Investigating Factors Influencing Learning Satisfaction in Blended Learning Environments: A PLS-SEM Approach

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Abstract

Blended learning has gained significant attention in the field of education, particularly within Bachelor of Education (B.Ed.) programs, due to its potential to enhance learning outcomes and engage students flexibly and interactively. Educators and course developers need to understand the factors influencing students' satisfaction with blended learning in order to optimize the learning experience. Educators and course developers need to understand the factors influencing students' satisfaction with blended learning in order to optimize the learning experience. This study aims to explore these influencing factors in blended learning environments specifically tailored for B.Ed. Students. By employing the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach, this research will analyze the relationships among critical variables such as instructional design, technology integration, student engagement, interaction quality, and perceived ease of use. This research is quantitative. The study will collect data from B.Ed. Students, through questionnaires, assess how these variables contribute to their overall learning satisfaction. The PLS-SEM approach will allow for a comprehensive examination of the direct and indirect effects of these factors, providing a nuanced understanding of their interplay. The findings will offer insights into the most impactful elements of blended learning environments and highlight areas for improvement. By identifying the critical determinants of learning satisfaction, this research aims to inform the development of more effective blended learning strategies, ultimately leading to enhanced educational experiences and outcomes for B.Ed. Students. The results will be valuable for educators, instructional designers, and policymakers seeking to implement and refine blended learning models in teacher education programs.

Keywords: Blended, Learning, Online Learning, Technology

Introduction

The increasing integration of technology into our daily lives has brought about significant changes in knowledge distribution and learning processes. Higher education institutions (HEIs) have adapted to this trend by offering blended learning environments that complement traditional classroom experiences and provide flexible learning options (Bushra et al., 2024). There is a growing emphasis on transforming teaching and learning from a teacher-centered approach to a learner-centered model through the integration of technology in all aspects of education. In recent years, HEIs have shifted their focus from fully online distance learning to blended learning as a means to enhance face-to-face teaching methods (Fayaz et al., 2023).

Blended learning is a practical approach that allows for passive knowledge engagement and

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expands learning beyond traditional face-to-face environments (Lashari et al., 2023). It is currently trending in institutions due to its positive impact on student motivation and performance.

This study aims to determine the effects of BL on learners' academic effectiveness and further evaluate the teaching effectiveness of BL. Researchers such as Brown (2016) argue that the persistent study of factors that influence BL in isolation without examining how the factors influence each other does not progress the field of BL. Thus, this study further explores factors that determine the perception of learners, academic staff, and management in adopting BL.

Blended learning promotes active learning, fostering essential skills such as communication, information literacy, creativity, and collaboration (Buriro, 2023). It also enables HEIs to adapt quickly to contextual changes in a cost-effective manner. However, there are challenges in implementing blended learning, including the absence of a shared institutional vision and the need for capacity building and support for teaching staff (Suhag et al., 2023). Negative perceptions held by instructors may also hinder the practical application of blended learning.

Research Objectives

The research will analyze the motivation and satisfaction of students with blended learning. The objectives of the study are as follows:

1. To identify the factors affecting students' satisfaction and performance regarding blended classes.
2. To analyze the factors affecting the efficiency of blended learning.

Research Question

Q1: What is the most effective learning role of Blended Learning for teaching and learning effectiveness in institutions of higher learning at B. ED level?

Literature Review

Theoretical Framework

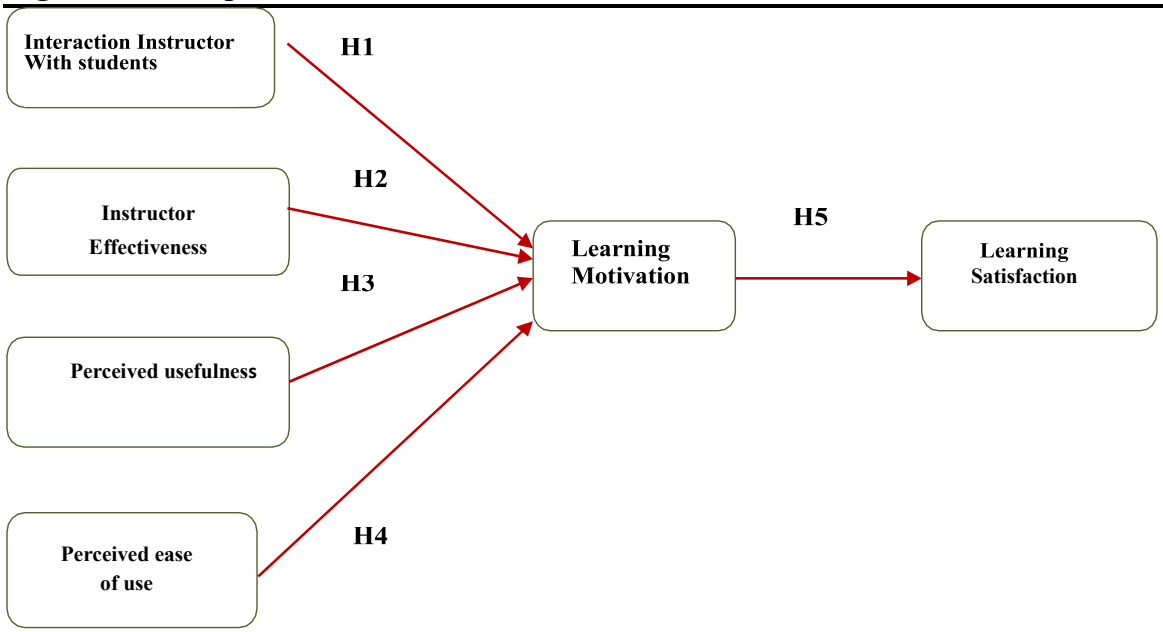
Salman et al. (2003) emphasize that blended learning is a natural evolution of e-learning; it combines e-learning and traditional learning, which does not eliminate e-learning and traditional learning but is a combination of the two. Different theories of learning complement each other and may even interfere with each other. These theories are considered essential in the formation of the educational process, which includes elements of three primary schools: behaviorist, cognitivist, and constructivist. Such theories fit well with the concept of blended learning (Salman et al., 2023; Lashari et al., 2021). Blended learning is based on constructive learning theory, emphasizing student-centered learning. Students complete the dents in the process of being active, which consists of knowledge and abilities. Jean Piaget is known as one of the first theorists of constructivism (Bushra et al., 2024; Fayaz et al., 2023). His theories indicate that humans create knowledge through the interaction between their experiences and ideas.

A Blended Synchronous Classroom facilitates applying constructivism theory in the learning process by increasing interaction, communication, and collaboration among students from different locations with different experiences and knowledge.

Blended learning courses can combine online and offline teaching through appropriate teaching design, and they can interactively transform different learning methods to improve student's learning motivation and interest (Bagozzi & Yi, 1988). The benefits can provide students with a richer learning experience. With the development of online learning technology and the popularization of internet technology, blended learning is quickly becoming the standard in higher

education.

Figure 1: Conceptual Framework



Research Methodology

A quantitative research is used in this study to investigate the influence of blended learning on the levels of motivation and satisfaction experienced by students toward B.Ed. degree. The data gathering for the purpose of this research, a questionnaire survey is sent to students of private university through online. The link share through what's app group and email. Students have chosen from institutions that are using Blackboard (BB), an open-source program that is used for online classes as an educational platform for the purpose of promoting better-blended learning. The development of a research instrument included the creation of four dimensions, each of which had its own set of components. Thus, the Interaction with peer and instructor (IPI) dimension is comprised of 5 items, Instructor effectiveness (IE) of 6 items, Perceived usefulness (PU) of 6 items, Perceives ease of use (PEOU) of 6 items, learning motivation (LM) is comprised of 8 items and Learning Satisfaction (LS) of 5 items.

Table 1: Instrumentation Sources

Variables	Items	Sources
Interaction with peer and instructor	4	Zeqiri et al
Instructor Effectiveness	6	Pierce et al
Perceived Usefulness	6	Hwang et al
Perceived Ease of Use	6	Hwang et al
Learning Motivation	8	Hwang et al
Learning Satisfaction	5	Sun et al

Students who are using BL in their B.ED degree programs were given the questionnaire. The students of B.ED (BS 4 years, 2.5 years and 1.5 years) The participants individually answered questions on

their own self-perceptions toward blended learning. The data were collected by non-probability sampling technique in May 2022.

The questionnaire provided demographic data of respondents as well. A Likert scale with five points was used (with 5 denoting strongly agree and 1 = strongly disagree"). Smart PLS 3 and SPSS 22 software were utilized for the purpose of conducting an analysis of the actual data that was collected. The sample of 126 students used in the study was B.ED students enrolled in blended learning courses offered in the spring Semester 2022 by the private university. To 126 participants, collected data through online provide the link total targeted participants were 140 and got 126 students' responses the survey form. Eighty one (81%) was female and eighteen (18%) male. Participants filled out the Survey Form, which consisted of two parts. The first part of the survey gathered personal and demographic information, while the second part had 35 questions rated on a Likert scale from 1 to 5. The questions were developed based on the findings of the literature research and addressed aspects that are critical to the satisfaction of students enrolled in blended learning.

Table 2: Descriptive Statistic (N=126)

	Demographic	Frequency	Percentage
Gender	Female	103	81.5
	Male	23	18.3
Age:	21 to 30	90	71.4
	30 to 40	32	25.4
	more than 40	4	3.2
B.Ed. Program	BS 4 years	74	58.7
	2.5 Years	20	15.9
	1.5 Years	32	25.4
No of students	1-10 Students	3	2.4
	1-20 Students	35	27.8
	1-40 Students	67	53.2
	1-50 Students	13	10.3
	more than 50	8	6.3

Data Analysis

The PLS-SEM technique, implemented using Smart PLS 3.2.8, is being used in order to do the data analysis that is required to fulfill the aim of this study and the model that has been proposed. In accordance to the guidelines made by (Hair, et al 2011) initially, the data was analyzed for both external and internal measurements, and then hypotheses were tested.

Outer Validity of Measurement Model

Analyzing the correlations that exist between the independent variable and the constructs that they are associated with is the purpose of the outer model, which is also referred to as the measurement model. PLS-SEM begins with the construction of a path model that links variables and constructs according to reasoning and concept.

An evaluation of the data validity and reliability is part of the outer model measurement. Validity involves assessing the convergent and discriminant validity as well as the internal consistency of the variables. As part of the measurement model evaluation 2 items, H1. I3, I4 were removed from the analyses because of low factor loading.

Reliability Testing

It is the constancy of efficiency that is referred to as reliability. It was determined using the composite reliability. For better evaluation of internal consistency, it is preferable to the Cronbach's alpha (Hair, et al 2011). The CR value for all latent variables is shown in Table 3. The composite reliability for all variables was > 0.7 (Hair, et al 2011).

Convergent Validity

The convergent validity relates to the extent to which the constructed indicators converge or share certain particular variances (Ramayah et al., 2018). Convergent validity is determined by these factors, as suggested by (Hair et al., 2017), the factor loading, Average Extracted Variance (AVE) and Composite Reliability (CR). (Bagozzi & Yi (1988). The value should be at least 0.5 or above and factor loadings for convergent validity should be above 0.7 (Hair et al. (2017). Table 4 presents the indicator loadings, AVE and CR. From this, it can be inferred that the constructs in the interpretation satisfy the requirements for reliability and convergent validity.

Table 3: Reliability Testing and Convergent Validity

Constructs	Items	Loadings	P Value	CR	AVE
I	I1	0.906	0.000	0.904	0.825
	I2	0.911	0.000		
IE	IE1	0.831	0.000	0.917	0.649
	IE2	0.724	0.000		
	IE3	0.796	0.000		
	IE4	0.836	0.000		
	IE5	0.867	0.000		
	IE6	0.772	0.000		
PU	PU2	0.920	0.000	0.942	0.671
	PU5	0.920	0.000		
PEOU	PEOU1	0.754	0.000	0.931	0.728
	PEOU2	0.791	0.000		
	PEOU3	0.804	0.000		
	PEOU4	0.784	0.000		
	PEOU5	0.795	0.000		
	PEOU6	0.829	0.000		
LM	LM1	0.823	0.000	0.910	0.629
	LM2	0.877	0.000		
	LM3	0.870	0.000		
	LM4	0.859	0.000		
	LM5	0.886	0.000		
	LM6	0.748	0.000		
	LM7	0.723	0.000		
	LM8	0.747	0.000		
LS	LS1	0.861	0.000	0.917	0.847
	LS2	0.88	0.000		
	LS3	0.863	0.000		
	LS4	0.849	0.000		
	LS5	0.811	0.000		

Discriminant Validity

It is essential to determine the discriminant validity of a test in order to guarantee that the outcome will be accurate and that there will be no statistical variations in the results (Jorg, 2015). Discriminant validity is determined by Fornell and Larcker criterion, crossing loading and Heterotrait-Monotrait ratio between the items (Hair et al., 2014; Henseler et al., 2015). According to Fornell and Larcker criteria, a particular variable should demonstrate greater variation with its own items than with other variables. For this, as shown in Table 4, the values in diagonal i.e. square root of AVE should be greater in than inter-construct correlation (Hair, et al 2011).Table 4 confirming the discriminant validity. (See Table 4)

Table 4: Correlations of Discriminant Validity

	I	LM	LS	PEOU	PU
I	0.908				
IE	0.476				
LM	0.729	0.819			
LS	0.670	0.788	0.853		
PEOU	0.580	0.683	0.618	0.793	
PU	0.632	0.770	0.746	0.599	0.920

The values of HTMT less than 0.85.(Jorg Henseler, (2015) , and according to Larcker the value less than 0.90 also acceptable. The Table 5 shows the results of HTMT confirming discriminant validity.

Table 5: Heterotrait-Monotrait Ratio (HTMT) Results

	I	LM	LS	PEOU	PU
IPI					
IE	0.559				
LM	0.852				
LS	0.786	0.845			
PEOU	0.689	0.74o	0.669		
PU	0.786	0.87o	0.866	0.686	

Measurement of the Structural Model (Inner Model)

After assessing the hypothesis and evaluating whether or not the measurement model is appropriate for the purpose, the structural model is analyzed. The structural model provides evidence that the latent components of the research model are linked to one another in a causal manner. First, the structural model is assessed by determining the model's ability for prediction, and then, second, potential correlations among the latent constructs that are indicated in the research model are checked for their existence (Hair et al., 2016). Table 6 highlights the discriminant validity of cross-loadings as an important point of emphasis. A further investigation of the discriminant validity is carried out using the cross-loading criteria. It is important that the outer loadings of an indicator's associated constructs have a greater value than the other remaining constructs based on these criteria, in order to assure that the latent variable is able to adequately explain the variation of its own indicators. (Hair et al., 2016). Table 6 results show that the discriminant validity is satisfactory for all of the constructs tested.

Table 6: Factor Analysis

	I	IE	LM	LS	PEOU	PU
I3	0.906	0.426	0.653	0.574	0.549	0.581
I4	0.911	0.439	0.671	0.642	0.504	0.566
IE1	0.37	0.831	0.418	0.434	0.357	0.513
IE2	0.283	0.724	0.274	0.167	0.293	0.347
IE3	0.391	0.796	0.427	0.338	0.383	0.422
IE4	0.497	0.836	0.471	0.445	0.478	0.579
IE5	0.377	0.867	0.459	0.39	0.321	0.544
IE6	0.349	0.772	0.354	0.315	0.362	0.354
LM1	0.627	0.473	0.823	0.712	0.581	0.79
LM2	0.621	0.38	0.877	0.676	0.601	0.667
LM3	0.618	0.492	0.87	0.714	0.615	0.739
LM4	0.516	0.484	0.859	0.705	0.55	0.708
LM5	0.701	0.324	0.886	0.68	0.534	0.621
LM6	0.631	0.353	0.748	0.574	0.536	0.497
LM7	0.488	0.407	0.723	0.529	0.538	0.478
LM8	0.566	0.406	0.747	0.528	0.519	0.466
LS1	0.576	0.446	0.704	0.861	0.606	0.721
LS2	0.618	0.347	0.743	0.88	0.483	0.616
LS3	0.618	0.439	0.716	0.863	0.523	0.607
LS4	0.545	0.368	0.607	0.849	0.534	0.631
LS5	0.483	0.291	0.563	0.811	0.491	0.613
PEOU1	0.508	0.265	0.468	0.416	0.754	0.314
PEOU2	0.423	0.345	0.458	0.351	0.791	0.362
PEOU3	0.525	0.402	0.692	0.652	0.804	0.582
PEOU4	0.391	0.422	0.52	0.475	0.784	0.548
PEOU5	0.426	0.337	0.48	0.392	0.795	0.42
PEOU6	0.466	0.383	0.565	0.567	0.829	0.556
PU2	0.608	0.554	0.709	0.627	0.565	0.920
PU5	0.554	0.519	0.709	0.747	0.538	0.920

Predictive Relevance of the Model

The quality of the internal model is determined by its ability to accurately anticipate the estimate (Hair et al., 2014). Assessing the inner model's coefficient of determination (R^2) and cross-validated consistency are the most important criteria (Q^2) (Hair et al., 2011, 2014; Henseler et al., 2009). The R square (R^2) ratio is used to evaluate the accuracy of model predictions. The value of R^2 is a reflection of the total influence that the external (independent) variable has on the internal (dependent) variable (Sanchez, 2013). R square divided into the three categories of high, moderate, and low using the classification system. If the R2 value is larger than 0.6, then it is regarded high; if the R2 value is between 0.3 and 0.6, then it is considered moderate; and if the R2 value is less than 0.3, then it is considered low.

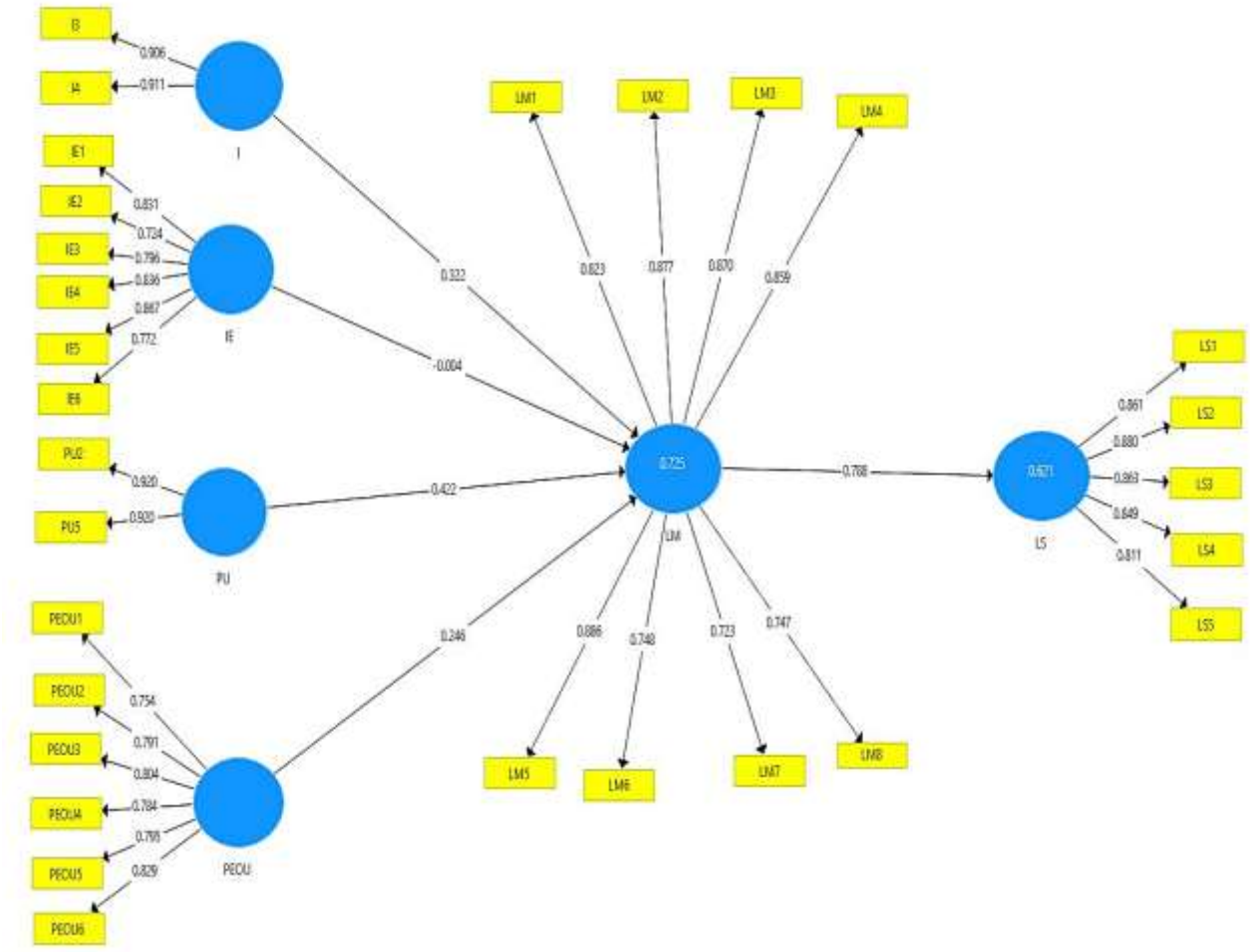
One further method for determining whether or not the model is accurate is to use cross-validated redundancy (Q^2). The predictive significance of the inner model is evaluated using the Q^2. The Q^2

is measured using a blindfolded technique. Q^2 should have a value larger than zero. Confirmation of model fit can be shown in Table 7 shows since all values are larger than zero.

Table 7: Predictive power of construct

Constructs	Q Square	R Square
LM	0.410	0.725
LS	0.385	0.621

Figure 2: Hypothesis Development



H1: Interactions of instructors with students have a positive effect on motivation for applying blended learning

H2: Instructor effectiveness in blended classes have a positive effect on the students' perceived motivation.

H3: Perceived usefulness positively affects learning motivation

H4: Perceived ease of use positively affects learning motivation.

H5: Learning motivation positively affects learning satisfaction.

Hypotheses Testing

After establishing a good reliability test, convergent and discriminant validity, the regression analysis was used to test the hypotheses (Ibrahim et al , 2019). In this current study, there are five hypotheses. These were examined through the structural equation modeling (SEM). The hypotheses were put to the test with the use of data analysis after a reliable reliability test, convergent validity, and discriminant validity were established. In order to assess whether or not all of the relationship points in the anticipated direction were statistically significant, the values of the standardized coefficient, the standard error, and the t-value were all taken into consideration (Ibrahim et al , 2019).

Further assessment of goodness of fit, hypothesis was tested as ascertain the significance of the relationship. H1 evaluate whether I. has significant impact on LM. The results revealed that I. has significant impact on LM (β=0.322, t =3.734, p = 0.000)

Hence, H1 was supported. H2 evaluate whether IE, has a significant impact on LM. The results revealed that IE has significant impact on LM (β= -0.004, t = 0.057, p = 0.955).

H2 was not supported. H3 evaluate whether PU, has significant impact on LM. The results revealed that PU. has significant impact on LS (β=0.422, t = 5.258, p = 0.000).

Hence, H3 was supported. H4 evaluate whether PEOU has significant impact on LM. The results revealed that PEOU has significant impact on LM (β=0.246, t =2.402, p = 0.014). H5 evaluate whether LM has significant impact on LS. The results revealed that Lm has significant impact on LS (β=0.788, t = 15.799, p = 0.000). Hence, H5 was supported.

Table 8 provides a comprehensive overview of the model's correlation test values as well as its route analysis. Table 8 showing the result of Hypotheses acceptance or rejection. If the value is less than 0.05 then the hypothesis will support and if the value is greater than 0.05 then the hypothesis rejected. The H2 rejected because the value is greater than 0.05 and the H1, H3, H4 and H5 accepted.

Table 8: Hypotheses testing

No		Estimate	(STDEV)	T Statistics	P Values	Decision
H1	I -> LM	0.322	0.086	3.734	0.000	Accepted
H2	IE -> LM	-0.004	0.079	0.057	0.955	Rejected
H3	PU -> LM	0.422	0.080	5.258	0.000	Accepted
H4	PEOU -> LM	0.246	0.102	2.402	0.014	Accepted
H5	LM -> LS	0.788	0.050	15.799	0.000	Accepted

Discussion

The purpose of this study is to investigate, using the PLS-SEM model, the variables that influence the level of learning satisfaction in blended learning. This study explains the link between interaction, the effectiveness of the instructor, perceived usefulness, and perceived ease of use, learning motivation, and learning satisfaction. We provide a hypothesis on the ways in which students' levels of learning motivation are related to the degree to which they are satisfied with their blended learning experience. Results from the research model are discussed here. The findings of the data analysis that was conducted on the students reveal that they are pleased with their blended learning experience. . The hypothesis that interactions have a significant positive influence on motivation for adopting blended learning was supported by the data. Therefore, before moving forward with the adoption of BL, the educator has to have a firm understanding of how the students feel about BL system in its entirety. When it comes to the students' level of knowledge

with the BL, there is a need for investigation, particularly in the field of simplicity of use. Including a number of different blended learning. In addition, the results of this investigation are consistent with those obtained from an earlier study that was performed (Ismail, 2018). That study found that the component instructor impacts and enhances students' happiness with the blended learning, which has a substantial link with the students. The findings of the present research may also be substantiated by the findings of a previous study.

As part of the measurement model evaluation 2 items, H1. I3, I4 were removed from the analyses because of low factor loading. According to Henseler criterion, the values of HTMT are stated to be less than 0.85. According to Larcker the value 0.90 also acceptable. The finding of this study of HTMT are acceptable after remove four items of PU1, PU3, PU4 and PU6 because the value of PU>LM was 0.943.

After deleting four items of PU the value of HTMT 0.866 according to the criteria 0.866 value is acceptable.

This research has five hypotheses that are being tested in it. Using Structural Equation Modeling, they were analyzed (SEM). A trustworthy reliability test, convergent and discriminant validity, and data analysis was used to assess the hypotheses. Each connection point's statistical significance was evaluated using standardized coefficients, standard deviation and t-values, which were all properly considered.

Further assessment of goodness of fit, hypothesis were tested as ascertain the significance of the relationship. H1 evaluate whether I. has significant impact on LM. The results revealed that I. has significant impact on LM (β=0.322, t =3.734, p = 0.000)

Hence, H1 was supported. H2 evaluate whether IE, has a significant impact on LM. The results revealed that IE has significant impact on LM (β= -0.004, t = 0.057, p = 0.955).

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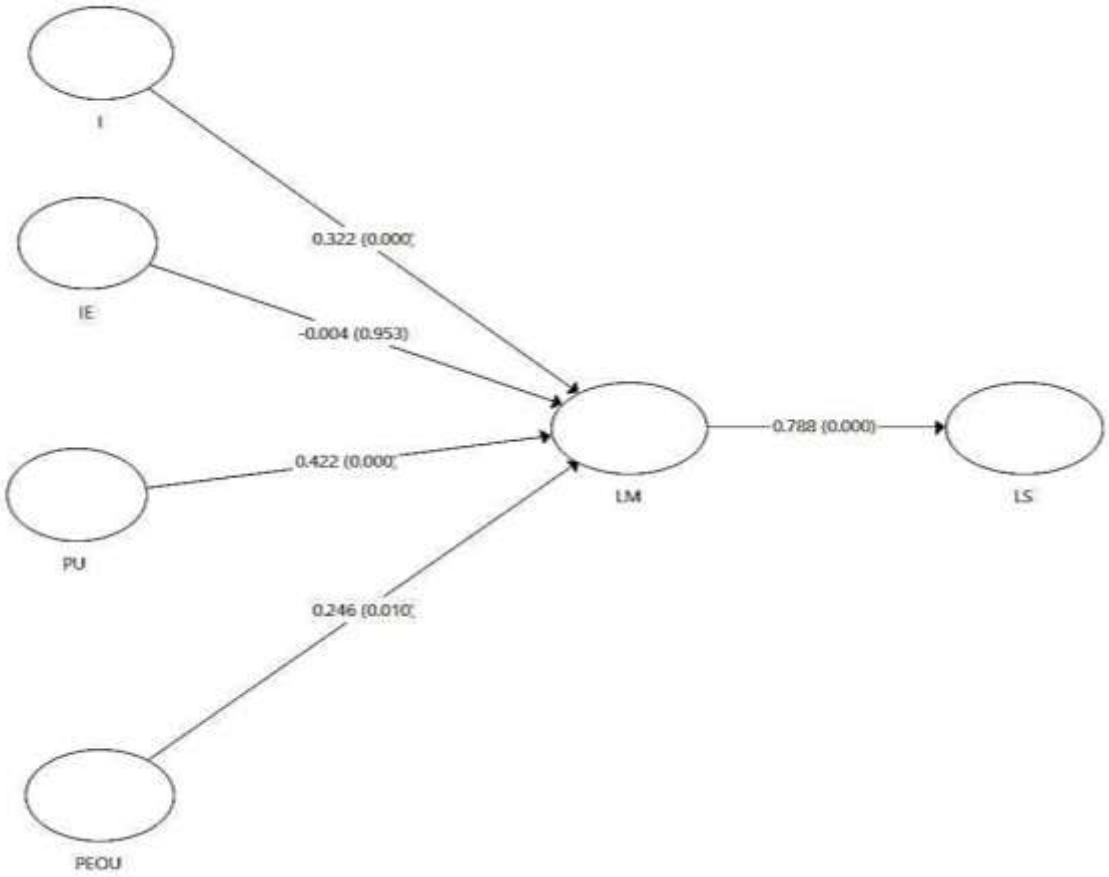
Hence, H3 was supported. H4 evaluate whether PEOU has significant impact on LM. The results revealed that PEOU has significant impact on LM (β=0.246, t =2.402, p = 0.014). H5 evaluate whether LM has significant impact on LS. The results revealed that Lm has significant impact on LS (β=0.788, t = 15.799, p = 0.000). Hence, H5 was supported.

As a consequence of testing, it was determined that four of the hypotheses were accurate, while one was invalid. If the value is lower than 0.05, then the hypothesis is found to be true; on the other hand, if the value is higher than 0.05, then the hypothesis is found to be false. The hypothesis H2 was rejected since the result was more than 0.05, but the hypotheses H1, H3, H4, and H5 were accepted.

In summary, it is important to determine that it would be beneficial for the university to investigate and implement these findings. This is because to the fact that the institution will get a better positive reputation as a result of enhancing its blended learning system and ensuring of that its students are pleased with the blended learning plate form

Figure 3: Statistical results



Future Recommendations

Future Study to better understand the components that contribute to student satisfaction and to assist the betterment of blended learning, more study is required to determine the reasons behind the various degrees of satisfaction that were reported in these areas. Understanding the requirements of students, providing assistance to students participating in blended learning, and promoting positive learning experiences for students will be key to a successful of blended learning in higher education settings like universities. However, in order to accomplish this goal, it will be necessary to use a bigger sample, which should consist of both face-to-face and online learning. This would not only assist to discover the cause for disparities in satisfaction based on interaction, teacher effectiveness, perceived usefulness, or motivation and satisfaction, but it would also help to give solutions for improving the situation overall results of the learning process. The research should be expanded such that it also investigates the level of satisfaction experienced by instructors, as well as the connection that exists between student and teacher levels of satisfaction. In addition, more research is required to evaluate the difference in the level of pleasure felt by students.

Conclusion

When students are satisfied with their blended learning experience, they are more likely to succeed

and earn a degree. The university benefits from measuring satisfaction since it may be used to assess to some extent, According to this study's interpretation of survey data, students still valued face-to-face instruction, even if they were satisfied with the effectiveness of blended learning. Researchers observed that students' desire to utilize blended learning has a major influence on their satisfaction with their education, as shown by our data analysis. Blended learning has the capacity and efficiency to make students believe that it is beneficial to gain new information.

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