood flow, internal computer operation, celestial movement, which could not be visually observed in general situations or chemical experiments, vocational training, and flight training, which needed to be constructed knowledge learning topics through learning-by-doing experiences. Being able to effectively apply relevant software to simulate such knowledge would assist teachers in instruction and help learners' learning. Li et al. [11] regarded the close characteristics of simulation game based learning with the theoretical principles of constructivism, including (1) connecting learning activity to large tasks and problems, (2) supporting participants to develop personal tasks and problems, (3) tasks being real, (4) tasks and learning environment being able to reflect the complexity in real world, (5) providing participants with opportunities for developing personal solution process, (6) learning environment being able to support and challenge learners' thinking, (7) allowing testing ideas aiming at distinct points of view and situations, and (8) offering opportunities for reflecting the learned content and learning process. Maryam et al. [12] pointed out four major advantages of simulation compared to traditional media or teaching styles, covering (1) allowing learners to present higher learning motivation, (2) helping learning transfer, (3) better learning efficiency, and (4) more flexible learning (being able to be applied to various teaching stages and suitable for different subjects). Through simulation games, students could apply knowledge learned in classes to assumed situations, enhance their understanding of cause and effect through "learning by doing," and directly observe the decision-making quality [13]. Simulation games could accelerate the learning process by allowing learners to quickly observe the gaming behavior that affects gaming results. In this case, simulation provided a

more effective way of observing future learning [14]. Apparently, simulation could make up the shortage of traditional teaching, effectively help students connect abstract concepts and life experience, and provide students with testing under simulated situations to construct knowledge through observing, reflecting, and correcting self-behavior [15]. As a result, the following hypothesis is proposed in this study:

H2: Financial simulation games show remarkable and positive effects on learning effectiveness.

The relationship between learning motivation and the outcomes it drives is a pivotal theme in educational research. According to Xu and Wang [14], learning motivation is instrumental in steering an individual's learning goals. It acts as a catalyst, inducing sustained effort in learning, bolstering cognitive processes, and reinforcing one's conviction in the outcomes of learning. In a similar vein, Naz and Hussain [16] defined learning motivation as the psychological impetus that galvanizes students' interest, spurring continuous engagement towards achieving educational objectives. When we pivot to the context of English learning in senior high school students, Horovitz and Mayer [17] provide intriguing insights. They observed that most students' drive to learn English wasn't necessarily underpinned by a genuine affection for the subject. Instead, their motivations were tethered to pragmatic goals, such as gaining admission to esteemed colleges. Nonetheless, it was evident that students who exhibited a positive orientation towards learning motivation exhibited superior performance in English. They not only showcased a proclivity to learn but also signaled a propensity to persist in their English learning journey. One cannot underestimate the role of motivation in amplifying learning efficacy. Wang et al. [3] accentuated this by noting that students buoyed by higher levels of motivation articulated clearer objectives and an intensified zeal to grapple with academic content. Such students held loftier expectations of outcomes and exhibited heightened self-efficacy, translating to enhanced learning effectiveness. Moore et al. [18] delved further into the motivations of domestic college students learning English and unearthed that these motivations were significantly swayed by the course content and the instructors. This observation suggested a tilt towards extrinsic motivation overshadowing intrinsic motivation. However, a salient point to note is that students with robust intrinsic motivation displayed superior eagerness to learn, which translated to better learning outcomes. One cannot underestimate the role of motivation in amplifying learning efficacy. However, a salient point to note is that students with robust intrinsic motivation displayed superior eagerness to learn, which translated to better learning outcomes. Lynn et al. [19] embarked on a quest to explore the pedagogical efficacy of situational learning and its adaptability across genders. Their findings illuminated that situational learning had a profound impact on "effort attribution" within the domain of learning motivation. This modality of learning, by virtue of its efficacy, overshadowed non-situational learning methods. In light of these observations, this study proposes a hypothesis. The underpinning tenets of this hypothesis advocate for a learning design that binds the learning activity to overarching tasks and challenges. It underscores the need for learners to carve out their own unique tasks and challenges, ensuring that these tasks mirror real-world intricacies. Furthermore, the learning environment should challenge learners, stimulating their cognitive faculties. There should be ample latitude for learners to test their ideas across diverse perspectives and scenarios. Finally, the design should scaffold learners in introspecting both their learning journey and the content imbibed.

H3: Learning motivation reveals notable and positive effects on learning effectiveness.

### 3 RESEARCH DESIGN AND METHOD

#### 3.1 Research framework

Summing up the above literature review, the conceptual framework is drafted for this study (Figure 1) to discuss the effects of financial simulation game-based teaching models and multimedia interactive web-based teaching models on learning motivation and effectiveness.

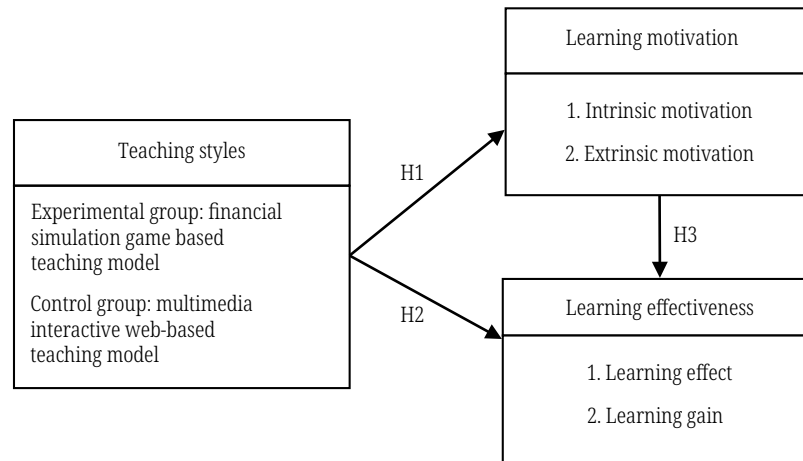


Fig. 1. Conceptual framework

#### 3.2 Measurement of research variable

**Learning motivation.** In the study by Tang et al. [9], students' motivation to learn is bifurcated into two primary dimensions. The first, intrinsic motivation, encompasses the pure joy derived from grappling with challenging topics, perceiving learning as a genuine personal interest or hobby, and viewing education as a pathway to widen one's perspectives. Furthermore, it involves the proactive pursuit of new educational content and the desire to harness learning as a medium to tap into one's latent potential and inch closer to personal dreams and ideals. On the other hand, extrinsic motivation is characterized by the drive to earn validation or affirmation from external sources. This includes aiming for superior academic performance, studying with the primary intent of clearing exams or assessments, and striving to make an impression on or outpace one's peers. Moreover, it comprises the quest for acknowledgment or adulation from seniors or individuals of the opposite gender, the inclination to study as a means to sidestep punitive consequences or verbal reprimands, the urgency to stave off the dishonor linked with academic setbacks, and the ambition to lay the groundwork for future academic aspirations, like securing admission into prestigious institutions.

**Learning effectiveness.** According to Chen [15], learning effectiveness covers two dimensions.

1. Learning effect: include test performance, time for completing the schedule, and term performance.
2. Learning gain: containing learning satisfaction, achievement, and preference.

### 3.3 Research object and sampling data

Simulation game materials and multimedia interactive web materials for financial education are designed in this study, and the effects of these two teaching models on students' financial learning effectiveness and motivation are compared. Aiming at college students in southern Taiwan, as the research objects, 168 effective samples precede the 16-week (total 48 sessions) experimental teaching. The experimental class is taught with a financial simulation game-based teaching model, while the control class is taught with a multimedia interactive web-based teaching model. The collected questionnaire is analyzed with SPSS, and factor analysis, reliability analysis, and analysis of variance are applied to test various hypotheses (see Table 1).

**Table 1.** Research object

| Group   | Male | Female | Total |
|---|------|--------|-------|
| Experimental group: simulation game based group       | 38   | 46     | 84    |
| Control group: multimedia interactive web based group | 35   | 49     | 84    |

### 3.4 Teaching design

The teaching experiment is preceded by 16 weeks. The course explanation, grouping, and evaluation standards are preceded in the first week; the financial course is preceded in the second week; and the review and test are preceded in the last week.

### 3.5 Analysis method

An analysis of variance is utilized in this study for discussing the effects of a financial simulation game-based teaching model and a multimedia interactive web-based teaching model on learning motivation and effectiveness.

## 4 RESEARCH AND ANALYSIS

### 4.1 Reliability and validity analysis

Learning motivation, through factor analysis, is extracted two factors, and the results are shown in Table 2.

**Table 2.** Factor analysis of learning motivation

| Factor                | Eigenvalue | A    | Variance Explained | Cumulative Variance Explained |
|-----------------------|------------|------|--------------------|-------------------------------|
| Intrinsic orientation | 2.625      | 0.90 | 41.583%            | 41.583%                       |
| Extrinsic orientation | 2.183      | 0.92 | 37.622%            | 79.205%                       |

Learning effectiveness, through factor analysis, is extracted two factors, and the results are shown in Table 3.



**Table 3.** Factor analysis of learning effectiveness

| Factor          | Eigenvalue | A    | Variance Explained | Cumulative Variance Explained |
|-----------------|------------|------|--------------------|-------------------------------|
| Learning effect | 2.247      | 0.89 | 36.942%            | 36.942%                       |
| Learning gain   | 3.565      | 0.94 | 43.861%            | 80.803%                       |

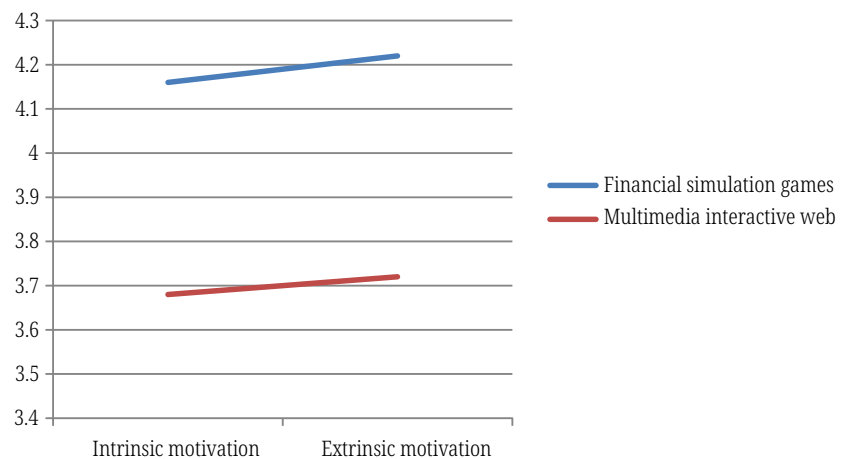
## 4.2 Variance analysis of learning motivation in financial simulation games

According to the analysis of variance to discuss the effects of financial simulation games on learning motivation, i.e., the analysis and explanation of teaching styles, financial simulation games (4.16) outperform multimedia interactive web (3.68) on intrinsic motivation, and financial simulation games (4.22) outperform multimedia interactive web (3.72) on extrinsic motivation (Table 4 and Figure 2). H1 is therefore supported.

**Table 4.** Variance analysis of learning motivation in financial simulation games

| Variable                   | F                    | P      | Scheffe Post Hoc |   |
|----------------------------|----------------------|--------|------------------|---|
| Financial simulation games | Intrinsic motivation | 21.472 | 0.000**          | Financial simulation games (4.16) > multimedia interactive web (3.68) |
|                            | Extrinsic motivation | 25.185 | 0.000**          | Financial simulation games (4.22) > multimedia interactive web (3.72) |

Notes: \*stands for  $p < 0.05$ ; \*\*for  $p < 0.01$ .

**Fig. 2.** Variance analysis of learning motivation in financial simulation games

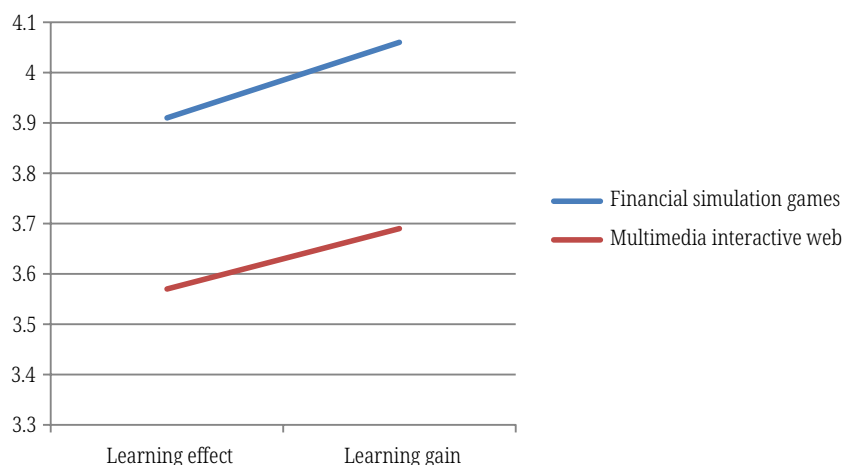
## 4.3 Variance analysis of learning effectiveness in financial simulation games

According to the analysis of variance to discuss the effects of financial simulation games on learning effectiveness, i.e., the analysis and explanation of teaching styles, financial simulation games (3.91) outperform multimedia interactive web (3.57) on learning effect, and financial simulation games (4.06) outperform multimedia interactive web (3.69) on learning gain (Table 5 and Figure 3). Consequently, H2 is supported.

**Table 5.** Variance analysis of learning effectiveness in financial simulation games

| Variable                   |                 | F      | P       | Scheffe Post Hoc  |
|----------------------------|-----------------|--------|---------|---|
| Financial simulation games | Learning effect | 18.556 | 0.000** | Financial simulation games (3.91) > multimedia interactive web (3.57) |
|                            | Learning gain   | 18.556 | 0.000** | Financial simulation games (4.06) > multimedia interactive web (3.69) |

Notes: \*stands for  $p < 0.05$ ; \*\*for  $p < 0.01$ .



**Fig. 3.** Variance analysis of learning effectiveness in financial simulation games

#### 4.4 Correlation analysis of learning motivation and learning effectiveness

**Correlation analysis of learning motivation and learning effect.** To test H3, the analysis results, Table 6, reveal significant effects of intrinsic orientation ( $\beta = 2.341^{**}$ ) and extrinsic orientation ( $\beta = 2.426^{**}$ ) on learning effect.

**Correlation analysis of learning motivation and learning gain.** To test H3, the analysis results, Table 6, show remarkable effects of intrinsic orientation ( $\beta = 2.383^{**}$ ) and extrinsic orientation ( $\beta = 2.241^{**}$ ) on learning gain. Accordingly, H3 is supported.

**Table 6.** Factor analysis of learning motivation and learning effectiveness

| Dependent Variable →    | Learning Effectiveness |       |               |       |
|-------------------------|------------------------|-------|---------------|-------|
|                         | Learning effect        |       | Learning gain |       |
| Independent variable ↓  | $\beta$                | P     | $\beta$       | P     |
| Learning motivation     |                        |       |               |       |
| Intrinsic orientation   | 2.341**                | 0.000 | 2.383**       | 0.000 |
| Extrinsic orientation   | 2.426**                | 0.000 | 2.241**       | 0.000 |
| F                       | 29.633                 |       | 34.283        |       |
| Significance            | 0.000***               |       | 0.000***      |       |
| R <sup>2</sup>          | 0.261                  |       | 0.325         |       |
| Adjusted R <sup>2</sup> | 0.253                  |       | 0.314         |       |

Notes: \*stands for  $p < 0.05$ ; \*\*for  $p < 0.01$ .



## 5 CONCLUSION AND DISCUSSION

The research findings reveal that students with a financial simulation game-based teaching model present better performance on learning motivation and learning effectiveness than those with a multimedia interactive web-based teaching model. Learners' decisions in financial simulation games would affect the gaming result, and financial simulation games could provide charming stories, content challenges, and competition to induce learning motivation, so that the cultivation of learning motivation and learning effectiveness appear to be more effective. Past research indicated that "competition" in games could induce learning motivation. The financial simulation game-based teaching materials show the "competition" element in the result between player and non-player characters (NPC). The researcher discovers that most students are glad to record their gaming performance in comparison to their peers. For this reason, personal performance ranking could be designed in future financial simulation games for automatically recording and uploading financial simulation gaming results so that students could look up personal and peers' performance to satisfy the competition attitude in the gaming process.

By negotiating with the school, the experimental teaching is arranged in two successive sessions, and the first session and the hours when students have more external affairs are avoided in order not to affect the learning effectiveness. The effectiveness of game materials is evaluated with multiple evaluations, including traditional pen-and-paper tests, situational tests, or qualitative observation, to evaluate students' practical financial application ability. Other game elements and mechanisms, such as "self-created characters, stories, and endings", "multi-level challenge design", and "being able to cooperate with others and social interaction", could be included in the game design for future financial simulation game-based teaching in order to increase the richness and fun of financial simulation games and discuss the effects of financial simulation game elements and mechanisms on learning effectiveness and motivation.

## 6 SUGGESTION

According to the research results, the following suggestions are proposed in this study:

1. The advantage of the model could be well applied to the future design of financial simulation game-based teaching materials to cultivate students' financial use and management attitudes and values as well as build students' basic financial knowledge concepts. It would effectively promote financial learning motivation and effectiveness.
2. Multi-level objective design, from simple to complicated, should be included in future financial simulation game-based teaching materials for students to achieve conditions through staged objectives and understanding personal performance in a financial simulation game-based teaching model to avoid unmatched personal expectations and actual situations reducing learning achievement and satisfaction. Furthermore, reward systems, e.g., enhancing a certain ability or a bonus, could be established for achieving staged objectives in order to induce students' motivation to continuously achieve objectives.
3. Future financial simulation game-based teaching materials should be designed with neutral perspectives to cover game elements of "competition" and "challenge" preferred by males as well as "cultivation" and "puzzle" preferred by females so

as to shorten the learning performance on the financial simulation game-based teaching model between the two genders.

4. "Challenge" is better designed in future financial simulation game-based teaching materials for class practice, as the difficulty and operation time could be planned according to class hours so that teachers could better control students' learning schedules.

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