Technology Adoption in Graduate Education: Basis for Faculty Development Plan

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Abstract
With the rapid growth of the technological environment and the current COVID-19 epidemic, the way we interact and conduct business has undergone significant changes. Graduate education institutions are not exempted from these changes, as administrators and faculty are under pressure to research and implement new learning approaches in order to ensure the continuation of service delivery. With this in mind, there is a need to build and strengthen faculty capacities in technology use. Given this, the study was undertaken to determine the technology adoption of the graduate school faculty of St. Paul University Quezon City utilizing its Learning Management Systems. By using the Technology Acceptance Model as its framework, the findings reveal that the perceived ease of use and usefulness of the University's online learning management systems are impacted by the series of training organized and conducted by the Graduate School department, as well as the necessity to adapt due to the current circumstance. Furthermore, findings suggest that professors' positive views about the utilization of learning management systems are important if the University's graduate education is to successfully transition from the traditional approach to online learning. This emphasizes that teachers are critical stakeholders in education, and their views about adopting online learning have a big effect on students' perspectives and motivation about online learning. Results of the study served as bases for the faculty development plan of the Graduate School Department.

Keywords: Technology Adoption, Learning Management Systems, Perceived Usefulness, Perceived Ease of Use, Intention to Continue, Attitude Toward Using

Introduction

With the rapid growth of the technological environment and the current COVID-19 epidemic, the way we interact and conduct business has undergone significant changes. Graduate education institutions are not exempted to these changes, as administrators and faculty are under pressure to research and implement new learning approaches in order to ensure the continuation of service delivery. With this in mind, there is a need to build and strengthen faculty capacities in technology use.

In order to address the gaps in faculty knowledge, skills, and competencies, faculty development plan in graduate education is regarded important in light of the rising demand for online learning, which is expected to be a part of the "new normal." This effort is being made to equip the faculty, assuring that they will be able to fulfill the future needs and requirements of the post COVID-19 teaching-learning environment. Graduate education administration, on the other hand, must strengthen their hardware and software infrastructures in order to rebuild their present learning environments. Graduate Education Institutions that are fast and adaptable to these changes have a better chance of survival and are more likely to prosper in the future education environment.

Related Literature

The global impact of COVID-19 pandemic will unquestionably bring huge shifts in the education sector. Accompanying these anticipated shifts will be the changing role of the faculty. This role will undoubtedly evolve from being the sole source of knowledge in the confines of the four walls of classroom into a facilitator, a collaborator, and an enabler of learning utilizing plethora of online technologies. In view of this, universities need to make an investment in training their faculty.

The need for faculty capacity building and training cannot be underestimated due to the disruptive innovations brought by technology and due to the skills demanded by the business industry from the graduates.

Given these considerations, graduate faculty must learn new methods of teaching that are digital, technology-based, and utilize virtual space, unlearn processes that they have grown accustomed to and have become less effective, and relearn their roles (Zmuda, et.al, 2020)as teachers in educating Generation Alpha, the newest generation of students who are perfectly comfortable with virtual connections but do not necessarily perform well with physical human interactions.

Training Needs and Capacity Building

The conduct of training needs analysis is undeniably a requisite in carrying out an effective and relevant training program. According to Guevara and Nuqui (2016), training and growth are essential in every organization that aspires to advance. They play crucial roles in the performance of a company and its personnel. These two are critical in faculty professional development, with the former focusing on teaching instructors particular skills to improve their performance and the latter encompasses a more expansive scope and focuses on faculty's future performance.

Literature indicates that training needs analysis in education has been neglected during the previous decade. According to Moeini (2008), for many years, teachers were supposed to figure out how to improve their teaching on their own, via trial and error, and by pursuing the appropriate professional development on their own. He further stated that given the changing environment of higher education, this form of trial and error training of professors is no longer acceptable.

Technology Acceptance and Adoption

The COVID-19 health crisis has exposed vulnerabilities in the economic, social, technological aspects of the Philippine education system. With the dramatic surge in demand for online learning, most graduate education institutions were caught off guard and had to turn to online learning with faculty members struggling to learn the new technology. This current situation has depicted a glaring technology skills gap among faculty. The current situation which nobody imagined has forever changed the landscape of education characterized by new ways of learning, demanding new ways of teaching.

Information and technology literacy are among the skills demanded in the 21st century. For teachers, these constitute technology acceptance, integration and adoption. For the longest time, educational institutions have been staunchly resistant to altering their long-established and time-honored structure, methods, and practices. For decades, instructors have insisted on the traditional style of teaching, claiming that it is the only way to teach and learn, until the global crisis forced educational institutions to reconsider their approaches. Educational institutions are now realizing that they must make budget modifications that prioritize infrastructural and instructional issues/concerns. According to Ensign et al. (2007), as referenced by O'reilly (2016), the dilemma of giving instructors with access to technology but then having a poor adoption is well-known. This is supported by the findings of Arinto (2016) citing that "*there is a persistence of traditional modes of teaching and, in some cases, outright resistance to educational innovation".* Such resistance can be brought by faculty preparedness. Markauskaite and Goodyear (2009) discovered evidence that "there is a requirement for and difficulty in combining pedagogical frames and ICT tools with the other knowledge frames required to develop productive learning activities for teaching specific discipline knowledge. The research also identifies a shift from a teacher-focused technique to a learner-centered one as a barrier to successful technology integration. Teachers are finding it challenging to convert their traditional classroom environment to online learning in one way or another. Arinto (2016) expands on Daly and Pachler (2007), emphasizing that the use of online distant education/learning necessitates a shift in teachers' pedagogical attitude and techniques.

Given the foregoing discussions, this research was conducted to (1) determine the perceived usefulness and ease of use of the learning management of the University; (2) determine the attitude of graduate school faculty toward the utilization of the University's LMS; (3) determine the respondents' continuance intention; (4) find out the major obstacles that faculty consider in making effective use of technology in and outside the classroom; and (5) design a faculty development plan.

Theoretical Framework

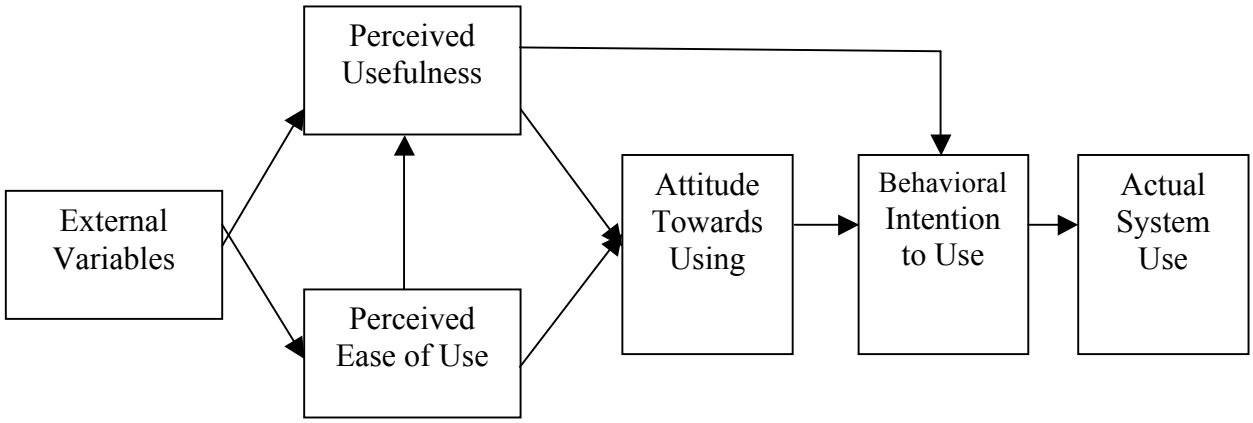

Figure 1. Technology Acceptance Model (TAM) by Davies, et.al (1989)

The Technology Acceptance Model was initially developed by Davis, et.al (1989) to provide an explanation of the determinants human computer usage behavior. This is practically an extension of the theory of reasoned behavior of Fishbein and Ajzen (1975). TAM considers that the person's individual intention to use the technology depends on how useful the technology is to the user and how easily it can be used in terms of functionality. Further, Davis (1989) as cited by Alenezi,et.al (2011) believed that the usefulness of the technology is directly proportional to the ease of use. Perceived usefulness is also seen as being directly impacted by perceived ease of use (Alenezi, et.al,2011).

Method

The quantitative technique was used in the study, adapting certain sections of O'reily (2016) survey instrument. It is a self-evaluation survey with numerical skill ratings. The following areas were evaluated for the purpose of this research: (1) perceived usefulness of the University's LMS; (2) perceived ease of use of the University's LMS; (3) respondents' behavior toward using; (4) respondents' continuance intention and (5) perceived obstacles/barriers to effectively adopting technology. The responders are the graduate school professors from St. Paul University City, school year 2020-2021.

Findings

The purpose of this research was to gauge graduate school faculty opinions on the perceived usefulness, perceived ease of use, attitude toward utilizing, and intention to continue using the University's learning management systems. The study's conclusions will be one of the foundations for developing a faculty development plan.

Perceived Usefulness	**x**	**sd**
Using the OPEN LMS in my class helps me to control the pedagogy	3.67	0.50
Using MSTEAMS in my class helps me to control the pedagogy	3.44	0.53
Using the OPEN LMS in my class enhances my teaching performance	3.56	0.53
Using MSTEAMS in my class enhances my teaching performance	3.56	0.73
I find the use of OPEN LMS in my class useful	3.56	0.53
I find the use of MSTEAMS in my class useful	3.56	0.53

Using the OPEN LMS makes it easier to monitor the student's needs	3.22	0.83
Using the MSTEAMS makes it easier to monitor the student's needs	3.22	0.67
Average weighted mean	**3.47**	

Table 1: Perceived Usefulness of Learning Management Systems

The Technology Adoption Model of Davis (1989) is one of the most important models of technology acceptance, with two major variables influencing an individual's behavior to accept new technology: perceived usefulness and perceived ease of usage. In The usage of the Technology Acceptance Model (TAM) among the respondents in this study demonstrated a significant agreement on the perceived usefulness of the OPEN LMS utilized by the University, as shown by the data in table 1 with an average weighted mean of 3.47. When the standard deviation of each item is closely examined, which ranges from 0.50 to 0.83, it is clear that respondents' responses are comparable, suggesting that respondents have a similar perception of the utility of the University's learning management systems, which can be attributed to the same reference point, which is the COVID-19 pandemic.

COVID-19 has caused school closures all around the world. As a result, education has altered drastically, with the notable emergence of online learning, in which instruction is done remotely and on digital platforms. Given this, graduate school institutions together with their faculty are duty-bound to enhance their online learning management systems and skills to enable continuation of service delivery in the absence of actual face-to-face sessions. Respondents' high agreement on the perceived usefulness of the LMS given the present circumstance connotes that the use of information technology in education will increase further, and online education is now an important and essential component of classroom instruction.

Perceived Ease of Use	**x**	**sd**
It is easy to become skillful at using OPEN LMS	3.22	0.83
It is easy to become skillful at using MSTEAMS	3.33	0.71
The features of OPEN LMS are easy to use	3.22	0.67
The features of MSTEAMS are easy to use	3.44	0.53
Using OPEN LMS is more flexible than traditional face to face teaching	3.44	0.53
Using MSTEAMS is more flexible than traditional face to face teaching	3.33	0.50
OPEN LMS is understandable and easy to navigate	3.33	0.71
MS TEAMS is understandable and easy to navigate	3.44	0.53
Average weighted mean	**3.34**	

Table 2: Perceived Ease of Use of Learning Management Systems

In terms of the second TAM variable, **perceived ease of use**, the respondents perceived the ease of use of the learning management systems to be very high. This suggests that the respondents rate the use of OPEN LMS as friendly and easy to navigate. Such finding can be attributed to the recent efforts of the department to intensifying the use of its OPEN LMS prior to the COVID-19 outbreak, which included intensive training for all staff on online courses, as well as preparing and developing instructional materials before their formal deployment to students. This further illustrates the importance of training and capacity building of faculty. Several studies have revealed that ICT-related training programs, whether beginner or experienced, develop teachers' competences in computer use (Bauer & Kenton, 2005; Franklin, 2007; Wozney et al., 2006), influence teachers' attitudes toward computers (Hew and Brush, 2007; Keengwe and Onchwari, 2008), and assist teachers in reorganizing the task of technology and how new technology tools are used. In a study conducted by

Lawless and Pellegrino (2007), findings reveal that if a training program is of high quality, educators are eagerly involved in important context activities, teamwork among colleagues is improved, and there is a clear vision for student achievement. But the perceived ease of use for technology is not limited to its physical interface though. In cognitive psychology, for example, the Information Processing Model of Cognition serves as a foundation for interface design. According to Gary (nd) this model demonstrates that: (1) humans have a working memory restricted to five to seven "chunks" of knowledge; (2) people need to refresh their attention often; and (3) recalling information needs more cognitive effort than recognizing information. Menus, query-by-example, and direct manipulation are examples of computer interface styles that adhere to this concept. Menus are preferred over command languages by novices and casual users since identifying a suitable selection is easier than memorizing a command. Because they share the "burden" between physical and cognitive effort, direct manipulation interfaces (such as touch panels in information kiosks or input devices and visual displays in most video games) circumvent numerous psychological constraints. Furthermore, their rapid feedback and reversibility encourage user discovery.

Attitude Toward Using Technology	**x**	**sd**
Using OPEN LMS in class is a good alternative to traditional face to face teaching	3.67	0.50
Using MSTEAMS in class is a good alternative to traditional face to face teaching	3.78	0.44
Using MSTEAMS in class is favorable	3.56	0.53
Using OPEN LMS in class is favorable	3.22	0.83
I think it is valuable to use OPEN LMS in class	3.44	0.73
I think it is valuable to use MSTEAMS in class	3.56	0.73
I think asynchronous online learning is needed for the future of education	3.89	0.33
I think synchronous online learning is needed for the future of education	3.67	0.50
Average weighted mean	**3.60**	

Table 3: Attitude toward Using Technology

Generally, the respondents hold a very positive view in using technology in their teaching with an average weighted mean of 3.60. With more than 1 year of delivering online learning, the very high agreement and the consistency **(sd)** in the answers of the respondents show that they have already adjusted to the new modality. Given the current circumstance where health and safety are at risk, respondents believe that while contemporary modalities may not be completely equivalent to conventional settings, they do give an alternate method of maintaining educational continuity.

Numerous literatures confirm that teachers' attitudes toward using technology are crucial in the effective implementation of any learning program. According to Teo (2009) and Venkatesh, et.al (2003) as cited by Kisanga (2016), there are two types of variables that influence teachers' attitudes toward technology namely internal and external variables. Internal variables include instructors' internal beliefs about technology, which are formed by the degree to which instructors evaluate the technology favorably or unfavorably, while external variables include subjective norms (Ajzen & Fishbein, 1980), organizational structure (Rogers, 2003), technical factors such as technology complexity (Rogers, 2003; Weller, 2007), and environmental factors such as ICT infrastructure, ICT features and support and many more (Chien, Wu, & Hsu, 2014; Teo, 2009).

Continuance Intention	x	sd
I intend to learn the other features of OPEN LMS	3.78	0.44
I intend to learn the other features of MSTEAMS	3.78	0.44
I intend to provide variety of assessments using the different learning activities in OPEN LMS	3.75	0.46
I intend to provide variety of activities using the different learning activities in MSTEAMS	3.67	0.5
I intend to continue using OPEN LMS to supplement my synchronous teaching	3.67	0.5
I intend to continue using MSTEAMS to supplement the asynchronous online learning of my students	3.67	0.5
I intend to attend trainings and workshops in OPEN LMS	3.67	0.5
I Intend to attend trainings and workshops in MSTEAMS	3.67	0.5
Average weighted mean	**3.71**	0.5

Table 4: Continuance Intention

The results in table 4 demonstrate that respondents are **very likely to continue** using the University's learning management systems, with an average weighted mean of 3.71. This is further confirmed by the consistency in their responses, with standard deviations ranging from 0.44-0.50. The respondents' intention to stay is linked to their attitude toward adopting learning management systems, which also indicated a very high level of agreement among respondents. This finding is backed by a large body of literature. For instance, according to Davis (1989), as quoted by Teo (2019), a behavior's intention to use is determined by one's attitude toward computer/technology usage. He goes on to argue that if users have a favorable attitude about computer use, they will create the intention to act consistently (Teo, 2019). This was verified in a study done by Yi and Hwang (2003), who discovered that when users have a strong desire to utilize university resources for teaching and learning, they visit university websites more frequently and stay longer than those with weak intentions. Furthermore, perceived usefulness was discovered to predict behavioral intention. Davis as cited again by Teo (2019) also proposed that when consumers considered technology to be beneficial, it would have a direct impact on intention to use technology.

Barriers to Technology Integration

Among the **major obstacles/barriers** that graduate school faculty consider in making effective use of technology inside and outside the classroom are the unpredictability of computers (can easily crash and lose data), an unstable wifi connection inside the classrooms and an Internet connection that is slow or drops connection.

Conclusions

There has been a greater reliance on digital-online technologies during the Covid-19 epidemic. People all across the globe rely significantly on internet platforms to connect, transact, and learn. Similarly, the educational system relies on internet technologies to conduct teaching.

In this study, the perceived ease of use and usefulness of the University's online learning system are impacted by trainings organized and conducted by the Graduate School department, as well as the necessity to adapt due to the current circumstances.

The study's findings suggest that professors' positive views about the utilization of learning management systems are important if the University's graduate education is to successfully transition from the traditional approach to online learning. This emphasizes that teachers are critical stakeholders in education, and their views about adopting online learning have a big effect on students' perspective and motivation about online learning.

Lastly, the study's conclusions on the impediments to technology integration differ dramatically from those mentioned in the literature. Unlike those in the literature, which included both internal and extrinsic barriers, as analyzed by Maguire et.al (2007), the data obtained from the results of this study focused on infrastructural barriers, namely the reliability of internet connections for both faculty and students. This can be ascribed to the location of the research. Unlike previous studies that were conducted in first-world countries where connectivity was not an issue, the current one was being conducted in a third-world country that is said to be the second slowest in internet speed among the 10-member Association of Southeast Asian Nations (ASEAN), and 110th among 139 countries (Porcalla, 2020). However, despite the reservations about the country's sluggish internet connection in general, respondents were fast to adopt and adapt.

Recommendations

In the light of the findings obtained from the study, the following recommendations are given.

- Comprehensive technology integration and faculty development plans to improve graduate school faculty capacities are highly suggested. These include but not limited to the following:
    a. Structured opportunities for in-service retraining, upgrading, and acquiring new information and skills, such as school-based workshops and trainings;
    b. Needs-based just-in-time learning and peer coaching to ensure further development of teachers' ICT and pedagogical skills (ILO-UNESCO-World Bank,2020).
- A comprehensive ICT development which include procurement of needed infrastructure is necessary to sustain the technology initiatives of the institution;
- Up skilling of current technical support personnel is vital in providing effective onsite or remote assistance to faculty and students;
- An establishment of an educational technology office/unit is necessary to cater to the evolving needs of faculty and students as well.
- A follow up research is needed to determine improvement in the technology integration skills, usage and application of faculty.

References

Alenezi,A.,Karim,A.,& Veloo,A. (2011). **Institutional Support and E-Learning Acceptance: An Extension of the Technology Acceptance Model**. Retrieved, http://www.itdl.org/Journal/Feb_11/article01.htm on May 20, 2020.

Arinto,P.(2016). Issues and Challenges in Open and Distance e-Learning: Perspectives from the Philippines. **International Review of Research in Open and Distributed Learning**,17(2),163-180. Retrieved, https://files.eric.ed.gov/fulltext/EJ1093775.pdf on May 20, 2020.

Bauer, J., & Kenton, J. (2005). Toward technology integration in the schools: Why it isn't happening. **Journal of Technology and Teacher Education**, vol. 13, no. 4,pp. 519–546.

Charness,N.,Boot,W.(2016).Technology, Gaming, and Social Networking.Handbook of the Psychology of Aging.Elsevier Inc.

Chien, S-P., Wu, H-K., & Hsu, Y-S. (2014). An investigation of teachers' beliefs and their use of technology-based assessments. Computers in Human Behaviour, 31, 198-210.

Daly,C., & Pachler,N.(2007).**Learning with others in mind**. In J. Pickering,C. Daly, & N. Pachler(Eds.),New designs for teachers' professional learning.London, UK: Institute of Education.

Davis, F. D. (1989). **Perceived usefulness, perceived ease of use, and user acceptance of information technology**. MIS Quarterly, 13(3), 319-340.

Ensign, J., McAloon, P. Walker, G. & Wright, M. 2007. "2007 **U.S. language summits: Ohio language roadmap for the 21st century"**, The Language Flagship.Retrieved, https://www.thelanguageflagship.org/media/docs/roadmaps/Ohio_language_roadmap.pdf on May 20, 2020.

Fishbein, M., & Ajzen, I. (1975). **Belief, attitude, intention, and behavior: An introduction to theory and research**. Reading, Mass; Don Mills, Ontario: Addison-Wesley Pub. Co.

Franklin, C. (2007). **Factors that influence elementary teachers use of computers**. Journal of Technology and Teacher Education, vol. 15, no. 2, pp. 267–293.

Guevara,I., & Nuqui,A. (2016). **LCUP Administrators and Teachers Training Needs Assessment:Basis for Developing a Faculty Development Program**. Retrieved, http://manuscript.advancejournals.org/uploads/022ba167856333c99e7d16a9d617aca9e8e08062593ab8f6249c7b7f6d1b4036/Manuscript/5517.pdf on May 15, 2020.

Gary,M.(nd). **Psychological Dimensions of User Computer Interface**. ERIC Clearinghouse on Information Resources Syracuse NY.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. Educational Technology Research and Development, vol. 55, pp. 223-253.

ILO-UNESCO-World Bank (2020). Skills development in the time of COVID-19: Taking stock of the initial responses in technical and vocational education and training. Retrieved, https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---ifp_skills/documents/publication/wcms_766557.pdf on July 15, 2021.

Keengwe, J., & Onchwari, G. (2008). Computer technology integration and student learning: Barriers and promise, Journal of Science Education and Technology, vol. 17, pp. 560–565.

Kisanga, D. H., & Ireson, G. (2016). Test of e-Learning Related Attitudes (TeLRA) scale: Development, reliability and validity study. International Journal of Education and Development using Information and Communication Technology (IJEDICT)12(1), 20-36.

Lawless, K., & Pellegrino, J. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns and ways to pursue better questions and answers. **Review of Educational Research**, vol. 77, no. 4, pp. 575-614.

Maguire, S., Koh,S.C.L., and Magrys,A. (2007). The adoption of e-business and knowledge management in SMEs**. An International Journal**., 14: 37-58.

Markauskaie,L & Goodyear,P.(2009). **Designing for complex ICT-based learning:Understanding teacher thinking to help improve educational design**. Paper presented at the 26th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE), Auckand, Australia.

Moeini, H. (2008). **Identifying Needs: A Missing Part in Teacher Training Programs**.Retrieved,https://www.researchgate.net/publication/26628276_Identifying_Needs_A_Missing_ Part_in_Teacher_Training_Programs/references on May 20, 2020.

O'Reilly,E. (2016). Developing technology needs assessments for educational. International **Journal of Education and Development using Information and Communication Technology** (IJEDICT),12(1) pp. 129-143.

Porcalla,D. (2020, December 28).Philippines internet 'second slowest' in ASEAN, ranks 110th worldwide.*Philippine Star Global*. Retrieved,https://www.philstar.com/headlines/ 2020/12/28/2066612/philippines-internet-second-slowest-asean-ranks-110th-worldwide on September 30, 2021.

Rogers, E.M. (2003). Diffusion of innovations. New York: Free Pres

Sen,D. (2019). **5 Easy Steps To Conduct Training Needs Analysis**.Retrieved, https://elearningindustry.com/training-needs-analysis-easy-steps-conduct on May 15,2020.

Teo,T. (2019). Students and Teachers' Intention to Use Technology: Assessing Their Measurement Equivalence and Structural Invariance. **Journal of Educational Computing Research**, Vol. 57(1) 201–225. DOI: 10.1177/0735633117749430.

Vatanartiran,S. & Karadeniz,S. (2015). A Needs Analysis for Technology Integration Plan: Challenges and Needs of Teachers. **Contemporary Educational Technology**, 6(3), 206-220.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.

Weller, M. (2007). Virtual learning environments: Using, choosing and developing your VLE. London: Routledge Taylor and Francis Group.

Wozney, L., Venkatesh, V., & Abrami, P.C. (2006). Implementing computer technologies: Teachers' perceptions and practices. Journal of Technology and teacher education, vol. 14, no.1, pp. 173-207.

Yi, M. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: Self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. **International Journal of Human-Computer Studies**, 59(4), 431–449.

Zmuda,A., Alcock,M.,& Fisher,M.(2020). Meet Generation Alpha: Teaching the Newest Generation of Students.,Retrieved, https://www.learningpersonalized.com/meet-generation-alpha-teaching-the-newest-generation-of-students/

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