



# Explore the Effects of Usefulness and Ease of Use in Digital Game-Based Learning on Students' Learning Motivation, Attitude, and Satisfaction

Chun-Hsiung Huang<sup>(✉)</sup>

Department of Digital Content Design, Ling Tung University, Taichung, Taiwan  
huangch@teamail.ltu.edu.tw

**Abstract.** This study actually produced and developed a computer role-playing game which aimed at 108 first-year college students. It discovered the relationship between the perceptual usefulness and ease of use of digital game-based learning and students' learning motivation, learning attitude, and learning satisfaction. In this study, a questionnaire survey method was applied to analyze the relationship between the research variables and the input hypothesis verification for the 108 questionnaire data recovered. The following conclusions were obtained: (1) "Usefulness" positively affects "learning motivation," "learning attitude," and "learning satisfaction." (2) "Ease of use" does not affect "learning motivation," "learning attitude," and "learning satisfaction." (3) The research infers that students are now familiar with the operation of computer role-playing games. Whether it is easy to use is not an important consideration. However, in terms of teaching strategies, teachers should pay attention to the usefulness of learners' perceptions. If the perceptions are useful, teachers can greatly increase the chances of success in teaching, and can enable students to have equivalent learning motivation, attitude, and satisfaction.

**Keywords:** Digital Game-Based Learning (DGBL) · Learning motivation · Learning attitude · Learning satisfaction

## 1 Introduction

In terms of the concept of situated teaching, the meaning of knowledge cannot be isolated from the context. The computer role-playing games applies a variety of level designs to form a rich and reasonable storyline. Through the exploration, users can look for information and try to complete the tasks given in the game. The computer role-playing game makes the players deeply feel that they are the characters in the stories and survive in the virtual games as the characters. What attracts players is the process of story development and the curve of character development, as well as the relationships they build up with other characters in the game world.

The Digital Game-Based Learning (DGBL) system can provide learners with an active learning environment and opportunity. It allows learners to immerse themselves

into learning and obtain better learning information. The field of DGBL has been widely researched and applied currently. Through this way of learning, it brings more pleasant and stimulating in the learning process which not only enhances motivation and interests, but also improves learning effectiveness.

DGBL is a valuable study for teachers and students in terms of teaching strategies and methods to enhance students' motivation, attitude and satisfaction, and thus enhance students' learning effectiveness. Therefore, this study will explore the relationship between the use of computer role-playing games in mythology literature, the usefulness of perception, the ease of perception, and the learning motivation, attitude, and satisfaction of students.

## **2 Reviewed Literature**

### **2.1 Digital Game-Based Learning**

Digital Game-Based Learning (DGBL) is a student-centered teaching method that can decrease the frustration of learners. It combines digital games with teaching content and considers learner's learning and cognitive style. Learning activities by simulating states can make the learning process more stimulating and effective [1]. DGBL can also be applied on Inquiry-based learning. The exploratory way of learning is an effective teaching strategy which provides students with the opportunity to explore in the game environment with tasks and challenges. It also allows learners to continually retry tasks and solve problems based on feedbacks from the game system. Inquiry-based learning integrates teaching strategies into the game environment and provides challenges in the game tasks. It can also arrange to elevate significant inquiry activities which can effectively improve learners' learning effectiveness, motivation, flow experience, learning satisfaction [2].

### **2.2 Learning Motivation**

Motivation is the requirement to reach reserved goals and the initial point for a series of physiological processes that drive individuals to influence behavior [3]. How to stimulate students' learning motivation is one of the important topics for teachers in the classrooms. Motivation can be divided into internal and external forms according to the different causes or goals that are caused by the action. The intrinsic motivation refers to the way of internal reward rather than any external reward. The motivation for learning in this study is from the perspective of internal motivation. The origin of internal motivation is the personal desire, but not external reward or punishment [4]. It is the desire of students to continuously pursue knowledge and skills. Intrinsic motivation is motivated by interest or entertainment, even because of the internal desire to challenge and solve the target tasks [5]. As the learners acquire abilities and knowledge, intrinsic motivation leads to satisfaction and pleasure in the learning process [6]. To compared with extrinsically motivated students, intrinsically motivated students are more likely to persevere and maintain long-term learning motivation when facing the learning challenges [7].

### 2.3 Learning Attitude

Attitude can be a relatively stable cognitive and emotional psychological tendency expressed in a situation or concept. Attitude is different from motivation. Attitude is a group of beliefs, and motivation is the reason for doing something [8]. Attitudes are also usually different from beliefs, because attitudes have a moderate duration, strength, and stability. And they have emotional content as well, while beliefs are stable and difficult to change ideas [9]. Emotional factors such as attitude, motivation, and anxiety, play an important role in stimulating and supporting learning effectiveness [10]. In the study of higher education, regardless of the teaching method adopted by teachers in the college, it points out that the student participation may be the most important factor in determining whether college students can successfully learn or not [11]. Research on attitudes regarding the use of Information and Communication Technology has shown that there is greater potential for the use of digital learning technology in order to enhance learning activities. It can not only promote the participation in learning, but also enhance the positive learning attitudes [12].

### 2.4 Learning Satisfaction

Satisfaction is a kind of psychological sense and an abstract term as well. Martin [13] believes that satisfaction refers to the consistency between an individual's expectation of gaining experience and the actual results one feels when experiencing. If it equals or exceeds to expectations, one will feel satisfied. Otherwise, one will not be satisfied. In this way, learning satisfaction can be the degree of psychological expectation that the learner feels whether the learning activities are encountered. When the learning topics help to fulfill student expectations and needs, they can increase students' satisfaction. Kuo et al. [14] studied some predictive indicators of student satisfaction and pointed out that when learners and instructors or learners and learning materials interacted well, they were good predictors of learning satisfaction. Learning through a series of interactions allows learners and instructors or learners and textbooks to have a large number of good interactions, which is also a way to improve learning satisfaction. The higher learning satisfaction will also affect learning motivation and effectiveness as well [15].

## 3 Methodology

### 3.1 Teaching Material Content

This study uses the Input-Process-Outcome Game Model (IPOGM) [16]. It produces a computer role-playing game with the learning content in the game which is set to the Shan Hai Jing mythology literature course. The learner can control the roles in the adventure and puzzle solving of the game, under the rich and reasonable storyline. The learners can also enjoy in the game loop, and solve problems by exploring the environment, collecting information, and thinking strategies in order to achieve high engagement of participation in learning activities. The dialogue mode in the game is shown in Fig. 1, and the battle mode in the game is shown in Fig. 2.



Fig. 1. Game dialogue mode.



Fig. 2. Game battle mode.

### 3.2 Research Hypothesis

This study focuses on the relationship between the use of computer role-playing games in the teaching of mythology and literature courses. And it explores the relationships among perception of students' usefulness, ease of use, learning motivation, learning attitude, and learning satisfaction.

- H1: Usefulness affects students' learning motivation.
- H2: Ease of use affects students' learning motivation.
- H3: Usefulness affects students' learning attitude.
- H4: Ease of use affects students' learning attitude.

H5: Usefulness affects students’ learning satisfaction.

H6: Ease of use affects students’ learning satisfaction.

**3.3 The Definition and Measurement of the Research Dimensions**

All Dimensions of this study refer to relevant literature for the definition and operation of variables. As for the question of all the Dimensions, the “usefulness”, “ease of use”, and “learning motivation” scales were modified from Hwang et al. [17]. And the questions of the “learning attitude” scale were modified from Pierce et al. [18]. The questions on the “learning satisfaction” scale were modified from Sun et al. [19]. The questionnaire items and scale reference sources are shown in Table 1, Table 2, Table 3, Table 4 and Table 5.

**Table 1.** Questionnaire items and source.

Dimensions	Questions	Sources
Usefulness	I think that the use of computer role-playing games enriches learning activities in mythology literature courses	Hwang et al. [17]
	I think that the mythology literature courses using computer role-playing games is very helpful for me to gain new knowledge	
	I think that in mythology literature courses, the learning mechanism provided by computer role-playing games makes the learning process smoother	
	I think, in mythology literature courses, using computer role-playing games helps me getting valuable information when I need it	
	I think that in mythology literature courses, using computer role-playing games helps me learning better	
	I think it is more useful to apply computer role-playing games in mythology literature courses	

**Table 2.** Questionnaire items and source.

Dimensions	Questions	Sources
Ease of use	I think it is not difficult for me to use computer role-playing games in mythology courses	Hwang et al. [17]
	It only took me a short time to fully understand how to use computer role-playing games in mythology literature courses	
	I think that in mythology literature courses, learning activities using computer role-playing games are easy to understand and follow	

*(continued)*

**Table 2.** (continued)

Dimensions	Questions	Sources
	I quickly learned how to use computer role-playing games in mythology and literature courses	
	I think it is not difficult for me to use computer role-playing game learning methods in mythology literature learning activities	
	I think it is easy to use computer role-playing games in mythology courses	

**Table 3.** Questionnaire items and source.

Dimensions	Questions	Sources
Learning motivation	I think it is interesting to use computer role-playing games to learn mythology and literature courses	Hwang et al. [17]
	I think it is valuable to use computer role-playing games to learn mythology and literature courses	
	I want to use computer role-playing games to learn more in mythology and literature courses	
	I think it is worthy to use computer role-playing games to learn the content of mythology and literature courses	
	To me, learning mythology and literature courses is very important	
	I know that learning mythology and literature courses is very important for future applications	
	I will actively look for more information to learn mythology and literature courses	
	I think it is very important to learn mythology and literature courses for every student	

**Table 4.** Questionnaire items and source.

Dimensions	Questions	Sources
Learning attitude	I like to use computer role-playing games for mythology and literature courses	Pierce et al. [18]
	I think I will learn more when using computer role-playing games in mythology courses	

(continued)

**Table 4.** (continued)

Dimensions	Questions	Sources
	I think the use of computer role-playing games in mythology literature courses is worth to pay extra effort	
	I think mythology and literature courses are more interesting when using computer role-playing games	
	I think computer role-playing games can help me learning mythology and literature courses better	

**Table 5.** Questionnaire items and source.

Dimensions	Questions	Sources
Learning satisfaction	I am satisfied with the decision of using computer role-playing games to learn mythology and literature courses	Sun et al. [19]
	If have the opportunity to use computer role-playing games to learn mythology and literature courses, I would be happy to do so	
	I selected to use computer role-playing games to learn mythology and literature courses	
	I think to use the computer role-playing games to assist the mythology course is very satisfied	
	I think that mythology literature courses assisted with computer role-playing games satisfies my learning needs well	
	I will do my best to use computer role-playing games to learn mythology and literature courses	

**3.4 Data Collection**

The Likert’s 5-point scale is used in this research. After taking an 80-min computer role-playing game in mythology and literature courses for the freshmen students of the Department of Digital Media Design of Ling Tung University, the questionnaire is distributed and filled out. A total of 108 copies of effective questionnaires were collected 75 females and 33 males were included in the questionnaire. The SPSS 21.0 is used as the computer statistical analysis software. The statistical analysis includes reliability analysis and the validity is tested through KMO. Also the research hypothesis has been analyzed. Through correlation analysis, we can understand the relationships between Dimensions. Through regression analysis, it provides further understanding the degree of mutual influence of Dimensions.

## 4 Research Results

### 4.1 Reliability Analysis

The interviewing questionnaire of this research includes five dimensions: “usefulness”, “ease of use”, “learning motivation”, “learning attitude” and “learning satisfaction”. According to Guiford [20], a Cronbach’s alpha value greater than 0.7 indicates a high degree of confidence. In this study, 108 questionnaires were distributed, and 108 valid questionnaires were recovered, with an effective recovery rate of 100%. Cronbach’s alpha values of the five dimensions, such as usefulness, ease of use, learning motivation, learning attitude, learning satisfaction, are higher than 0.8 (between 0.862–0.958). It possesses relatively high reliability. The five dimensions of Cronbach’s alpha are listed in Table 6:

**Table 6.** Reliability analysis table.

Dimensions	Number of questions	Cronbach’s alpha value
Usefulness	6	0.958
Ease of use	6	0.862
Learning motivation	8	0.936
Learning attitude	5	0.914
Learning satisfaction	6	0.946

### 4.2 Validity Analysis

In the validity part, the issuance questionnaires are supervised by three relevant experts with experience in designing questionnaires in order to complete the questionnaire design, so that the questionnaires have certain content validity.

Through the KMO Spherical Test. The KMO value is between 0 and 1. The closer the value is to 1, the higher the correlation of the variable is, which is more suitable for factor analysis. The closer the value is to 0, the lower the correlation of the variable is which is less suitable for factor analysis. The KMO measure of sampling adequacy is commonly used metrics above 0.9 indicate that it is very suitable; 0.8 indicates that it is suitable; 0.7 indicates that it is generally suitable; 0.6 indicates that it is not suitable; 0.5 or less indicates that it is extremely unsuitable. The overall test results of this study are summarized in the following Table 7:

**Table 7.** The KMO spherical test.

Dimensions	KMO Value	Results
Usefulness	0.908**	Very suitable
Ease of use	0.759**	Generally suitable
Learning motivation	0.851**	Suitable
Learning attitude	0.881**	Suitable
Learning satisfaction	0.894**	Suitable

\*\* significant at  $p < 0.01$

Among the dimensions, the KMO value of learning motivation is 0.851, which passes the verification standard. The interpretable variation is 69.46% which can be extracted of a component. The KMO value of learning attitude is 0.881, which passes the verification standard. The interpretable variation is 74.43% which can be extracted of a component. The KMO value of learning satisfaction is 0.894, which passes the verification standard. The interpretable variability is 79.28% which can be extracted of a component. The KMO value of ease of use is 0.759, which passes the verification standard and can explain 59.30% of the variation. It can be extracted a component. The KMO value of usefulness is 0.908, which passes the verification standard. The explainable variation is 86.60% which can be extracted of a component. The overall test results of this study are summarized in the following Table 8. Therefore, all the dimensions of this study have passed the standard with certain validity.

**Table 8.** The KMO spherical test.

Dimensions	KMO Value	Explanation Total Variance
Usefulness	0.908**	86.60%
Ease of use	0.759**	59.30%
Learning motivation	0.851**	69.46%
Learning attitude	0.881**	74.43%
Learning satisfaction	0.894**	79.28%

\*\* significant at  $p < 0.01$

### 4.3 Correlation Analysis

In order to understand the influence variables between the facets and whether there is a relationship between the facets, the results are shown in Table 9 through Pearson correlation analysis:

**Table 9.** Correlation analysis table.

Dimensions	Usefulness	Ease of use	Learning motivation	Learning attitude	Learning satisfaction
Usefulness	1				
Ease of use	0.71**	1			
Learning motivation	0.81**	0.61**	1		
Learning attitude	0.87**	0.69**	0.86**	1	
Learning satisfaction	0.91**	0.67**	0.84**	0.91**	1

\*\* significant at  $p < 0.01$

As shown in Table 9, there are correlations between the facets. This study will further carry out regression analysis.

### 4.4 Regression Analysis

In order to understand the influence among the facets, this study will carry out regression analysis to clarify the relationship between each other. It used usefulness and ease of use as independent variables, and respectively analyzed learning motivation, learning attitude, and learning satisfaction as dependent variables. The result are summarized in Table 10:

**Table 10.** Table of three-mode regression analysis arrangement.

Independent variable/dependent variable	Model 1: learning motivation	Model 2: learning attitude	Model 3: learning satisfaction
Usefulness	0.759**(p = 0.000)	0.803**(p = 0.000)	0.603**(p = 0.000)
Ease of use	0.076 (p = 0.343)	0.096 (p = 0.065)	0.046 (p = 0.418)
Significance	0.000**	0.000**	0.000**
Degree of freedom	2	2	2
F value	103.605	199.100	262.630
R <sup>2</sup>	0.664	0.791	0.833

\*\* significant at  $p < 0.01$

In Model 1, we use learning motivation as a dependent variable, through usefulness and ease of use as independent variables. We found that the model is established and the regression analysis was found that usefulness affects the learner’s learning motivation (0.759\*\*). But the perception ease of use has not affected.

In Model 2, we use learning attitude as a dependent variable, through usefulness and ease of use as independent variables. We found that the model is established and the regression analysis found that usefulness affects the learner’s learning attitude (0.803\*\*). But the perception ease of use has not affected.

In Model 3, we use learning satisfaction as a dependent variable, through usefulness and ease of use as independent variables. We found that the model is established and the regression analysis found that usefulness affects learner’s learning satisfaction (0.603\*\*). But the perception ease of use has not affected.

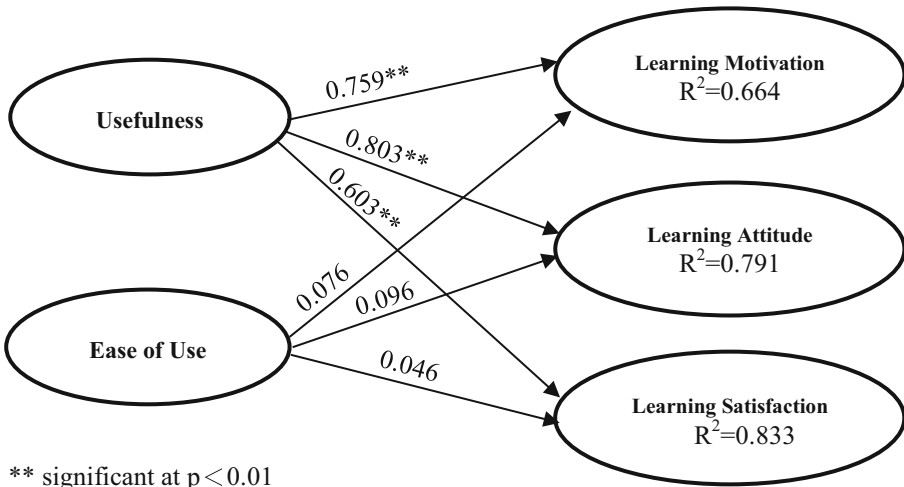


Fig. 1. The result of regression analysis.

#### 4.5 Summary

Through the statistical analysis of the data from above, in addition to having good reliability and validity, this research has an impact on the relationship between “usefulness”, “learning motivation”, “learning attitude”, and “learning satisfaction”. However, “ease of use” is invalid for “learning motivation”, “learning attitude” and “learning satisfaction”. The inference may be because students are now fairly familiar with the operation of computer role-playing games. Therefore, the ease of use is not an important consideration. However, in terms of teaching strategies, teachers must pay attention to the usefulness of learners’ perception. If the learners’ perception is useful, it can greatly increase the chances of achieving success in teaching. And it can make students have more comparable learning motivation, attitude, and satisfaction. Based on the above, the results of the hypothesis in this study are summarized in Table 11:

**Table 11.** The hypothesis of the establishment.

Hypothesis	Status
H1: Usefulness influences the learning motivation of computer role-playing games in teaching mythology and literature	True
H2: Ease of use influences the learning motivation of computer role-playing games in teaching mythology and literature	False
H3: Usefulness influences the learning attitude of computer role-playing games in teaching mythology and literature	True
H4: Ease of use influences the learning attitude of computer role-playing games in teaching mythology and literature	False
H5: Usefulness influences the learning satisfaction of computer role-playing games in teaching mythology and literature	True
H6: Ease of use influences the learning satisfaction of computer role-playing games in teaching mythology and literature	False

## 5 Conclusion

### 5.1 Research Finding

- (1) Usefulness will positively affect students' learning motivation (H1)  
The research confirms that computer role-playing games are used to teach mythology and literature courses. Usefulness will positively affect students' learning motivation. Therefore, the hypothesis H1 of this study is confirmed.
- (2) Ease of use cannot positively affect students' learning motivation (H2)  
The research confirms that computer role-playing games are used to teach mythology and literature courses. Ease of use does not positively affect students' learning motivation. Therefore, the hypothesis H2 of this study is not confirmed.
- (3) Usefulness will positively affect students' learning attitude (H3)  
The research confirms that computer role-playing games are used to teach mythology and literature courses. Usefulness will positively affect students' learning attitudes. Therefore, the hypothesis H3 of this study is confirmed.
- (4) Ease of use cannot positively affect students' learning attitude (H4)  
The research confirms that computer role-playing games are used to teach mythology and literature courses. Ease of use cannot positively affect students' learning attitudes. Therefore, the hypothesis H4 in this study is not confirmed.
- (5) Usefulness will positively affect students' learning satisfaction (H5)  
The research confirms that computer role-playing games are used to teach mythology and literature courses. Usefulness will positively affect students' learning satisfaction. Therefore, the hypothesis H5 of this study is confirmed.
- (6) Ease of use cannot positively affect students' learning satisfaction (H6)  
The research confirms that computer role-playing games are used to teach mythology and literature courses. Ease of use cannot positively affect students' learning satisfaction. Therefore, the hypothesis H6 of this study is not confirmed.

## 5.2 Research Conclusion

In addition to the nice reliability and validity of this research, when discussing the impact relationship, “Usefulness” has a respective effect on “learning motivation”, “learning attitude”, and “learning satisfaction”. However, “Ease of use” does not hold for “learning motivation”, “learning attitude”, and “learning satisfaction”. This result is somewhat different from the research of some scholars [21]. The inference of this research is that students in the Department of Digital Content Design have a high chance of using computers. In addition, computer role-playing games are so popular in Taiwan that students are very familiar with the operation of such computer role-playing games. Therefore, ease of use is no longer an important consideration for students. However, in terms of teaching strategies, teachers should pay attention to the usefulness of learners’ perception. If the learners’ perception is useful, it can greatly increase the chances of success in teaching. It can also make students have certain promoted degree of comparable learning motivation, attitude, and satisfaction.

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