Virtual Learning Environment in a Philippine Higher Education Institution: Acceptance and Practices

Jo Ann M. Petancio*, Angeline M. Pogoy, Imelda C. Montalbo, and Genalen M. Pepito

College of Teacher Education, Cebu Normal University, Philippines
Email: petancioj@cnu.edu.ph (J.A.M.P.); pogoya@cnu.edu.ph (A.M.P.); montalboi@cnu.edu.ph (I.C.M.); pepitog@cnu.edu.ph (G.M.P.)
*Corresponding author

Manuscript received July 2, 2023; revised August 8, 2023; accepted November 17, 2023; published May 20, 2024

***Abstract*—Acceptance and practices in the use of virtual learning environments in Philippine higher education institutions should be explored to provide insights for its long-term implementation and to sustain quality education. This study extends the technology acceptance model to include perceived pedagogical impact and personal innovativeness, and examines the prevalent practices in the utilization of the virtual learning environment in a higher education institution in Cebu City, Philippines, in accordance with the principles for Universal Design for Learning. Participants in the study included 567 students who completed an online survey questionnaire. This quantitative study utilized structural equation modeling that revealed how perceived pedagogical impact and personal innovativeness have a significant impact on perceived usefulness and perceived ease of use, respectively. Also, perceived usefulness and perceived ease of use are both related to behavioral intention to use, which influences the actual use of the virtual learning environment. The results demonstrated how various practices and strategies were perceived by the students as being frequently used in the virtual learning environment by using the average of the weighted means. The list was topped by student-teacher interactions and student-platform interactions, with timely feedback coming in last. The findings suggest that higher education institutions may assess students' innovativeness and perceptions of the impact of virtual learning environments right from the start. Enhancement programs may subsequently be implemented. Furthermore, faculty members may be trained in the use of digital tools to hone the time management skills of students and implement cooperative learning activities and effective feedback mechanisms in the online mode.**

***Keywords*—perceived pedagogical impact, personal innovativeness, quality education, virtual learning environment**

I. Introduction

The COVID-19 pandemic has accelerated the development and use of Virtual Learning Environments (VLEs) across Philippine higher education institutions (HEIs). A VLE is a web-based platform that is a combination of the "conventional education concept with the virtual method" [1]. It enables learning to take place at any time and from any location and provides teachers with a vast array of online resources to aid in the creation and delivery of online courses [2]. Apart from the information and training tasks of a VLE, it also has communication, control, and administrative functions [3].

The benefits of VLE use in higher education have been demonstrated through various studies. Students' logs of their participation in VLE activities were favorably connected with the grades they received for the course [4]. Additionally, VLE enhanced students' learning and motivation to learn [5] and helped pupils become more innovative thinkers [6]. The number of times students visit the VLE is positively correlated with the number of courses they pass [7]. A VLE system also enhanced the twenty-first-century learning and innovation skills of HEI students [8].

Despite research showing that they can have a positive impact on students' learning, the use of VLEs in HEIs across the country has been beset by a lot of concerns. Some of the issues that are frequently seen and read about have evolved into memes that show the struggles that both teachers and students have had adjusting to this modality in education. These identified challenges were cited by various authors: internet connectivity, accessibility and availability of resources such as technology and study/work spaces, and capacity and capability for online learning of students and faculty members [9–11].

According to some studies, students view using VLEs favorably and have positive attitudes toward doing so [12–14]. There are other studies where the lack of interaction and involvement from the students' teachers has resulted in the students' expressing dissatisfaction and negative perceptions of the VLE [15, 16]. As teaching, social, and cognitive presence are important factors that can affect students' satisfaction with the online learning environment [17], it is important to improve student interactions with the VLE [18].

In the research environment where this study was conducted, the virtual learning environment comprised of tools that provide a collective experience to students enabling them to learn both synchronously and asynchronously. Through web conferencing tools, students and teachers can interact and engage in meaningful discussions. Students are also able to access reading materials, assessments, and other audiovisual resources that are prepared by the teachers using a learning management system. Understanding how students view the use of the VLE can give important insights for improving the way that education is delivered in HEIs in response to Sustainable Development Goal Number 4 of Quality Education.

By determining the factors impacting the acceptance of the VLE and exploring the practices in its use as perceived by the students in the HEI, practical implications for its sustainable utilization in the country may be identified. As culture may explain why VLE use is accepted [19], this study's findings may support or contradict those of other studies.

In this era of Education 4.0, creating and making use of VLEs is here to stay and so coming up with ways to improve their implementation in HEIs is both timely and relevant. These strategies will be aimed at catering to students' needs and interests which will positively impact their academic

performance. Hence, this quantitative study.

In light of studies examining the acceptance of technology in HEIs with other external variables taken into account [20–22], this study expanded the Technology Acceptance Model (TAM) to include two additional factors: perceived pedagogical impact and personal innovativeness. Perceived pedagogical impact and personal innovativeness are considered personal factors that will affect the perceived usefulness and perceived ease of use of a particular system respectively [23]. Also, in this study, actual strategies and practices frequently used in the VLE were determined based on the perceptions of the students in line with the Universal Design for Learning framework. The findings led to the identification of practical application implications for sustainable implementation of VLEs in the HEI.

II. Research Objectives and Hypotheses

A. Objectives

This study aimed to investigate the factors in the acceptance of the students and the practices in the use of the virtual learning environment (VLE) in the teaching-learning of various courses among the students of the different colleges of a higher education institution in Cebu City. It specifically intended to:

1) identify the factors that have significant effects on the acceptance and use of the virtual learning environment among the students such as perceived pedagogical impact, personal innovativeness, perceived ease of use, perceived usefulness, behavioral intention to use, and actual use;
2) determine the predominant strategies and practices in the use of the virtual learning environment based on the perceptions of the students.

B. Hypotheses

This study tested the following hypotheses:

HO1: Perceived Pedagogical Impact does not significantly affect the Perceived Usefulness of VLE.

HO2: Personal Innovativeness does not significantly affect the Perceived Ease of Use of VLE.

HO3: Perceived Ease of Use of VLE does not significantly affect Perceived Usefulness of VLE.

HO4: Perceived Usefulness of VLE does not significantly affect Behavioral Intention to Use VLE.

HO5: Perceived Ease of Use of VLE does not significantly affect Behavioral Intention to Use VLE.

HO6: Behavioral Intention to Use VLE does not significantly affect Actual VLE Use.

III. Research Framework and Methodology

A. Research Framework

This study was anchored on the Universal Design for Learning (UDL) and the Technology Acceptance Model (TAM) that was being extended to include two external variables namely perceived pedagogical impact and personal innovativeness as shown in Figure 1.

Universal Design for Learning. The Universal Design for Learning (UDL) is a framework developed by CAST or the Center for Applied Special Technology. Scientifically based on the ways by which humans learn, the UDL is meant for the improvement and optimization of the teaching and learning of all individuals [24]. It is to be used as a guide in designing learning experiences for diverse learners that also include the utilization of digital technology though not a requirement. The guidelines for universal design for learning include providing multiple means of a) representation, b) engagement, and c) action and expression [24].

The students in this study determined how frequently the strategies and practices were used in the VLE. It was investigated whether these methods and strategies provide students with information in a variety of ways, offer flexible options for the students to relate to the lesson and demonstrate what they have learned, and engage students in learning through a variety of means.

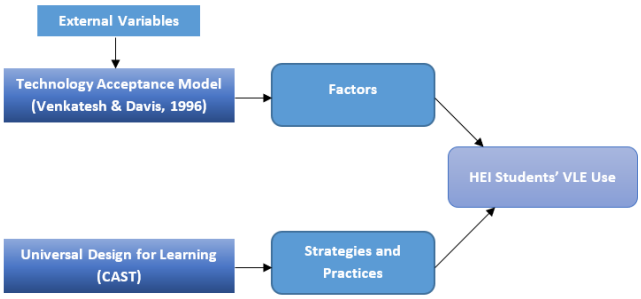


Fig. 1. Research framework.

Technology Acceptance Model. The Technology Acceptance Model (TAM) was first developed by Fred Davis [25]. The TAM is the leading model that explains the factors that affect the acceptance of technology among users [26]. These factors are perceived ease of use of the system that affects the perceived usefulness of the system. The two mentioned factors in turn affect the user's behavioral intention to use the system and consequently the actual use of the system. The model has evolved over the years and has undergone refinement concerning the Theory of Reasonable Action (TRA) by Fishbein and Ajzen extended to become the Theory of Planned Behavior (TBA) [27]. The final version of TAM developed by Venkatesh and Davis [28] included external variables that have the potential to influence an individual's acceptance of a system [29].

This model is suitable for this present study which aims to examine the factors affecting the acceptance and use of the virtual learning environment in different college courses. It was being extended in this study to include the external variables namely perceived pedagogical impact and personal innovativeness.

Perceived Pedagogical Impact. The perceived pedagogical impact is the idea that technology can put teaching-learning principles into practice in the classroom [30]. As revealed in some studies wherein technology was used for educational purposes, students had a positive opinion of and response to its adoption and use [31], and significant socio-pedagogical benefits were observed [32]. There are limited studies conducted so far on perceived pedagogical impact. It has been found that pedagogical impact has an effect on all stages of technology adoption [23].

Personal Innovativeness. Personal innovativeness is the

propensity of an individual to experiment with and pioneer new technologies [33]. It goes further in explaining the phenomenon of technology uptake in educational settings. Studies have shown the significant effect of personal innovativeness on the perceived ease of use of the technology [34] and on the attitude towards the game and on the flow experience [35]. On the other hand, personal innovativeness was not found to be a main factor, although it has some indirect influences on technology acceptance [36].

B. Design

This quantitative study employed structural equation modeling to examine the factors affecting the acceptance and use of the VLE among the students through the questionnaire based on the extension of TAM. Also, this study investigated the strategies and practices frequently used in the VLE as perceived by the students in light of the UDL principles.

C. Participants

Data were collected from the students belonging to the different colleges of a tertiary institution in Cebu City for the Academic Year 2021–2022. The student participants were those who: a) officially enrolled as first to fourth-year and graduate school students for the first semester, and b) chose the online mode of learning for the first semester.

As shown in Table 1, there were 567 student participants whose responses were subjected to structural equation modeling. The required sample size for structural equation modeling is between 200 and 500 participants [37]. Also, when the estimated minimum path coefficient ranges from 0.11 to 0.2, the minimal sample size at a 0.05 significance level is 155 using the inverse square root approach [38].

Table 1. Demographic information of the participants

Demographic Variable	Category	Frequency	Percentage
Gender	Female	457	*80.6%
	Male	85	*15%
	Prefer not to say	25	*4.4%
Year Level	First	135	*23.8%
	Second	178	*31.4%
	Third	129	*22.8%
	Fourth	115	*20.3%
	Graduate School	10	*1.7%

*Percentage is computed based on sample size n = 567.

Table 1 also reflects the data of the demographic profile of the respondents of this study. Most of the student respondents (80%) are females. The student respondents are from the first to fourth year of their baccalaureate degrees. The four levels are represented by nearly equal numbers of respondents. There are also a few student respondents (1.7%) from the graduate school.

D. Instrument

An online questionnaire using Google Forms was used to gather data from the students. The questionnaire was made up of three parts. Part I was for the demographic profile of the participants. Part II contained items for each of the factors: Perceived Ease of Use (PEU), Perceived Usefulness (PU), Behavioral Intentions (BI), and Actual Use (AU) as adapted from validated scales in previously published studies using the TAM. The same goes for the external variables —Perceived Pedagogical Impact (PPI) and Personal Innovativeness (PI)— whose items were adapted [23]. This part of the instrument was a 5-point Likert scale questionnaire with responses ranging from 1 for "completely disagree" up to 5 for "completely agree".

Part III contained a list of the strategies and practices employed by teachers in using the VLE. The items on this list were obtained from a literature review of studies on good practices in VLEs. Each item was rated by the respondents based also on a five-point rating scale with 5 for "always used", 4 for "often used", 3 for "sometimes used", 2 for "rarely used" and 1 for "never used".

The instruments were pilot-tested on N=38 participants. Cronbach's alpha (α) for Parts II and III of the questionnaire were computed and shown in Table 2. An α of 0.8 and higher indicates a very good level of reliability [39].

Table 2. Pilot testing participants and reliability coefficients

Participants	N	Part II α	Part III α
Students	38	0.84	0.82

E. Data Collection

In gathering data, a link with direct access to the Google Forms containing the three-part instrument was sent to the official university email addresses of the prospective participants who gave their consent and voluntarily answered the questionnaire.

F. Data Analysis

To determine the factors that have significant effects on the acceptance and use of the virtual learning environment among students, this study extended the TAM by including perceived pedagogical impact and personal innovativeness. Hence, Structural Equation Modeling (SEM) using the Partial Least Squares (PLS) method was used in the analysis through the trial version of Smart PLS 3. PLS-SEM is to be used when theoretical extensions of established theories are being explored [37]. Through PLS-SEM, causal relationships among variables postulated in the theoretical model were examined.

G. Ethical Considerations

Formal ethics approval for this study was obtained from the Ethics Review Committee of the Cebu Normal University. The participants were informed of the purpose of the study, how it would be conducted, the extent of their involvement, and the benefits and risks for them. They were also made aware of their liberty to participate or not in the study and their freedom to withdraw from the study at any time with no repercussions. The participants were assured that their participation or nonparticipation and withdrawal from the study as well as their responses will have no bearing whatsoever on their grades. To uphold the principles of privacy, anonymity, and confidentiality, the participants were also given the liberty to write or not their names on the form. The prospective participants were also asked for their consent to participate in the study. All these were stipulated in the first two sections of the Google Form before the actual questionnaire.

IV. Results

A. Measurement Model and Structural Model Assessment Results

Measurement Model Assessment. The measurement model is assessed based on indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. The rules of thumb for the results obtained are as follows: a) For indicator reliability, the size of the outer loadings should be 0.708 or higher. b) For internal consistency reliability, Cronbach's alpha and composite reliability values between 0.70 to 0.90 are considered satisfactory. c) For convergent validity, the Average Variance Extracted (AVE) that is 0.50 or higher means that the construct can account for more than half of the variance of its indicators [40].

Table 3 shows that all six factors have met the acceptable values for internal consistency reliability and convergent validity. However, for indicator reliability, there are three indicators with outer loadings below 0.708. Indicator AU3 is to be deleted since its outer loading is below 0.40 while BI5 and PI2 are to be retained as the corresponding factors' internal consistency reliability and convergent validity measures meet the recommended thresholds [40].

Table 3. Indicator reliability, internal consistency reliability, and convergent validity results

Factors	Indicators	Outer Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Actual Use	AU1	0.864	0.724	0.778	0.570
	AU2	0.922			
	AU3	**0.337			
Behavioral Intention	BI1	0.856	0.876	0.909	0.669
	BI2	0.870			
	BI3	0.879			
	BI4	0.779			
	BI5	*0.689			
Perceived Ease of Use	PEU1	0.866	0.845	0.906	0.762
	PEU2	0.886			
	PEU3	0.868			
Perceived Pedagogical Impact	PPI1	0.756	0.928	0.941	0.666
	PPI2	0.745			
	PPI3	0.776			
	PPI4	0.822			
	PPI5	0.856			
	PPI6	0.857			
	PPI7	0.886			
	PPI8	0.822			
Perceived Usefulness	PU1	0.826	0.830	0.899	0.747
	PU2	0.900			
	PU3	0.865			
Personal Innovativeness	PI1	0.847	0.794	0.866	0.623
	PI2	*0.589			
	PI3	0.854			
	PI4	0.836			

*below the acceptable value but to be retained; **below the acceptable value but to be deleted

As for discriminant validity, two constructs are considered distinct when they have an Heterotrait-Monotrait Ratio (HTMT) ratio below the threshold value of 0.85 [40]. Table 4 shows that the six factors are different from each other as the HTMT ratio results are below 0.85. Hence, the factors in this model are constructs unique from each other.

Table 4. Discriminant validity results: Heterotrait-Monotrait Ratio (HTMT)

	Actual Use	Behavioral Intention	Perceived Ease of Use	Perceived Pedagogical Impact	Perceived Usefulness
Behavioral Intention	0.221				
Perceived Ease of Use	0.151	0.701			
Perceived Pedagogical Impact	0.130	0.612	0.541		
Perceived Usefulness	0.181	0.744	0.834	0.549	
Personal InnovativeNess	0.187	0.700	0.626	0.610	0.657

Structural Model Assessment. The steps in the structural model assessment were performed in this study wherein the following were assessed: collinearity, significance, relevance of relationships, explanatory power, and blindfolding and predictive relevance [40]. Table 5 below reveals the collinearity statistics (VIF) that are all lower than 5. For collinearity, the VIF for each predictor should be less than 5 and even preferable, less than 3 [40].

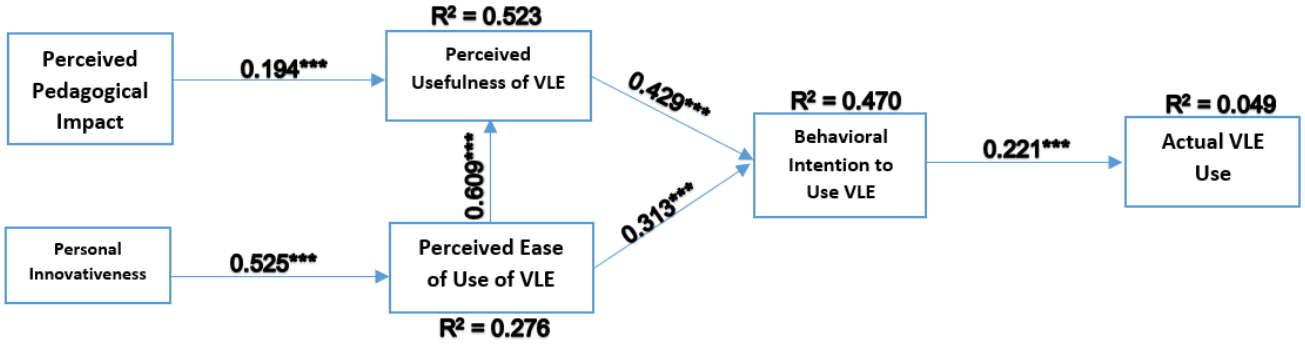
Table 5. Collinearity Statistics (VFI)

Indicators	VFI	Indicators	VFI	Indicators	VFI
AU1	1.626	PEU3	1.834	PU1	1.678
AU2	1.626	PPI1	2.104	PU2	2.371
BI1	2.310	PPI2	1.812	PU3	2.043
BI2	2.901	PPI3	2.252	PI1	1.933
BI3	2.913	PPI4	2.475	PI2	1.240
BI4	1.915	PPI5	3.283	PI3	2.104
BI5	1.667	PPI6	3.303	PI4	1.756
PEU1	2.086	PPI7	3.857		
PEU2	2.327	PPI8	2.748		

To identify the predominant strategies and practices in the use of the VLE, the averages of the weighted means based on the responses of the students were examined.

B. Extended Technology Acceptance Model

The structural model as shown in Fig. 2 confirms the extended TAM relationships. Fig. 2 depicts the significant associations among the factors. The six paths in the model denoted by the six arrows are all statistically significant at α = 0.05. The numbers on top of the arrows connecting the two factors are the path coefficients (β). These coefficients explain how a dependent variable changes with a change of one unit in the independent variable [38]. The figure shows that the largest change (β = 0.609, p < 0.05) occurs in PU with a change in PEU while the smallest change happens (β = 0.194, p < 0.05) in PU with a change in PPI.



***statistically significant at α = 0.05

Fig. 2. Structural extended technology acceptance model.

Furthermore, the figure indicates the R^2 or the coefficient of determination values. The R^2 is the measure that is examined when assessing the explanatory power of the structural model with higher values suggesting higher explanatory power [40]. In the model, 27.6% is the R^2 value of PEU, 52.3% for PU, 47% for BI, and 4.9% for AU.

Aside from R^2 values, the f^2 effect sizes are also being studied for the explanatory power of the structural model. Effect size indicates the magnitude of the effect regardless of the sample size. It is to be interpreted as follows: if $f^2 < 0.020$, no substantial effect; if $0.020 \leq f^2 < 0.150$, weak effect size; if $0.150 \leq f^2 < 0.350$, medium effect size; and if $f^2 \geq 0.350$, large effect size [41].

Based on Table 6, BI has a weak effect size on AU as well as PEU on BI and PPI on PU. PU has a medium effect size on BI. On the other hand, PI has a large effect size on PEU and so with PEU on PU.

Table 6. f^2 effect sizes

Factors	AU	BI	PEU	PU
AU				
BI	0.051			
PEU		0.093		0.598
PPI				0.061
PU		0.175		
PI			0.381	

Predictive accuracy that is measured by the Q^2 is also looked into when assessing the structural model. Q^2 values are obtained using the blindfolding procedure. Q^2 values higher than 0, 0.25, and 0.5 indicate small, medium, and large predictive relevance [40]. Table 7 shows the small predictive relevance of AU and PEU. Meanwhile, BI and PU have medium predictive relevance.

Table 7. Q^2 blindfolding and predictive relevance

	SSO	SSE	Q^2(=1−SSE/SSO)
Actual Use	1134	1094.78	0.035
Behavioral Intention	2835	1968.916	0.305
Perceived Ease of Use	1701	1351.353	0.206
Perceived Pedagogical Impact	4536	4536	0.000
Perceived Usefulness	1701	1048.255	0.384
Personal Innovativeness	2268	2268	0.000

Note: SSO = sum of squares of observations; SSE = sum of squared prediction errors

The results in Table 8 show that hypotheses 1–6 were supported. PPI positively and significantly predicted PU (β = 0.194) but not as much as PI does for PEU (β = 0.525). PEU is significantly related to PU (β = 0.609) while both PEU and PU positively influence BI (β = 0.429 and β = 0.313 respectively). Additionally, BI significantly affects AU (β = 0.221).

Table 8. Hypotheses test results

Hypothesis Number	Hypothesized Relationship	Path Coefficient	Result
HO1	Perceived Pedagogical Impact → Perceived Usefulness	0.194***	Supported
HO2	Personal Innovativeness → Perceived Ease of Use	0.525***	Supported
HO3	Perceived Ease of Use → Perceived Usefulness	0.609***	Supported
HO4	Perceived Usefulness → Behavioral Intention to Use	0.429***	Supported
HO5	Perceived Ease of Use → Behavioral Intention to Use	0.313***	Supported
HO6	Behavioral Intention to Use → Actual Use	0.221***	Supported

***significant at 0.05 alpha level

C. Strategies and Practices in the Use of VLE

Table 9 presents the average weighted mean for each of the strategies and practices in the use of VLE as perceived by the students. The mean rating for perceived frequency of usage for all the seven practices listed corresponds to “Often Used”. These practices are indeed the dominant strategies and

practices used in the VLE.

Based on the students' responses, interaction among students and teachers through discussion, online forums, etc., and interaction between students and the online platforms were equally perceived as the strategy most used in the VLEs. These two practices are followed by encouragement of innovation in both students and teachers and organization of resources and activities in the online platforms. The strategies with the lowest averages are the promotion of student's time management in the accomplishment of activities, involvement of students in cooperative/collaborative activities, and the provision of structured and immediate feedback to students.

Table 9. Strategies and practices in the use of VLE as perceived by the students

Strategies and Practices in the Use of VLE	Students n=567	Interpretation
Interaction among students and teachers through discussion, online forums, etc.	3.95	Often Used
Interaction between students and the online platforms	3.95	Often Used
Encouragement of innovation in both students and teachers	3.93	Often Used
Organization of resources and activities in the online platforms	3.87	Often Used
Promotion of student's time management in the accomplishment of activities	3.85	Often Used
Involvement of students in cooperative/collaborative activities	3.81	Often Used
Provision of structured and immediate feedback to students	3.73	Often Used

Legend: 1.00–1.80 Never Used, 1.81–2.60 Rarely Used, 2.61–3.40 Sometimes Used, 3.41–4.20 Often Used, 4.21–5.00 Always Used

V. Discussion

This study intended to examine the factors in the acceptance and the practices in the use of the VLE in a higher education institution. The study provides empirical evidence for the following:

Students have a positive perception of the online environment when they can see how it can help with their learning. Every stage of technology acceptance is impacted by perceived pedagogical impact [15]. Additionally, research has shown that when used for educational goals and to produce learning outcomes, technology is well-received by students [28, 42].

Also, perceived usability is influenced by individual innovation [34]. The students are more accustomed to using technology, which affects how easily they seem to be able to use the VLE. The degree to which an individual is innovative has a significant impact on how easily they are perceived to be able to use technology [34]. Personal innovativeness, however, was found to have no appreciable impact on perceived usability in another study [43]. In a recent study, technological literacy and competency were the least among the online learning challenges identified by the students [44].

Further, perceived VLE usability and ease of use are both important predictors of attitude toward VLE use [45]. According to studies [43, 45–50], perceived user-friendliness has a direct impact on how useful people perceive a VLE. Digital technology will only be viewed as useful by students if they find it convenient to use.

Moreso, students are more likely to use the VLE when they comprehend and recognize the benefits of doing so. Intention is sparked by purpose. The behavioral intention to use a VLE is directly influenced by its perceived usefulness [43, 46–49].

The VLE is perceived as being user-friendly by the students, and this perception is reflected in their intention to use it. One study [48] claims that perceived ease of use directly affects behavioral intention to use VLE, in contrast to another study [46] that claims otherwise. It can be deduced that purpose over usability pushes a person to intend to use VLE because more studies support perceived usefulness to influence behavioral intention over perceived ease of use of VLE.

The results of other studies [43, 47–49] support the notion that behavioral intention to use has a significant impact on actual VLE use. Students use the VLE, so their intention to do so does not end there. Students who want to continue their education must follow the available modality in the emergency e-learning situation during the COVID-19 pandemic.

Additionally, the findings demonstrate that student perceptions of VLE usage practices were most favorable for interactions between students and teachers as well as between students and online platforms. This further supports the students' acceptance of VLE in the HEI as some studies have shown that negative perceptions toward the VLE are due to limited interactions [15, 16]. The VLE is viewed favorably by the students overall because they are satisfied with the interactions occurring in it.

The practices also frequently employed in the VLE are the organization of resources and activities on online platforms, followed by the encouragement of innovation in both teachers and students. These results emphasize the importance of individual creativity as students and teachers navigate the online learning environment. The propensity and openness to using a particular technology may have an impact on how an individual accepts it. Additionally, how well a person accepts technology is indirectly influenced by their capacity for innovation [36].

These findings suggest how the conduct of an orientation or introduction of the virtual learning environment among the students before its use will be favorable for its acceptance. The orientation will aim to increase the student's awareness of the potential benefits of the utilization of the VLE for the attainment of their academic goals. Also, an assessment of the student's level of personal innovativeness before commencing the use of the VLE would provide valuable insight and information to the faculty and administration in terms of the kind of assistance they could provide and programs they could offer to cater to the students and their varying needs. The lack of training among students was a cited challenge in virtual learning [11] and the greatest challenge among students was related to the conduciveness of their home setting and situation for learning. It is suggested that management of the student's abilities in terms of technology utilization to improve their digital skills is a possible solution to help address difficulties in the VLE [51].

The promotion of time management for the completion of tasks among the students is included in the lower half of the frequently used practices in VLE usage. Time management is one of the difficulties students face when using an online

learning environment [52]. On the other hand, a different study revealed that students constantly followed the learning process on time [53]. It is crucial for students to learn time management skills because doing so fosters metacognition, which in turn helps them self-regulate and monitor their learning while they are online [54].

The students reported that cooperative/collaborative learning strategies and practices were employed frequently. This ranked second to the last in the list. Implementing strategies for online collaboration was one of the challenges associated with using virtual teaching and learning environments [51]. There is much to learn about how to carry out and execute cooperative/collaborative activities in the VLE given the novelty of this platform and the unstable internet connection in the Philippines.

At the bottom of the list is the provision of structured and immediate feedback to the students. This is consistent with the findings that students give the teaching staff lower scores for their satisfaction with feedback when compared to other teaching and learning aspects [15]. In the online modality, the students found it difficult to raise clarification of topics with their teachers [9]. The ability to deliver high-quality feedback is a long-recognized and important concern among educators [55].

Based on these results, it can be implied that there is a necessity to retool and reskill the faculty members in terms of preparing activities and using digital tools that will hone the time management skills of the students, encourage collaboration among the students, and provide prompt quality feedback to the students using the VLE. Training to capacitate the faculty members to make the most out of the VLE whether for pure online or hybrid modalities may equip them with the needed strategies and skills to improve their instruction and assessment practices. The insufficient training of both students and faculty members as an issue in the e-learning classroom has also been identified [11]. In a particular study, the students expressed general dissatisfaction with how the faculty carried out their e-learning tasks and duties [15]. Teaching through digital platforms requires the digital competence, time management, and organizational skills of teachers [51]. Hence, the faculty teaching load should also be looked into to give the educators ample time for planning and preparation of their classes.

VI. Conclusion

The study provided empirical results for the factors in the acceptance of the VLE among the students and the prevailing practices in its utilization in a higher education institution. Extending the Technology Acceptance Model confirmed that the perceived pedagogical impact and personal innovativeness of higher education students are significant factors in their acceptance of the virtual learning environment. The students' perceptions of the dominant practices in VLE use provided relevant insights on how interaction, innovation, and organization skills are enhanced through this platform. Further, it was revealed how this online instructional modality can be improved further in terms of the development of time management skills of the students as well as provisions for cooperative activities, and feedback mechanisms for its sustainable implementation in the HEI.

However, the convenient sample drawn from a higher education facility in Cebu City, Philippines, poses a limitation to this study. The majority of participants are female, and they mostly attend one particular college. This may limit the generalizability of the study's findings.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

JAMP was responsible for conceptualization, data curation, investigation, software, and writing – original draft, review, and editing; AMP for conceptualization, investigation, funding acquisition, and writing – original draft; ICM and GMP for conceptualization, investigation, methodology, and writing – original draft.

References

[1] Z. Hamid, C. F. Peng, M. S. N. Shaharom, T. C. Ter, and K. Raman, "The concept and use of the virtual learning environment in teaching: A literature review," *International Journal of Academic Research in Business and Social Sciences*, vol. 8, no. 6, pp. 1293–1301, 2018. https://doi.org/10.6007/IJARBSS/v8-i6/4517

[2] R. Hodhod, M. Ibrahim, M. Khafagy, and M. S. Abdel-Wahab, "Issues of choosing the suitable virtual learning environment," *Research Journal of Information Technology*, vol. 2, no. 1, pp. 24–29, May 2010.

[3] N. Kerimbayev, "Virtual learning: Possibilities and realization," *Educ Inf Technol*, vol. 21, pp. 1521–1533, November 2016. https://doi.org/10.1007/s10639-015-9397-1

[4] A. M. Mogus, I. Djurdjevic, and N. Suvak, "The impact of student activity in a virtual learning environment on their final mark," *Active Learning in Higher Education*, vol. 13, no. 3, pp. 177-189, September 2012. https://doi.org/10.1177/1469787412452985

[5] J. Barker and P. Gossman, "The learning impact of a virtual learning environment: students' view," *Teacher Education Advancement Network Journal (TEAN)*, vol. 5, no. 2, pp. 19–38, July 2013.

[6] N. Songkram, "E-learning system in virtual learning environment to develop creative thinking for learners," *Procedia - Social and Behavioral Sciences*, vol. 174, pp. 674–679, February 2015. https://doi.org/10.1016/j.sbspro.2015.01.600

[7] P. Alves, L. Miranda, and C. Morais, "The influence of virtual learning environments in students' performance," *Universal Journal of Education Research*, vol. 5, no. 3, pp. 517–527, 2017. https://doi.org/10.13189/ujer.2017.050325

[8] J. Khlaisang and N. Songkram, "Designing a virtual learning environment system for teaching twenty-first-century skills to higher education students in ASEAN," *Tech Know Learn*, vol. 24, pp. 41–63, March 2019. https://doi.org/10.1007/s10758-017-9310-7

[9] B. S. Fabito, A. O. Trillanes, and J. R. Sarmiento, "Barriers and challenges of computing students in an online learning environment: Insights from one private university in the Philippines," *International Journal of Computing Sciences Research*, vol. 5, no. 1, pp. 441–458, August 2020. https://doi.org/10.25147/ijcsr.2017.001.1.51

[10] G.T. Pawilen, "Preparing Philippine higher education institutions for flexible learning during the period of COVID-19 pandemic: Curricular and instructional adjustments, challenges, and issues," *International Journal of Curriculum and Instruction*, vol. 13, no. 3, pp. 2150–2166, 2021.

[11] E. Reyes-Chua, B. G. Sibbaluca, R. D. Miranda, G. B. Palmario, R. P. Moreno, and J. P. T. Solon, "The status of the implementation of the e-learning classroom in selected higher education institutions in Region IV-A amidst the COVID-19 crisis," *Journal of Critical Reviews*, vol. 7, pp. 254–258, 2020. https://doi.org/10.31838/jcr.07.11.41

[12] A. Faiqoh, and A. Ashadi. "EFL students' language attitudes toward virtual learning environment: A technology acceptance model," *Englisia: Journal of Language, Education, and Humanities*, vol. 10. no. 2, pp. 20–36, 2023. https://doi.org/10.22373/ej.v10i2.15178

[13] R. A. Karim and R. Mustapha. "The Malaysian higher education students' perceptions and acceptance toward mobile learning during the COVID-19 pandemic," in *Proc. 12th International Conference on*

Information Systems and Advanced Technologies 2022, vol. 624, 2023, Springer, Cham. https://doi.org/10.1007/978-3-031-25344-7_4
[14] A. R. F. Shafana and A. F. Musfira. "Students' opinion on the use of virtual learning environment: A case study from South Eastern University of Sri Lanka," in *Proc. 9th South Eastern University International Arts Research Symposium - 2020 Faculty of Arts and Culture*, South Eastern University of Sri Lanka 50 19th January 2021, ISBN: 978-955-627-253-6
[15] C. T. Mart ń, C. Acal, M. Homrani, and A. C. M. Estrad, "Impact on the virtual learning environment due to COVID-19," *Sustainability*, vol. 13, no. 2, pp. 1–16, 2021. https://doi.org/10.3390/su13020582
[16] K. H. Tan, P. P. Chan, and N.-E. M. Said, "Higher education students' online instruction perceptions: A quality virtual learning environment," *Sustainability*, vol. 13, no. 19, pp. 1–24, 2021. https://doi.org/10.3390/su131910840
[17] M. K. M. Nasir and A. H. Ngah, "The sustainability of a community of inquiry in online course satisfaction in virtual learning environments in higher education," *Sustainability*, vol. 14, no. 15, pp. 1–15, 2022. https://doi.org/10.3390/su14159633
[18] R. M. Nassr, A. A. Aldossary, and H. Nasir, "Students' intention to use emotion-aware virtual learning environment: Does a lecturer's interaction make a difference?" *Malaysian Journal of Learning and Instruction*, vol. 18, no. 1, pp. 183–218, 2021. https://doi.org/10.32890/mjli2021.18.1.8
[19] N. Li, X. Zhang, and M. Limniou, "A country's national culture affects virtual learning environment adoption in higher education: A systematic review (2001–2020)," *Interactive Learning Environments*, vol. 31, no. 7, pp. 4407–4425, 2023. https://doi.org/10.1080/10494820.2021.1967408
[20] O. E. Kurt and O. Tingoy, "The acceptance and use of a virtual learning environment in higher education: an empirical study in Turkey, and the UK," *International Journal of Educational Technology in Higher Education*, vol. 14, no. 26, October 2017. https://doi.org/10.1186/s41239-017-0064-z
[21] A. A. Ahmed, N. H. Zakaria, and A. H. Elmi, "An evaluation of virtual learning environment readiness in higher institutions (HEIs)," *Journal of Information Systems Research and Innovation*, vol. 2, pp. 86–94, 2012.
[22] B. Rienties, B. Giesbers, S. Lygo-Baker, H. W. S. Ma, and R. Rees, "Why some teachers easily learn to use a new virtual learning environment: a technology acceptance perspective," *Interactive Learning Environments*, vol. 24, no. 3, pp. 539–552, February 2014. https://doi.org/10.1080/10494820.2014.881394
[23] P. Sumak, M. Pusnik, M. Hericko, and A. Sorgo, "Differences between prospective, existing, and former users of interactive whiteboards on external factors affecting their adoption, usage, and abandonment," *Computers in Human Behavior*, 2016. https://doi.org/10.1016/j.chb.2016.09.006
[24] CAST. (2018). Universal design for learning guidelines version 2.2. [Online]. Available: http://udlguidelines.cast.org
[25] F.D. Davis, A Technology Acceptance Model for Empirically Testing New End-User Information Systems : Theory and Results, 1985.
[26] N. Marangunić and A. Granić, "Technology acceptance model: A literature review from 1986 to 2013," *Univ Access Inf Soc*, vol. 14, pp. 81–95, March 2015. https://doi.org/10.1007/s10209-014-0348-1
[27] M. Fishbein and I. Ajzen, *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Addison Wesley Publishing Company, 1975.
[28] F.D. Davis and V. Venkatesh, "A critical assessment of potential measurement biases in the technology acceptance model: Three experiments," *International Journal of Human-Computer Studies*, vol. 45, no. 1, pp. 19–45, 1996.
[29] M.Y. Chuttur, "Overview of the technology acceptance model: Origins, developments, and future directions," *Working Papers on Information Systems*, vol. 9, no. 37, 2009.
[30] P.A. Ertmer, "Teacher pedagogical beliefs: The final frontier in our quest for technology integration?" *Educational Technology Research and Development*, vol. 53, no. 4, December 2005. https://doi.org/10.1007/BF02504683
[31] S. Teri, A. Acai, D. Griffith, Q. Mahmoud, D. W. L. Ma, and G. Newton, "Student use and pedagogical impact of a mobile learning application," *Biochemistry and Molecular Biology Education*, vol. 42, no. 2, pp. 121–135, March/April 2014. https://doi.org/10.1002/bmb.20771
[32] M. C. Pujol, M. G. Badilla, and J. Riera, "Socio-pedagogical impact of an educational innovation project supported by ICT," *Aula Abierta*, vol. 40, no. 1, pp. 129–144, 2012.
[33] R. Agarwal and J. Prasad, "A conceptual and operational definition of personal innovativeness in the domain of information technology," *Information Systems Research*, vol. 9, no. 2, pp. 204–215, June 1998. https://doi.org/10.1287/isre.9.2.204
[34] E. M. Raaij, and J. J. L. Schepers, "The acceptance and use of a virtual learning environment in China," *Computers and Education*, vol. 50, no. 3, pp. 838–852, April 2008. https://doi.org/10.1016/j.compedu.2006.09.001
[35] J. Matute-Vallejo and I. Melero-Polo, "Understanding online business simulation games: The role of flow experience, perceived enjoyment and personal innovativeness," *Australasian Journal of Educational Technology*, vol. 35, no. 3, June 2019. https://doi.org/10.14742/ajet.3862
[36] S. Hao, V. P. Dennen, and L. Mei, "Influential factors for mobile learning acceptance among Chinese users," *Educational Technology Research and Development*, vol. 65, no. 1, pp. 101–123, February 2017. https://doi.org/10.1007/s11423-016-9465-2
[37] M. E. Civelek, *Essentials of Structural Equation Modeling*, Zea E-Books, 2018. https://doi.org/10.13014/K2SJ1HR5
[38] N. Kock and P. Handaya, "Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods," *Information Systems Journal*, vol. 28, no. 1, pp. 227–261, January 2018. https://doi.org/10.1111/isj.12131
[39] G. Ursachi, L. A. Horodnic, and A. Zait, "How reliable are measurement scales? External factors with indirect influence on reliability estimators," *Procedia Economics and Finance*, vol. 20, pp. 679–686, 2015. https://doi.org/10.1016/S2212-5671(15)00123-9
[40] J. F. Hair, J. J. Risher, M. Sarstedt, and C. M. Ringle, "When to use and how to report the results of PLS-SEM," *European Business Review*, vol. 31, no. 1, pp. 2–24, January 2019. https://doi.org/10.1108/EBR-11-2018-0203
[41] J. Benitez, J. Henseler, A. Castillo, and F. Schuberth, "How to perform and report an impactful analysis using partial least squares: Guidelines for confirmatory and explanatory IS research," *Information & Management*, vol. 57, no. 2, March 2020. https://doi.org/10.1016/j.im.2019.05.003
[42] M. A. Camilleri and C. A. Camilleri, "The students' acceptance and use of their university's virtual learning environment," in *Proc. the 2020 11th International Conference on E-Education, E-Business, E-Management, and E-Learning*, pp. 48–53, 2020. https://doi.org/10.1145/3377571.3377574
[43] J. Chahal and N. Rani, "Exploring the acceptance for e-learning among higher education students in India: combining technology acceptance model with external variables," *Journal of Computing in Higher Education*, vol. 34, 2022. https://doi.org/10.1007/s12528-022-09327-0
[44] J. S. Barrot, I. I. Llenares, and L. S. Rosario, "Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines," *Educ Inf Technol*, vol. 26, pp. 7321–7338, May 2021. https://doi.org/10.1007/s10639-021-10589-x
[45] H. Alshurafat, M. O. Al Shbail, W. M. Masadeh, F. Dahmash, and J. M. Al-Msiedeen, "Factors affecting online accounting education during the COVID-19 pandemic: an integrated perspective of social capital theory, the theory of reasoned action and the technology acceptance model," *Educ Inf Technol*, vol. 26, no. 6, pp. 6995–7013, 2021. https://doi.org/10.1007/s10639-021-10550-y
[46] A. S. Al-Adwan, N. Li, A. Al-Adwan, G. A. Abbasi, N. A. Albelbis, and A. Habibi, "Extending the Technology Acceptance Model (TAM) to predict university students' intentions to use metaverse-based learning platforms," *Education and Information Technologies*, 2023. https://doi.org/10.1007/s10639-023-11816-3
[47] C. Copeland and J. Franzese, "Using the technology acceptance model to understand attitudes about a virtual learning environment for EFL writing," T*he Korean Association of General Education*, vol. 15, no. 5, pp. 215–227, 2021. https://doi.org/10.46392/kjge.2021.15.5.215
[48] K. Gautam, D. Sharma, K. Wangpo, and S. Dema, "The acceptance and use of the virtual learning Environment (VLE) in higher education: A contextual study of Royal University of Bhutan," *Asian Research Journal of Arts & Social Sciences*, vol. 13, no. 3, pp. 20–36, 2021. https://doi.org/ 10.9734/ARJASS/2021/v13i330215
[49] T. Huang, "Factors affecting students' online courses learning behaviors," *Educ Inf Technol*, vol. 15, pp. 1–23, 2023. https://doi.org/ 10.1007/s10639-023-11882-7
[50] C. Larmuseau, M. Evens, J. Elen, W. V. Noortgate, P. Desmet, and F. Depaepe, "The relationship between acceptance, actual use of a virtual learning environment and performance: An ecological approach," *Journal of Computers in Education*, vol. 5, pp. 95–111, 2018. https://doi.org/10.1007/s40692-018-0098-9

[51] N. L. Pereira, A. D. Mendes, F. J. Spanhol, and G. M. Lunardi, "Good practices in virtual teaching and learning environments: A systematic literature review," *Educação em Revista*, vol. 35, 2019. https://doi.org/10.1590/0102-4698214739

[52] U. Pem, C. Dorji, S. Tshering, and R. Dorji, "Effectiveness of the virtual learning environment (VLE) for online teaching, learning, and assessment: Perspectives of academics and students of the Royal University of Bhutan," *International Journal of English Literature and Social Science*, vol. 6, no. 4, pp. 183–197, 2021. https://dx.doi.org/10.22161/ijels.64.30

[53] H. Jusuf, N. Ibrahim, and A. Suparman, "Development of virtual learning environment using Canvas to facilitate online learning at a covid-19 era," *Jurnal Teknologi Pendidikan*, vol. 23, no. 2, pp. 153–168, 2021. http://dx.doi.org/10.21009/JTP2001.6

[54] Abdullah Melissa Ng Lee Yen, "The influence of self-regulation processes on metacognition in a virtual learning environment," *Educational Studies*, 2018. https://doi.org/10.1080/03055698.2018.1516628

[55] D. Tuffley and A. Antonio, "Enhancing educational opportunities with computer-mediated assessment feedback," *Future Internet*, vol. 7, no. 3, pp. 294–306, 2015. https://doi.org/10.3390/fi7030294