Article

Using PLS-SEM Model to Explore the Influencing Factors of Learning Satisfaction in Blended Learning

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Abstract: This research explores the influencing factors of learning satisfaction in blended learning. Three dimensions are proposed: perceived usefulness, perceived ease of use, and learning motivation. It studied how these variables affect students' learning satisfaction. The research hypotheses are: (1) Perceived ease of use positively affects perceived usefulness; (2) Perceived usefulness and perceived ease of use will have a positive effect on learning motivation; (3) Learning motivation positively affects learning satisfaction; (4) Perceived usefulness has a positive intermediary effect on the relationship between perceived ease of use and learning motivation. Participants included 173 freshmen who took the first-year interactive game design course at Ling Tung University in Taichung, Taiwan. The questionnaire survey method is applied in this research to analyze the relationship between the variables and verify the hypothesis based on the collected 173 valid questionnaires. The partial least square method structural equation model (PLS-SEM) is used to carry out structural equation modeling to study the relationship between latent variables. It explains that the perceived ease of use affects the perceived usefulness. Perceived usefulness and perceived ease of use have a positive impact on learning motivation. Learning motivation has a positive impact on learning satisfaction. Perceived usefulness as an intermediary factor of perceived ease of use has an indirect impact on learning motivation. The contribution of this research is to provide empirical evidence and explain what factors may affect learning satisfaction. Some other related factors that may affect learning satisfaction should be taken as the factors that teachers should pay attention to when implementing blended learning.

Keywords: PLS-SEM; blended learning; perceived usefulness; perceived ease of use; learning motivation; learning satisfaction

1. Introduction

Due to the prevalence of information technology, the teaching method of blended learning that combines online teaching and face-to-face teaching has become a common method in current teaching strategies [1,2]. Blended learning can be divided into online and offline teaching based on different places where teaching activities take place [3]. Through the combination of traditional face-to-face teaching and online teaching, the teaching mode of blended learning can cultivate students' independent learning and independent problem-solving abilities. It can also promote students' self-regulated and collaborative learning [4]. Incorporating ICT (Information and Communication Technologies) teaching technology allows teachers to find a teaching method that suits and tailors to their needs. It can also provide students with more active participation in learning [5]. Moreover, the application of information technology to teaching has not only changed the way students obtain learning materials, but also promoted their active and independent learning, the ability to think, and critical thinking [6].

However, are the learners satisfied with this blended learning model? Additionally, what factors will directly or indirectly affect students' learning satisfaction? What kind of influence relationship exists among the various factors? These are the key factors

to evaluate the design effects of teaching activities, and student learning satisfaction is also an important part of learning effectiveness analysis [7]. The research literature of blended learning seldom talks about the relationship between usefulness, ease of use, learning motivation and learning satisfaction, and lacks understanding of the relationship between usefulness, ease of use, and learning motivation. Therefore, the relationship between usefulness and ease of use and learning motivation, as well as the degree to which learning motivation affects learning satisfaction, is what this research wants to emphasize. As students are the main body of learning, individual differences of students have different subjective feelings and learning experiences for the learning process with the teaching method of blended learning. Learning satisfaction has certain significance for the design of teaching activities, improvement of learning effectiveness, and promotion of individualized learning. This research attempts to establish a model of the factors which influence learning satisfaction in interactive game design courses from the perspectives of perceived usefulness, perceived ease of use, and learning motivation. The partial least square method (PLS-SEM) is used to explain the structure model and analyze the interrelationship among influencing factors. It will provide ideas and references for follow-up theoretical research and teaching practice.

2. Literature Review and Hypotheses

2.1. Blended Learning

Blended learning combines two advantages of face-to-face and online learning [8]. Teaching and learning can make teaching activities more flexible through synchronous and asynchronous methods. Blended learning is a methodology that involves teaching and learning. It integrates e-learning with traditional learning theories and practices that promote self-regulation and collaborativeness [9]. Blended learning takes learning activities, learners and teachers as elements, and it can form a variety of blended learning forms [10]. In particular, the implementation of interactive game design curriculum teaching allows teachers to apply a variety of synchronous or asynchronous teaching. Additionally, students in groups can also discuss through various social software in different places. The combination of online teaching materials and the traditional face-to-face teaching mode can promote independent, group, and collaborative learning for students [11].

Blended learning can be mixed into various aspects, including blended offline and online learning, self-directed and cooperative learning, and structured and unstructured learning. This method of combining several different teaching methods to transfer knowledge can be assisted by information technology, such as cooperative learning software, online courses, and knowledge management tools [12]. In addition, the provision of online teaching and advanced internet technology provides an effective way to enter online learning for the blended learning model. For students who participate in learning independently, this method is also very successful and effective for adult learners [13].

In blended learning, interaction can be carried out face-to-face or online, which is considered to be the advantage of this educational method [14]. Blended learning is based on constructive learning theory, emphasizing student-centered learning. The gaining of knowledge and abilities is completed by students in the process of active construction. Students learn in a time, place, and learning pace or learning path that can be independently controlled [15]. Blended learning courses can combine online and offline teaching through appropriate teaching design, and they can interactively transform different learning methods to improve students' learning motivation and interest [16]. The benefits can provide students with a richer learning experience [17]. With the development of online learning technology and the popularization of internet technology, blended learning is quickly becoming the standard in higher education [18].

2.2. Perceived Usefulness and Perceived Ease of Use

In this study, we used perceived usefulness and perceived ease of use to check students' initial acceptance of blended learning. Perceived usefulness and perceived ease of

use are important factors in the Technology Acceptance Model. The Technology Acceptance Model (TAM) is a theory developed by Davis [19] to explain the determinants of technology acceptance. Perceived usefulness refers to the degree to which one believes using a particular system can improve one's work performance. The perceived ease of use refers to the degree of awareness that a person thinks a particular system is easy to use or not. In the TAM, the perceived ease of use will affect the perceived usefulness, and these two variables will also affect the behavioral intention of use at the same time.

Research on the use of new information technology in the learning environment pointed out that Wu and Chen [20] conducted a survey on the use of MOOC environments in China. This research found that perceived ease of use has an important impact on perceived usefulness. Joo et al. [21] tried to integrate self-determination theory with TAM. They tested the use intention of Korean college students to use K-MOOC learning environments. The results also showed that perceived ease of use has an important impact on perceived usefulness. Therefore, this research proposes the following hypothesis:

Hypothesis 1 (H1). *Perceived ease of use positively affects perceived usefulness.*

2.3. Learning Motivation

Motivation is a mental representation. It mainly refers to an internal driving force that causes an individual to produce active behaviors, persevere and move toward a certain goal [22]. Learning motivation is the motivation of learners to continue their learning behavior or a demand for success in the learning process. Learning motivation plays an important role in the learning process. It helps students to continue learning with confidence in the learning process [23]. Learning motivation can also be a mental journey that allows learners to induce learning activities and move towards learning goals [24]. Learning motivation can be divided into internal and external motivation. Internal motivation refers to the motivation caused by the individual's interest in the learning activity. External motivation is the motivation that promotes individual participation in learning activities caused by external factors [25]. Learning motivation is an indispensable internal driving force in the learning process of students. It allows students to persevere in learning towards their goal. Compared with externally motivated students, intrinsically motivated students are more likely to persevere and maintain long-term learning motivation when facing learning challenges [26]. Studies have shown that the relationship between teachers' input and students' learning effectiveness is not a simple positive correlation [27]. The high input of teachers may not be able to obtain high learning effectiveness from students. The effect of teaching input on learning effectiveness will be affected by factors such as learning motivation [28].

Nikou and Economides [29] combined technology acceptance theory and motivation factors in a study. They proposed the Mobile Based Assessment–Motivational and Acceptance Model (MBA-MAM). The model combines the interpretation and prediction of behavioral intentions using mobile learning devices. With the development of technology, the use of various learning technologies has become a part of daily life. The learning environment and the characteristics of the learners will greatly affect the experience and performance of the way of using the learning system [30]. There are some qualitative studies that provide useful insights into various types of motivation and participation patterns from the learner's perspective [31,32]. Liang et al. [33] found that learners' cognition of the usefulness of MOOC has a significant impact on learning participation. Thereby it improves the learning outcomes. According to Venkatesh and Davis [34], perceptual ease of use is a personal view of the ease of use of new technologies. It is considered to be an incentive for students in order to adopt new technological advancements. Shiau and Chau [35] also believed that if the technical tool or system is easy for students to use, students will use this new service intentionally. Relevant studies using the TAM believed that motivation factors can improve the predictability of the model [36,37]. We can extend

this argument to be that higher perceived ease of use and perceived usefulness will affect students' learning motivation. Therefore, the following hypotheses are made:

Hypothesis 2 (H2). *Perceived usefulness positively affects learning motivation.*

Hypothesis 3 (H3). *Perceived ease of use positively affects learning motivation.*

2.4. Learning Satisfaction

Learning satisfaction refers to the kinds of personal inner feelings of learners in the learning process. The satisfaction and positive feelings are generated by the learning process experienced by the individual in learning activities [38]. It mainly emphasizes the individual's subjective feelings about the content, methods, process, and results of learning activities. In the learning process, if the learning activity meets or exceeds its "expectations", it is considered as "satisfied", otherwise it is considered as "unsatisfied". Satisfactory experience will affect continuous participation in learning activities and increase investment in learning activities [39]. Learners' perception of learning results comes from the difference between the actual learning content obtained in the learning process and the learning results expected to be obtained, which is the learning satisfaction. Learning satisfaction will continue to affect students' learning experience. When learners meet or exceed expectations in their learning performance, they will have a sense of satisfaction. Additionally, the learning process will continue and appear repeatedly, which will form a virtuous circle [40,41]. Chou [42] verified the relationship between flipped classroom teaching and self-efficacy through experimental research. Self-efficacy has an impact on flipped classrooms with the help of learning satisfaction, which is conducive to enhance students' confidence and improve learning effects.

In previous studies, it was found that if there is a good large number of interactions between learners, teachers, and learning materials, this will positively affect learning satisfaction. Higher learning satisfaction will also affect learning motivation and learning effectiveness [43,44]. Learning motivation is an important indicator that affects learning satisfaction. Some experimental studies have found that students' attitudes towards teachers, their learning motivation and experience will affect their performance and satisfaction [45]. The stronger the learner's learning motivation is, the more significant learning satisfaction will be in the learning process. Based on the literature from above, this study concludes that learning motivation and learning satisfaction in blended learning have a substantial influence. Therefore, the following hypothesis is made:

Hypothesis 4 (H4). *Learning motivation positively affects learning satisfaction.*

3. Methodology

3.1. Teaching Method Design

This research focuses on blended learning with the concept of a flipped classroom [46]. The flipped classroom consists of two parts: one is the interactive group learning activities inside the classroom, and the other is the direct computer-based individual teaching activities outside the classroom. The core concept of the mixed teaching of the flipped mode is to flip the teaching mode. In traditional teaching, instructors teach course content in the classroom, and students discuss, practice, and complete their homework after class. Flipped classroom teaching means that students watch the video of the course content recorded by the instructors before class, and then go to the classroom to discuss, practice, and complete their homework. In this way, students can implement the traditional face-to-face classroom teaching and online learning at the same time.

The subjects of this research are the students from the Interactive Game Design course in three freshman classes in both the day and the night division of the university. The number of teaching sessions per week for this course is two classes, with a length of 50

min per class-hour. A total of nine weeks is the implementation. The teaching method is a mixture of traditional face-to-face discussion and online course content learning. In terms of online learning, students learn courses online by themselves within the course schedule given by the teacher. In traditional face-to-face learning, groups of 3–4 people per group are used to implement teaching methods such as group guidance, group discussion, and group work. Lastly, in the ninth week, the team members need to complete a computer adventure game design with character, scene, and story design.

3.2. Research Structure and Hypothesis

This research mainly explores the relationship between students' perceived usefulness, perceived ease of use, learning motivation and learning satisfaction in the course teaching of "interactive game design" in blended learning. The structure of this research is shown in Figure 1.
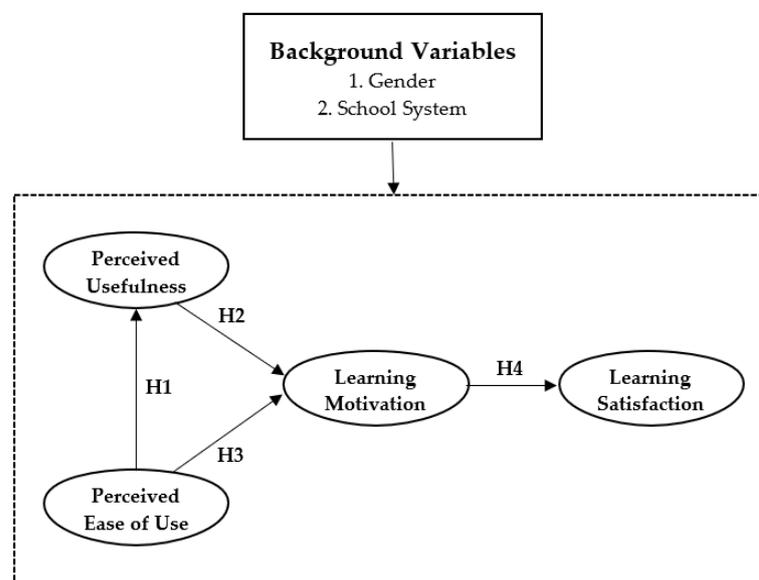

Figure 1. Hypotheses and research model.

According to the research purpose and framework, this research proposes the following research hypotheses: H1–H5.

1. The analysis of the differences in the research dimensions of different background variables.
2. The influence relationship between research dimensions.

Hypothesis 5 (H5). *Perceived usefulness has a positive intermediary effect on the relationship between perceived ease of use and learning motivation.*

3.3. The Definition and Measurement of Research Dimensions

All dimensions of this study refer to relevant literature for the definition and operation of variables. The questionnaire was translated into Chinese for students to fill out. The definition of the research operation and the questionnaire items are shown in Tables 1 and 2.

Table 1. The operational definitions.

Dimensions	Operational Definition
Perceived Usefulness	Students believe that the blended learning method is very helpful for obtaining new knowledge.
Perceived Ease of Use	Students believe that the blended learning method is easy to use.
Learning Motivation	Students are willing to participate in learning using blended learning methods.
Learning Satisfaction	Students believe that the blended learning style takes subjective feelings about learning activities.

3.4. Data Collection and Analysis Method

The teacher has told the students in advance before the course is implemented, and after the course is implemented, the students are asked to volunteer to fill in the questionnaire. This research questionnaire uses Likert's 5-point scale, with options including "strongly disagree", "disagree", "normal", "agree", and "strongly agree". For the freshmen from the Digital Content Design Department of Ling Tung University in Taiwan, questionnaires were issued and completed with a total of 173 valid questionnaires collected after 9 weeks of teaching in a blended learning mode. Next, SPSS 22.0 (IBM, USA) software is used to carry out descriptive statistics and independent sample t-test methods in order to test the difference analysis of different background variables to research variables. Smart-PLS 3.0 uses partial least squares structural equation modeling (PLS-SEM) to measure the correlation between observation variables and latent variables through a reflective measurement model.

Partial least squares structural equation modeling (PLS-SEM) is an analysis technique for detecting or constructing predictive models. Especially for the causal model analysis between latent variables, it is better than the general linear structural relationship model, which is very suitable for exploratory research [49,50]. Compared with covariance-based structural equation modeling (CB-SEM), which is evaluated by covariance matrix, the PLS-SEM is suitable for small sample analysis [51]. Chin [52] suggested that the sample size requirement of PLS should be collected at 10 times the dimension of most question items. The dimension of most question items is learning motivation. There are 8 question items. According to the principle of statistical conservativeness, a larger sample size should be used. Therefore, the minimum sample size for research must be at least 80. The sample size of this study is 173, which meets the minimum sample size requirement.

PLS-SEM is mainly designed to detect whether the causal relationship has a statistically significant mutual linear relationship. It is rather suitable for the construction of theoretical models. This study uses PLS-SEM as a method to explore the relationship between the research variables. It mainly uses PLS Algorithm and Bootstrapping to perform the repetitive sampling 5000 times in order to derive path coefficients and significance [53]. It can discuss the correlation and influence between the dimensions.

Table 2. Questionnaire items and reference.

Dimensions	Questions	Reference
Perceived Usefulness	PU1: This way of learning in class enriches learning activities. PU2: This way of learning in class is very helpful for me to acquire new knowledge. PU3: The learning mechanism provided by this way of learning in class makes the learning process smoother. PU4: This way of learning in class helps me get useful information when I need it. PU5: This way of learning in class helps me learn better. PU6: This way of learning in class is more useful than the traditional computer classroom.	Hwang et al. [47]
Perceived Ease of Use	PEOU1: The kind of operating system by this way of learning in class is not difficult for me. PEOU2: It only took me a short time to fully understand how to apply this way of learning in class. PEOU3: The learning activities in this way of learning in class are easy to understand and follow. PEOU4: I quickly learned to apply this way of learning in class. PEOU5: It is not difficult for me to apply the learning system in this way of learning in class. PEOU6: I think the system interface of this way of learning in class is easy to use.	Hwang et al. [47]
Learning Motivation	LM1: I think this way of learning in class is interesting. LM2: I think this way of learning in class is valuable. LM3: I want to learn more in this way of learning in class. LM4: I think it is worth to apply this way of learning in class. LM5: To me, it is important to apply this way of learning in class. LM6: I know that learning to apply this way of learning in class is very important in the future. LM7: I will seek more information to learn how to apply this way of learning in class. LM8: I think it is important for every student to learn to apply this way of learning in class.	Hwang et al. [47]
Learning Satisfaction	LS1: I am satisfied with this way of learning in class. LS2: If I still have the opportunity to apply this way of learning in class, I will be happy to do so. LS3: I think it is a wise choice to study courses in this way of learning in class. LS4: I feel very satisfied with this way of learning in class. LS5: I think this way of learning in class satisfies my learning needs very well. LS6: I will try to apply this way of learning in class as much as possible to study courses.	Sun et al. [48]

4. Research Results

4.1. Analysis of Background Variables

The subjects of this research are a total of 173 students: two classes of freshmen from the day division and one class of the night division of the Digital Media Design Department of Ling Tung University in Taiwan. There are 54 males and 119 females: 123 students from the day division and 50 students from the night division. The frequency distribution of sample data is shown in Table 3.

Table 3. Frequency distribution of sample data.

Items	Background Variables	Number of People	Percentage
Gender	Male	54	31.2%
	Female	119	68.8%
School System	Day-time classes	123	71.1%
	Evening classes	50	28.9%

4.2. Reliability and Validity Test

Reliability refers to the consistency of scale tools. The measurement indicators include individual item reliability and internal consistency [54]. Among them, the individual item reliability is tested by factor loading. The internal consistency is tested by latent variable composition reliability (CR) and Cronbach's alpha. The recommended value needs to be greater than 0.7.

The validity refers to the correctness of the scale tool, and the measurement indicators include convergent validity and discriminant validity. The convergent validity is mainly to measure the correlation between items with the same dimension, and to detect the average variance extraction (AVE). The recommended value needs to be greater than 0.5 [55]. The discriminant validity is to measure the correlation between items with different facets, using the square root value of AVE to test. If the square root value of the diagonal AVE is greater than the correlation coefficient value of the horizontal or vertical column, it represents discriminative validity [56].

From Table 4, it is known that the factor loadings of the questionnaire items in this research aspect are all greater than 0.7, which meets the verification standard. The Cronbach's alpha and CR values of all dimensions are also greater than 0.7, indicating good reliability and internal consistency. The AVE value of each dimension is greater than 0.5, indicating good convergent validity. Table 5 shows that the square root value of the diagonal AVE is greater than other correlation coefficient values in the matrix. Detected by heterotrait–monotrait analysis, Table 6 shows that all values are less than 0.9, indicating good discriminant validity [57].

4.3. The Analysis of the Difference of Various Background Variables on the Research Dimension

4.3.1. Analysis of Gender Differences

The results of independent sample t-tests for students of different genders found that the dimensions of perceived usefulness, learning motivation, and learning satisfaction reached a significant level. There was no significant difference in the dimensions of perceived ease of use. Thus, when blended learning is used in interactive game design courses, the perceived ease of use dimension will not be different due to the difference of gender. However, in terms of perceived usefulness, learning motivation, and learning satisfaction, males are significantly higher than females. Gender difference analysis data are shown in Table 7.

Table 4. Measurement model parameter estimation.

Dimensions	Question Items	Factor Loading	Cronbach's α	CR	AVE
Perceived Usefulness(PU)	PU1	0.904	0.959	0.967	0.832
	PU2	0.931			
	PU3	0.922			
	PU4	0.904			
	PU5	0.934			
	PU6	0.876			
Perceived Ease of Use(PEOU)	PEOU1	0.886	0.962	0.969	0.841
	PEOU2	0.940			
	PEOU3	0.890			
	PEOU4	0.922			
	PEOU5	0.939			
	PEOU6	0.923			
Learning Motivation(LM)	LM1	0.871	0.964	0.969	0.798
	LM2	0.924			
	LM3	0.869			
	LM4	0.938			
	LM5	0.899			
	LM6	0.897			
	LM7	0.902			
	LM8	0.845			
Learning Satisfaction(LS)	LS1	0.904	0.970	0.976	0.870
	LS2	0.942			
	LS3	0.936			
	LS4	0.955			
	LS5	0.932			
	LS6	0.928			

Table 5. Discriminant validity test (Fornell–Larcker).

Dimensions	AVE	PU	PEOU	LM	LS
PU	0.832	**0.912**			
PEOU	0.841	0.774	**0.917**		
LM	0.798	0.865	0.754	**0.893**	
LS	0.870	0.831	0.716	0.871	**0.933**

Note: The bold slash text is the square root value of AVE, and the rest are the correlation coefficients between the various dimensions.

Table 6. Heterotrait–monotrait ratio of correlations.

Dimensions	PU	PEOU	LM	LS
PU				
PEOU	0.801			
LM	0.897	0.780		
LS	0.861	0.736	0.898	

Table 7. Summary table of independent sample t-test analysis of gender on research variables.

Dimensions	Gender	Number	Mean	Standard Deviation	T Value
PU	Male	54	3.90	0.855	2.690 **
	Female	119	3.50	0.919	
PEOU	Male	54	4.14	0.799	1.731
	Female	119	3.91	0.807	
LM	Male	54	3.96	0.816	2.882 **
	Female	119	3.58	0.797	
LS	Male	54	3.92	0.914	2.899 **
	Female	119	3.50	0.877	

** significant at $p < 0.01$.

4.3.2. Analysis of the Difference of School Systems

The results of independent sample t-tests for students of different academic systems found that there are obvious differences between students in the day and the night division in perceived usefulness and perceived ease of use. The students in the day-time classes are significantly higher than the students in the evening classes. There is no obvious difference in the dimensions of learning motivation and learning satisfaction. The analysis of school system differences is shown in Table 8.

Table 8. Summary table of t-test analysis of independent samples of research variables by school system.

Dimensions	School System	Number	Mean	Standard Deviation	T Value
PU	Day-time classes	123	3.72	0.919	2.142 *
	Evening classes	50	3.40	0.873	
PEOU	Day-time classes	123	4.09	0.795	2.763 **
	Evening classes	50	3.72	0.794	
LM	Day-time classes	123	3.75	0.810	1.227
	Evening classes	50	3.58	0.840	
LS	Day-time classes	123	3.70	0.894	1.533
	Evening classes	50	3.47	0.929	

* significant at $p < 0.05$; ** significant at $p < 0.01$.

4.4. Structural Equation Modeling Analysis

When evaluating structural equation modeling, be sure to confirm that the problem of collinearity has been eliminated. When the Variance Inflation Factor (VIF) is greater than 5, it means that there may be a collinearity problem between the dimensions [58]. The VIF value of the structural equation modeling in this study is less than 5, which is between 1 and 2.498, indicating no collinearity among the study dimensions. SRMR, NFI and RMS_theta are commonly used indicators for PLS-SEM in order to evaluate the appropriateness of the overall model. The range of the SRMR value is from 0 to 1. When SRMR is less than 0.08, it can be regarded as a good fit of the model [59]. The range of the NFI value is between 0 and 1. The larger the value of NFI, the better performance it obtains. When NFI is greater

than 0.9, it indicates that the model fits well [60]. The RMS_theta value is only suitable for evaluating reflective measurement models. An RMS_theta value less than 0.12 indicates that the model fits well [61]. The SRMR value of the model evaluation verification in this study is 0.054. Although the NFI value of 0.858 is less than 0.9, it is not much different. The RMS_theta value is 0.153. Although it is greater than 0.12, it is also acceptable. Therefore, the model in this study is reasonably well-fitted in general. The collinearity analysis and model fit are shown in Table 9.

**Table 9.** Collinearity analysis and model fit.

Dimension Correlation	VIF	Model Fit
PEOU and PU	1.000	SRMR = 0.054
PU and LM	2.498	NFI = 0.859
PEOU and LM	2.498	RMS_theta = 0.154
LM and LS	1.000	

Next, the model verification is analyzed and explained by the path analysis and R^2. In the path analysis, the value of t is used to determine whether the hypothesis is true. When t value > 1.96, it means a significant level of 0.05 (indicated by *). When t value > 2.58, it means that it reaches a significant level of 0.01 (indicated by **). When t value > 3.29, it means that it reaches a significant level of 0.001 (indicated by ***). It can be seen from Table 10 that H1, H2, and H4 have reached a significant level with a *p* value less than 0.001. H3 reaches a significant level with a *p* value less than 0.05. Therefore, the hypotheses of H1, H2, H3, and H4 in this study are valid. The PLS-SEM path analysis model is shown in Figure 2.

Table 10. Path analysis verification.

Path Analysis	Path Coefficient	T Value	*p* Value	Hypothesis
PEOU→PU	0.774	20.020 ***	0.000	H1 valid
PU→LM	0.701	9.050 ***	0.000	H2 valid
PEOU→LM	0.211	2.580 *	0.010	H3 valid
LM→LS	0.871	36.434 ***	0.000	H4 valid

* significant at *p* < 0.05; *** significant at *p* < 0.001.
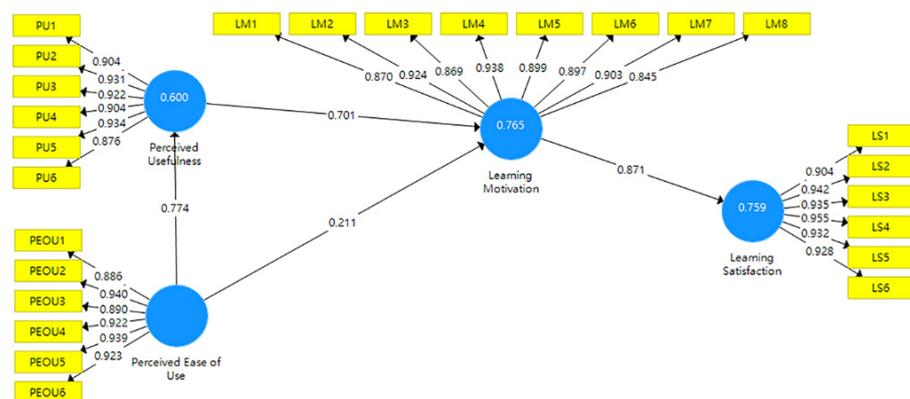
Figure 2. Model of PLS-SEM path analysis diagram.

The R^2 value is used to evaluate the explanatory ability of the model. The R^2 value is between 0 and 1. The higher the value, the higher the explanatory power. When the R^2 value is close to 0.50, the model has a moderate explanatory power. When the R^2 value is close to 0.75, the model has a high degree of explanatory power. It can be seen from Table 11 that the explanatory power of perceived ease of use to perceived usefulness is 60.0%. Perceived usefulness and perceived ease of use explanatory power to learning motivation is 76.5%.

The explanatory power of learning motivation to learning satisfaction is 81.2%. Therefore, the model in this study explains the latent variables very well and it has a high degree of explanatory power.

Table 11. R^2 value and f^2 value.

Path Analysis	R^2	R^2 Adjusted	f^2
PEOU→PU	0.600	0.597	1.498
PU→LM			0.841
PEOU→LM	0.765	0.763	0.076
LM→LS	0.759	0.758	3.152

Effect size is the effect of exogenous variables on endogenous variables using the explanatory effect value f^2 to detect. When $0.02 < f^2 \leq 0.15$, it is a small effect. When $0.15 < f^2 \leq 0.35$, it is a medium effect. Additionally, when $f^2 > 0.35$, it is a large effect. It can be seen from Table 11 that the explanatory effect value f^2 of PEOU to LM is 1.498. It displays a large-effect explanatory ability. The explanatory effect value f^2 of PU to LM is 0.841, which displays a large-effect explanatory ability. The explanatory effect value f^2 of PEOU to LM is 0.076, which displays a small-effect explanatory ability. The explanatory effect value f^2 of LM to LS is 4.313, which displays a large-effect explanatory ability. Except for the fact that the explanatory effect value of perceived ease of use on learning motivation displays a small-effect explanatory ability, the rest belongs to the large-effect explanatory ability. This represents that exogenous variables are very capable of explaining endogenous variables, with a high degree of explanatory effect value.

The conditions for the establishment of the intermediary effect firstly depend on the path coefficient of the independent variable to the intermediary variable, and the path coefficient of the independent variable to the dependent variable must both be significant. Secondly, the path coefficient of the intermediate variable to the dependent variable must also be significant. The independent variable produces an indirect effect on the dependent variable through the intermediate variable. If it is greater than the direct effect of the independent variable on the dependent variable, it can be judged that the intermediate variable does have an intermediate effect [62].

The test of intermediary effect can also be detected by the t value of indirect effect. A value of t greater than 1.96 indicates that there is an intermediary effect [63]. To assess the size of the intermediary effect, the variance accounted for (VAF value) can be applied. VAF < 20% means a slight intermediary effect. Furthermore, 20% < VAF < 80% means a partial intermediary effect. VAF > 80% indicates a complete intermediary effect. In this study, PU is used in the relationship between PEOU and LM, and it plays an intermediary role. The indirect effect value is 0.543, and the t value is 9.453, which reaches a significant level. The H5 hypothesis is established. That is, in the influence of perceived ease of use on learning motivation, perceived usefulness has a partial intermediary effect. The intermediary effect verification data are shown in Table 12.

Table 12. Intermediary effect verification.

Independent Variable	Intervening Variable	Dependent Variable	Direct Effect	Indirect Effect	VAF	Hypothesis
PEOU	PU	LM	0.211 (t = 2.583 **)	0.543 (t = 9.406 ***)	72.02%	H5 valid

** significant at $p < 0.01$; *** significant at $p < 0.001$.

5. Discussion

The main purpose of this research is to explore the influencing factors of learning satisfaction in blended learning with the PLS-SEM model. This research attempts to

explain the relationship between perceived usefulness, perceived ease of use, learning motivation, and learning satisfaction. In the hypothetical model, we propose the impact of two variables: perceived usefulness and perceived ease of use on learning motivation. Additionally, we propose how learning motivation affects students' learning satisfaction with blended learning as well. In this section, we discuss findings related to the research model.

First of all, in terms of the analysis of the difference of different background variables to the research dimensions: in terms of perceived usefulness, learning motivation, and learning satisfaction, male students are significantly higher than female students. There is no significant difference in the perceived ease of use dimension. In terms of perceived usefulness and perceived ease of use, students from day-time classes are significantly higher than students from evening classes. Compared to students from day-time classes, students from evening classes think that this blended learning method is not easy to use and that this blended learning method is not helpful for obtaining new knowledge. It is possible that the students from evening classes need to work during the day and do not have time to learn the course content recorded by the teacher in advance. There is no obvious difference in the dimensions of learning motivation and learning satisfaction.

Second, this research found that perceived ease of use does affect perceived usefulness (H1). This is consistent with the existing research [20,21]. Therefore, we speculate that students consider the blended learning method to be intuitively easy to use, which is very helpful for their learning. Considering that blended learning methods should be easy to use, designing student-friendly teaching methods is essential so that students will not encounter technical problems when using them for the first time. Additionally, they would believe that blended learning is very useful for their learning activities and goals.

Third, both perceived usefulness and perceived ease of use have a significant positive impact on learning motivation (H2, H3). The effect of perceived usefulness is far greater than that of perceived ease of use. This research infers that having powerful functionality is an important factor for students to consider learning motivation in blended learning. The teaching strategy we apply is to promote the growth of students' knowledge and skills through useful teaching. Additionally, it will promote students' learning motivation. Therefore, the teaching content that students consider useful is the key to whether they can learn successfully. Perceived ease of use will also affect learning motivation. This shows that the easier to use blended learning, the more positive the evaluation of learning motivation.

Fourth, learning motivation owns a significant positive impact on students' learning satisfaction (H4). This result is the same as the previous study [45]. This shows that it is important for learners to generate learning motivation for blended learning methods. Students with motivation will be able to continue learning with confidence during the learning process. Therefore, how to make students willing to use blended learning methods to participate in learning can affect their learning satisfaction. Learning experience with satisfaction will affect the continuous participation in learning activities and form a virtuous circle eventually.

Finally, the perceived ease of use mediated by perceived usefulness has a positive intermediary effect on learning motivation. Learning motivation is the willingness of students to use blended learning methods and participate in learning. Perceived usefulness far outweighs the impact of perceived ease of use on learning motivation. The significance of this discovery lies in the fact that students believe the implementation of teaching strategies in blended learning methods and the ability to acquire new knowledge. Useful teaching content is the most important element. Therefore, when implementing blended learning methods, using appropriate teaching strategies and providing useful content teaching can make students willing to participate in learning. This affects their learning satisfaction, and teachers should pay attention to these details.

6. Conclusions

6.1. Research Conclusion

In addition to the good reliability and validity of this research, it also confirmed that there is no collinearity between the research facets when evaluating the structural model. The SRMR value of this research model evaluation verification is 0.054, which is less than 0.08. Although the NFI value of 0.858 is less than 0.9, it is not much different. The RMS_theta value is 0.153. Although it is greater than 0.12, it is also acceptable. Overall, the model in this study is reasonably well-fitted. It can be seen from the path relationship of the model that Hypothesis 1 is valid, and perceived ease of use positively affects perceived usefulness ($\beta = 0.774$, t = 20.020, $p < 0.001$). Hypothesis 2 is valid. Perceived usefulness positively affects learning motivation ($\beta = 0.701$, t = 9.050, $p < 0.001$). Hypothesis 3 is valid. Perceived ease of use positively affects learning motivation ($\beta = 0.211$, t = 2.580, $p < 0.05$). Hypothesis 4 is valid. Learning motivation positively affects learning satisfaction ($\beta = 0.871$, t = 36.434, $p < 0.001$). Through the test of intermediary effect, Hypothesis 5 is valid. Perceived usefulness has a positive intermediary effect on the relationship between perceived ease of use and learning motivation (t = 9.406, $p < 0.001$).

The contributions of this research are as follows: it provides empirical data evidence of students' perceived usefulness, perceived ease of use, and learning motivation to learning satisfaction in a blended learning system. According to data analysis, we found that students' willingness to use blended learning methods has a very significant impact on their learning satisfaction. The key to making students willing to use blended learning lies in the teaching strategies and useful teaching methods implemented by teachers. The teaching methods and strategies implemented by teachers need to guide students to achieve learning goals and maintain their learning progress. The powerful and functional blended learning can make students think that it is very helpful to acquire new knowledge.

6.2. Research Limitations and Suggestions

We should also pay attention to some limitations of this research. First, this research investigates the perception of blended learning in a specific university environment, excluding students who take different courses in different grades, such as language or music courses. The sample size comes from 173 freshman students. It is suggested that future related research can expand the sample size so that quantitative data make more extensive inferences and macro explorations. Second, because this research is about the specific courses offered by the university and measuring students' learning motivation and learning satisfaction through subjective perception, the research results should be extrapolated to other situations carefully. Third, it is recommended that qualitative research can be added in the future to make further analysis of students' learning motivation and learning satisfaction. It will also explore how to improve teachers to face the introductory teaching of blended learning and have more adequate preparation and response.

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