The Effectiveness of Problem-Based Learning in Acquisition of Knowledge Using Online Learning

Hassan Rawash[1*], Ali Ratib Alawamreh[2], Abdallah Mishael Obeidat[3], Ahmad h nawafleh[4]

[1,3,4]*Jadara university, Jordan; E-mail: hassan_raw@jadara.edu.jo*

[2]*Zarqa university, Jordan,*

Abstracts: The adoption and use of creative teaching techniques, such as problem-based learning using online learning have relied upon improvement in order to improve educational outcomes. Regardless of the fact that problem-based learning is facilitated by online learning and has many clear advantages, it is still developing or at a very early level in many developing countries. Problem-based learning is a student-centered method where students study a subject by using online learning to collaborate in groups to solve an open-ended challenge. The research design was a cross-sectional field survey, was used in quantitative research approaches using PLS analysis. Additionally, the study's target population is all the class teacher students at private Universities. The author reviews the study on the investigation of influencing factors for problem-based learning strategy with online learning in Jordan to improve the education system as well. The findings demonstrated a positive influence between key factors and intention to use and this result enhance acquisition of Knowledge using online learning for Class Teacher students.

Keywords: Online Learning, UTAUT Model, Private Universities.

1. INTRODUCTION

Organizations continue to realize the significant impact that e- learning have on their day-to-day education processes, many individuals today are in real pursuit of literacy. This is characteristic of students in higher level of education that is the University level. University students are in great pursuit of information; they are willing to learn new things, ideas, technologies and also learn new way of acquiring information (Eke, 2011; Li et al., 2021). Online learning has created a need to transform how university students online learning using more modern, efficient, and effective alternative such as e learning. online learning is defined as realizing the teaching and learning process, while teacher and students are in different places, with the help of internet and computer technology (Moorthy et al., 2019; Zhayeh, 2021). In practice, Online learning supported teaching and learning can be viewed as web-supplemented, web-dependent, mixed mode or purely Online learning system (Mastan et al., 2022). Online learning supported learning systems have been developed, and improved interaction, better access to resources, reduced operating costs and reliable communication among users are reported benefits of having Online learning supported learning environment (Khanal & Carm, 2020). As information technology has developed and expanded, the benefits of Online learning extensively have become recognized. These benefits include providing consistency with the delivery of educational activities, reducing instruction time, enhancing cognitive recall and mastery of learning, and increasing students' motivation and satisfaction (Aseltine Jr et al., 2019; Baber, 2020). Since 1990s, Online learning is gradually being adopted by higher education institutions including social work context (Ruiz et al., 2007; Subashini et al., 2022). Problem based learning (PBL) is considered to be definitely the most suitable instructional method conceived in the history of education that designed to respond to the criticism that traditional teaching and learning methods fail to prepare (Hernández-Barco et al., 2021).

In the Problem based learning model, learners are involved with complex problems that require them to research for solution collaboratively. PBL empowers students to carry out research, integrate theories with practice and apply knowledge and skill to solve the given problem (Romanowski & Karkouti, 2021). However, this approach gave rise to several issues related to curriculum design and implementation, including determination of learning aims, creation and presentation of problems and facilitator's role and workload (Savery & Duffy 2001). Therefore, Rudd et al. (2006) suggest that it will not be possible to personalize education if the concept that learning happens only in certain places under certain assessment regimes and involves certain people is maintained. There is a need for e-

learning networks that link people, homes, communities and multiple sites of learning.

2. PROBLEM BASED LEARNING AND ONLINE LEARNING METHODS

Online learning is the use of software to help the acquisition of specialized information and skills, enable communication and group work, and provide assessment and reflection in the context of problem-based learning (PBL)(Abood, 2019; Alawamreh & Elias, 2016). E- learning (online learning) have affect interaction positively between students-teacher and students-students by creating more cordial environments (Arif et al., 2022; Selwyn, 2007). On the other hand they include web-based multimedia and distribution tools incorporating rich audio (podcasting, Skype, face time, zoom), photo (Flickr) and video (vodcasting, YouTube, Stickam) capabilities and provide engaging two-way experiences for users (Arif et al., 2022; McLoughlin & Lee, 2007). Collaborative online platforms, which have developed from web-based learning systems, enable social students to learn through networks and access learning media (Bentley et al., 2015). The collaborative web is rich in applications that can facilitate knowledge sharing, interaction, collaboration and communication. These technologies provide for a way for collaboration and engagement of learners and educators in a common space around shared interests (Kumi-Yeboah, 2018). The collaborative Web therefore supports social networks learning in which learners use personal tools for self-directed and problem-based learning (Kumi-Yeboah, 2018). This study look into social media networks usage as an effective as Online learning for Problem Based Learning. Hence, According to Simranjeet (2011) two research concerns are raised in the study. First, despite the benefits of PBL being demonstrated, its implementation has been heavily weighted toward students e learning, casting doubt on the notion that PBL is an appropriate approach for undergraduate programs (Mora et al., 2020) Second, Online learning has been a part of education in the university but very little teaching has been done by integrating Online learning into PBL, researching its effects. One of the reasons why computer in the form of technology has not been coupled with PBL is of its restrictive factors of is making decisions on students learning which should be done by the learner (Pedersen & Liu 2001). It should not make decisions on their learning rather it should aid and extend the thinking processes of learners. Thus, PBL, and Online learning are seen as two different entities and coupling it could improve the current teaching and learning process in the university. It is important to examine the benefits and disadvantages of using Online learning integrated with PBL, in the universities.

Problem based learning as a means of learning that can enhance the development of critical thinking skills (Saputra et al., 2019). To find out PBL students learn how to analyze the problem, identify relevant facts and to generate hypotheses, identify the necessary information/knowledge in solving the problem and provide provisions to find a reasonable solution to this problem. Instead of, PBL embeds students' learning processes in real life problems (Nadeak & Naibaho, 2020). Such respond can be seen with the students for solving problems in education. In the PBL model, learners are involved with complex problems that require them to research for solution collaboratively. PBL empowers students to carry out research, integrate theories with practice and apply knowledge and skill to solve the given problem (Goldberg & Warburton, 2021). However, PBL has a variety of drawbacks when used in the context education, including planning coordination and the potential for waste and redundancy in the delivery of online learning. For instance, asking students to collect data for collaboration between students' Online learning for Private Universities, organizations could help and influence an improvement in the effectiveness and calibre of online learning.

The students invested time and effort in PBL, a majority believed that their PBL grade should count towards their grade point average. As well, PBL could not be set up as a lab section, as it is part of the curriculum, which requires compulsory attendance in small groups in the PBL discussion rooms (Cankurtaran & Beverland, 2020; Chakravarthi & Haleagrahara, 2009; Wyness & Dalton, 2018). Consequently, researchers look into Online learning as possible solution through usage as an effective e-learning tool in problem-based learning in private Universities students.

In educational institutions, access to learning resources, real-time communication, and access to research sources can be simplified using Online learning (Kruger, 2010), and institutions can enhance classroom-based methods by integrating social learning methods into traditional approaches (Nichols and Anderson, 2005). Online learning provide students with an opportunity to choose the best fit tool for interaction (Baird & Fisher, 2005; Mazer

et al., 2007; Sarwar et al., 2019). Given that PBL focus on participant control, knowledge sharing, collaboration among participants, it is interesting to consider the integration of social media networks in Online learning that takes place.

Conversely, Online learning tools are currently under rapid development and evolution (Ebner et al., 2007). . Thus, integration of online learning to the Problem Based Learning become a challenge. Hence, researchers look into usage of e-learning as an effective e-learning tool in the Problem Based Learning particular in private Universities by proposing a new model that could determine factors which effect adoption of online learning for the student's usage in Problem-Based Learning in the Universities context.

3. PROPOSED MODEL OF THE PROBLEM-BASED LEARNING IN ACQUISITION OF KNOWLEDGE USING ONLINE LEARNING

Venkatesh et al. (2003) observed that when faced with a variety of models, researchers studying electronic learning were forced to select constructs from all of them or select a preferred model, neglecting the contributions of other models. They believed that a synthesis was necessary to arrive at a single understanding of users' adoption of technology. Investigated and contrasted Technology adoption behavior has been explained using the eight prevalent paradigms. Performance expectancy, effort expectancy, social influences, and facilitating conditions are the constructs that do directly influence behavioral intents and usage. (Venkatesh et al. 2012). The UTAUT model proposes that the behavioral intention of technology use and a direct determinant of usage behavior under facilitating settings are determined by three direct variables (performance expectancy, effort expectancy, and social influence).

Therefore, the researchers proposed the following hypotheses to identify better the Effectiveness of Problem-based Learning in Acquisition of Knowledge using Online learning for Class teacher students.

H1: The Performance Expectancy (PE) has significant effect on behavioral intention.

H2: The Effort Expectancy (EE) has significant effect on behavioral intention.

H3: The Social Influence has significant effect on behavioral intention.

H4: Facilitate condition has significant effect on use behavior.

H5: Behavioral intention has significant effect on use behavior.

4. DATA COLLECTION METHOD

For the purpose of this study, survey questionnaires were administered to collect data from all class teacher students enrolled at a private university in Jordan. The survey design was cross-sectional, and the questionnaires were tested for reliability and validity before administering them to the participants. Researchers randomly sampled 500 students from form the private universities. After accounting for undeliverable and incomplete questionnaires, 450 responses were used for analysis. The sample size was considered adequate, and the response rate was comparable to previous studies in the field. The questionnaires were designed to assess factors influencing problem-based learning with E-learning at the Private Universities, aiming to enhance the education system.

The study's conceptual model includes performance expectancy, which highlights the benefits of problem-based learning with E-learning in improving task completion and academic performance. Effort expectancy indicates that this learning strategy is user-friendly and easy to understand, facilitating comprehension and learning. Social influencers play a role in encouraging students to adopt the problem-based learning strategy with online learning. Facilitating conditions involve necessary resources and knowledge, as well as incompatibility with other systems. Correspondingly Facilitating conditions involve essential resources, such as technology and learning materials, along with guidance and support from instructors and peers. These conditions enable students to effectively utilize

problem-based learning with E-learning, enhancing their learning experience and successful implementation of this approach. Access to built-in assistance enables class teacher students to effectively utilize problem-based learning with E-learning for completing their work.

5. DATA ANALYSIS AND RESULTS

The data analysis was conducted using Smart PLS version 3. The former software was used to obtain the descriptive statistics for the sample. Furthermore, the latter was used to investigate the cause-and-effect building's latent variable. The statistical analysis results are reported in the following sub-sections.

5.1 Evaluation of the Measurement Model

As pointed out by Hair Jr et al. (2016) verifying the survey for the measurement model was part of the PLS procedure. This performed based on reflective and constructs. Reliability and validity regarded as two major criteria, which used for testing the goodness of measures. **Reliability** refers to the task of testing the consistency of a certain proposed instrument in measuring a particular aspect for which it designed. **Validity** refers to testing how well a particular instrument measures the particular concept for which it was intended to measure (Sekaran & Bougie, 2016). Assessment of the measurement model in this study performed by following a three-element procedure: **Indicator items reliability**, **convergent validity, and discriminant validity**.

As illustrated in Fig. 1, the measurement model tested by employing 27 reflective indicators. It was found that the items SI2, SI5, FC3 and UB5 had a factor loading less than 0.60. As suggested by Hair, Ringle and Sarstedt (2011) and Henseler et al. (2009), for the items with Variable factor loading values ranging from 0.40 to 0.70, the indicator should be deleted in condition that its removal will result in increasing the composite reliability (CR) higher than the suggested threshold value. Therefore, in this study, these indicators were removed by carrying out the PLS algorithm test.

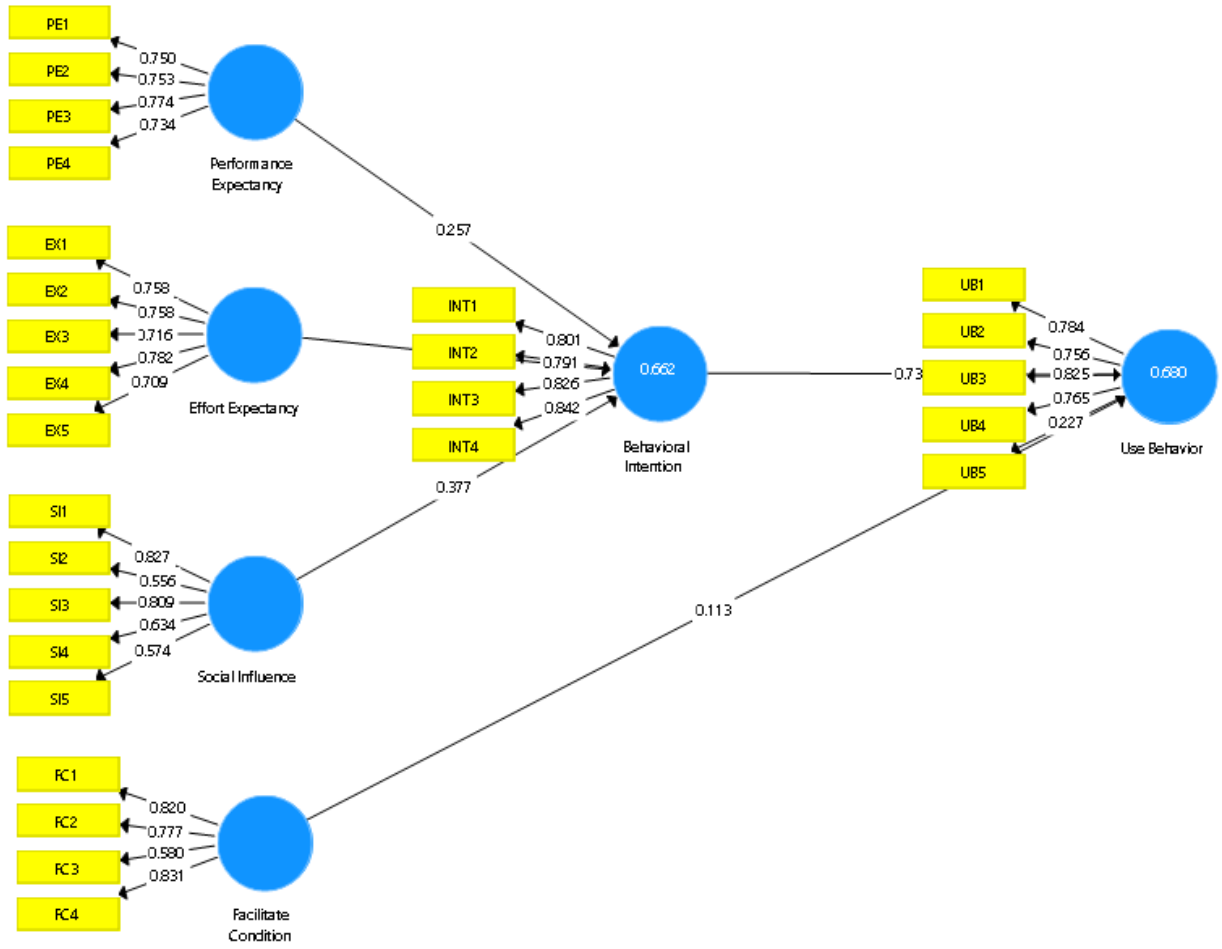

Figure 1 Measurement Model

As shown in Table 1, the convergent validity of each construct tested based on the Average Variance Extracted (AVE). Convergent validity is known as is the degree to which a measure has a positive correlation with alternative measures of the same construct (Hair Jr et al., 2016). In this study, 0.5 was adopted as the acceptable minimum value of AVE as recommended by previous studies (Hair Jr et al., 2016; Ramayah et al., 2016). The results indicate that whereas intention to use achieved the highest value for AVE (0.664), Social Influence achieved the lowest acceptable value (0.567). In brief, all these values were at the acceptable levels in relation to their convergent validity.

In addition, the values of CR as shown in Table 1 were used to measure the internal consistency for the respective constructors. Although it is suggested that the benchmark value must be at least 0.70, a higher CR value is preferred. As for the CR values of each respective construct, they range from 0.827 to 0.888, which are higher than the benchmark value. Based on the given benchmark values, the variables have fulfilled the convergent validity.

Table 1 Results of Measurement Model

Variable	Items	Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)>50%
Performance expectancy	PE1	0.750	0.840	0.567
	PE2	0.753		
	PE3	0.774		
	PE4	0.734		
Effort Expectancy	EX1	0.758	0.862	0.556
	EX2	0.758		
	EX3	0.716		
	EX4	0.782		
	EX5	0.709		
Social Influence	SI1	0.846	0.827	0.550
	SI2	0.839		
	SI3	~~0.659~~		
	SI4	~~0.588~~		
Facilitate Condition	FC1	0.820	0.842	0.575
	FC2	0.777		
	FC3	0.580		
	FC4	0,830		
Intention to use	IT1	0.802	0.888	0.664
	IT2	0.790		
	IT3	0.826		
	IT4	0.841		
Use behavior	UB1	0.783	0.867	0.619
	UB2	0.758		
	UB3	0.829		
	UB4	0.775		
	~~UB5~~	~~0.569~~		

The present study applied the Fornell and Larcker (1981) and Henseler et al. (2015) criterion for assessing the discriminant validity of the examined constructs. A particular construct with the average square root of extracted variance that is higher than the correlation values of all variables are said to have such a discriminant validity (Hair Jr et al., 2016). As illustrated in Table 2, based on the Fornell and Larker criterion, the results are indicative of the adequate discriminant validity of each construct because the squared correlation for each construct is lower than the average variance extracted. Furthermore, the Heterotrait-Monotrait Ratio (HTMT) is an estimate of the correlation between constructs, which parallels the disattenuated construct score creation. Using a value of 0.9 as the threshold. As illustrated in Table 3. this study concluded that there is no evidence of a lack of discriminant validity and all the constructs meet the criteria.

Table 2. Assessment of Discriminant Validity (Fornell & Larcker, 1981)

	Behavioral Intention	**Effort Expectancy**	**Facilitate Condition**	**Performance Expectancy**	**Social Influence**	**Use Behavior**
Behavioral Intention	**0.815**					
Effort Expectancy	0.740	**0.745**				
Facilitate Condition	0.722	0.651	**0.759**			
Performance Expectancy	0.719	0.765	0.634	**0.753**		
Social Influence	0.727	0.795	0.608	0.705	**0.741**	
Use Behavior	0.818	0.736	0.643	0.743	0.717	**0.787**

Table 3: Assessment of Discriminant Validity (HTMT) (Henseler et al., 2015)

	Behavioral Intention	Effort Expectancy	Facilitate Condition	Performance Expectancy	Social Influence	Use Behavior
Behavioral Intention						
Effort Expectancy	**0.912**					
Facilitate Condition	**0.927**	**0.831**				
Performance Expectancy	**0.906**	**0.981**	**0.847**			
Social Influence	**0.909**	**1.020**	**0.806**	**0.943**		
Use Behavior	**0.974**	**0.905**	**0.823**	**0.952**	**0.927**	

Based on their parameter estimates and statistical significance, the results for all constructs considered valid measures of their respective constructs. The overall results suggest that the measurement model of this study showed a satisfactory empirical support for its reliability, convergent validity, and discriminant validity.

5.2. Evaluation of the Structural Model

The structural model of this study, also known as the inner model, represents the relationships of effect among the investigated constructs. Thus, evaluating the structural model means that the research hypotheses underlying the hypothesized relationships or effects among these constructs. Regarding this, the present study used path coefficient (ß) criterions for testing the research hypotheses. The path Coefficient has standardized values between -1 and +1. The path coefficients value which is close to +1 implies that the relationship between each the constructs is strongly positive and vice versa for negative values (Hair Jr et al., 2016). In using this path coefficient value for assessing the significant level of the relationships, the t-value is higher than a specific critical value suggests that the coefficient is significant at a certain error probability. For example, t-value > 1.96 represents a significance level with a p- value < 0.05.

The main evaluation criteria for the structural model's goodness is that the measures the determination coefficient and the significance level of the path coefficients (beta values), as the higher the Adjusted value, is, the greater the ability of the exogenous variable can be explained by endogenous variables so that the structural equation is considered better (Hair, Ringle, Sarstedt, et al., 2011). Figure (2) shows the Behavioural Intention variable value is 0.73 which means that 73% of the Behavioural Intention variance can be explained by variables, while the rest is elucidated by other variables outside the research model.

The results obtained from testing the research hypotheses in figure 2 and table 4 show that all the proposed research hypotheses accepted. The results also indicate that the Behavioural Intention significantly and positively influence Use behavior (ß = 0.739, t = 15.064, p < 0.05). Therefore, H1 is supported. In addition Effort Expectancy positively influence Behavioral Intention (ß = 0.254, t = 3.643, p < 0.05). Therefore, H2 is supported and Facilitate Condition positively influence Use Behavior (ß = 0.113, t = 1.952, p < 0.05). Then, H3 is supported. Performance Expectancy positively influence Behavioral Intention (ß = 0.257, t = 4.257, p < 0.05). Therefore, H4 is supported. Social Influence positively influence Behavioral Intention (ß = 0.377, t = 5.282, p < 0.05). Therefore, H5 is supported.

Table 4. Hypothesis Testing

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Result
Behavioral Intention -> Use Behavior	0.739	0.735	0.049	15.064	0.000	Supported
Effort Expectancy -> Behavioral Intention	0.254	0.253	0.070	3.643	0.000	Supported
Facilitate Condition -> Use Behavior	0.113	0.121	0.058	1.952	0.051	Supported
Performance Expectancy -> Behavioral Intention	0.257	0.259	0.060	4.257	0.000	Supported
Social Influence -> Behavioral Intention	0.377	0.378	0.071	5.282	0.000	Supported

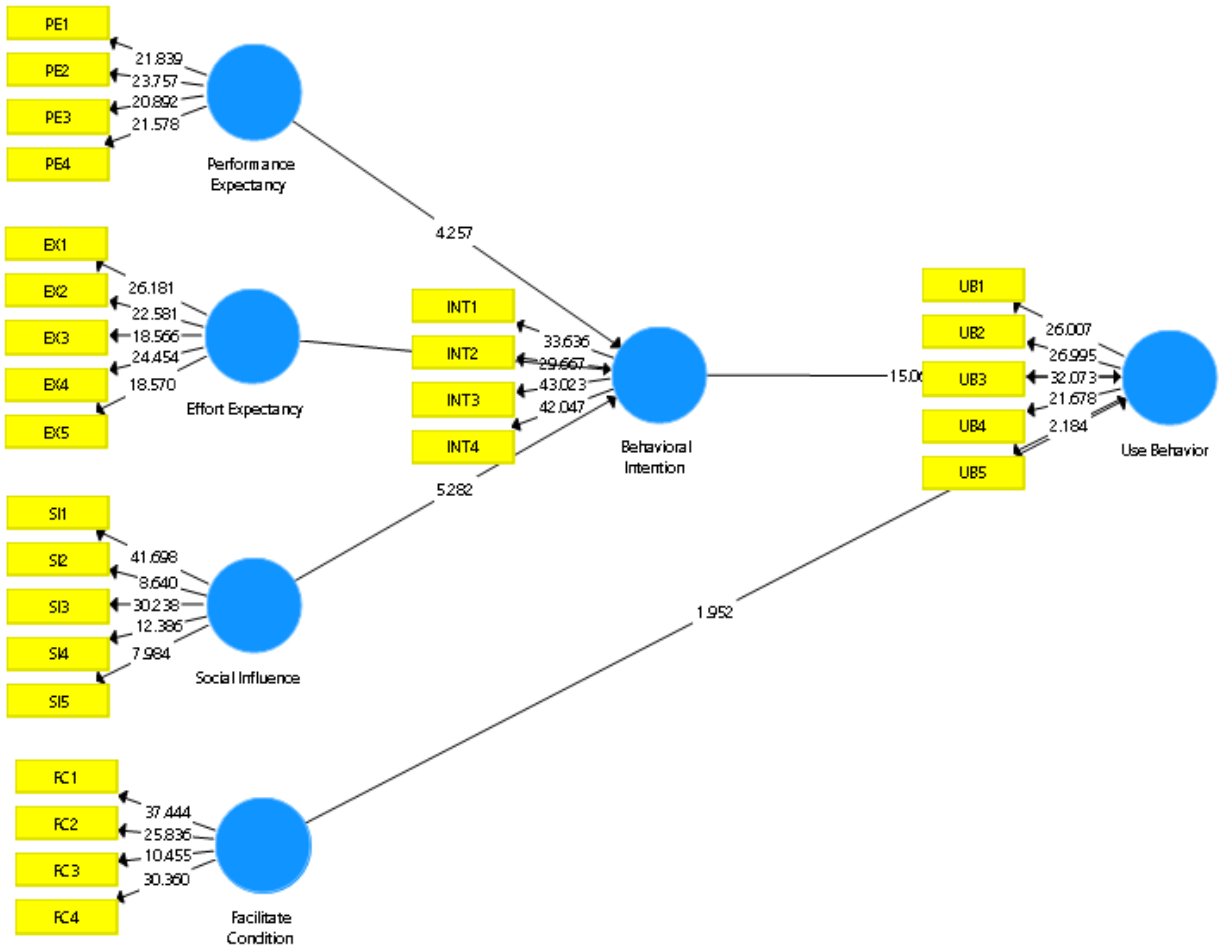

Fig. 2 Structural Model

6. DISCUSSION

The results of evaluating the data's goodness were reported in this research, along with the details of the data analysis. Factor analysis, reliability evaluation, rate of response, descriptive analysis, correlation analyses, and hypothesis testing were all examined in this research. The assumptions of normality, linearity, and homoscedasticity were tested in the first part of the analysis. The results showed that the assumptions had been met in most cases. a factor analysis was used to test the construct validity of all the interval scale variables, A reliability analysis was also conducted to determine the items' dependability across all constructs, as well as the accuracy of the measurement instrument used in this research. As evidenced by the findings, the instrument used in this study was determined to be both reliable and appropriate for measuring constructs. The aim of performing applied research is to develop answers that will improve practice; to that end, the current research used performance expectancy, effort expectancy, social influence, facilitate condition that influenced acceptability. These variables were discovered as factors influencing the intention and behavior of problem based learning strategy using online learning usage in this regard. The results of data analysis for H1 showed that performance expectancy has a positive and significant effect on users' behavioural intention to use problem based learning strategy using e learning; that is, if users believe that its enhances their performance, they are more motivated to utilize it. This finding is in accordance with previous research(Sair & Danish, 2018). The second finding H2 is that, among other factors influencing problem based learning strategy using e learning, effort expectancy had a favourable and significant impact on users' behavioural intention (Darmansyah et al., 2020).

As a result, if users are at ease with problem based learning with e learning. This finding is consistent with the report of this research (Do Nam Hung et al., 2019). Third, the findings revealed that social influence H3 has a large

and beneficial impact on users' behavioural intentions to use problem based learning with online learning, which was supported in these investigations (Darmansyah et al., 2020) H4, the results indicated that the facilitate condition had a significant and beneficial effect on the behavioural intention to utilize problem based learning with e learning, which was confirmed in this research (Al-Hujran et al., 2014)

. H5, the findings showed that training had a large and positive impact on the behavioural intention to use problem based learning using e learning, which was proven in this research(Al-Hujran et al., 2014)

Consequently, the findings of this research showed that the proposed problem-based learning using online learning model is effective in improving educational outcomes for class teacher students.

7. IMPLICATIONS AND RECOMMENDATION FOR FUTURE RESEARCH

Problem-based learning (PBL) can be an effective teaching method for class teacher students in online learning environments. The research suggests that PBL can lead to better acquisition of knowledge and skills compared to traditional methods of teaching. This has implications for online teaching and learning, as well as for teacher education programs. Online learning can be an effective mode of delivery for PBL. The research argues that PBL can be successfully implemented in online learning environments. This has implications for the design and delivery of online courses, as well as for the adoption of PBL in other online contexts. PBL can enhance students' critical thinking and problem-solving skills. The article highlights the importance of these skills for class teacher students, who will need to apply them in their future teaching roles. This has implications for the development of curriculum and assessment strategies that prioritize these skills. Moreover, as a recommendation for this study

1. Investigate the effectiveness of PBL in other contexts and with different student populations. While the article focuses on class teacher students, future research could explore the effectiveness of PBL with other groups of students, such as university students or students in vocational education programs.

2. Examine the impact of PBL on student motivation and engagement. The article suggests that PBL can lead to greater engagement and motivation among students, but more research is needed to confirm this. Future studies could investigate the relationship between PBL and student motivation and engagement, and explore strategies for optimizing student engagement in PBL.

3. Explore the role of technology in facilitating PBL. The article suggests that technology can support the implementation of PBL in online learning environments, but more research is needed to understand how technology can be best used to support PBL. Future studies could investigate the use of specific technologies (e.g., online discussion forums or virtual simulations) in PBL and their impact on student learning outcomes.

CONCLUSIONS

The nature of this research has been described as a descriptive study using a quantitative survey method. It also explains the approach used in this research investigate the factors performance expectancy, effort expectancy, social influence, facilitate condition on problem-based learning using Online learning for class teacher’s students. Moreover, the research components and related literature were introduced. In the other hand, research methodology and procedure were also highlighted.

According to the findings of this study, implementing of problem-based learning using online learning has a significant impact on improving Online learning process. This model would enhance problem-based learning strategy using online learning in acquisition of Knowledge using E-learning for Class Teacher students.

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DOI: https://doi.org/10.15379/ijmst.v10i3.1647