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Technology Acceptance Model in using E-learning on Early Childhood Teacher Education Program's student during pandemic

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Abstract

During the COVID-19 pandemic many education institutions implement e-learning as a replacement of traditional face to face teaching and learning activities. This situation forced students and teachers to adapt to the new normal of teaching and learning activity. This study aimed to examine the determinant factors of behavioral intention of using e-learning associated with the Technology Acceptance Model (TAM) for early childhood teacher education students. The factors included in the model are perceived ease of use, perceived usefulness, attitude, behavioral intention, self-efficacy, subjective norm, and system accessibility. Partial Least Square-Structural Equation Model (PLS-SEM) technique was employed with SmartPLS as a computational software. Using samples students in Early Childhood Teacher Education Program in Muhammadiyah University of Jember – Indonesia, this study result that perceived usefulness affects behavioral intention directly while self-efficacy affect behavioral intention directly and indirectly through perceived usefulness.

Keywords: *technology acceptance model; behavioral intention; e-learning; partial least square-structural equation model*

Abstrak

Selama pandemi Covid-19 banyak lembaga pendidikan yang menerapkan e-learning sebagai pengganti kegiatan belajar mengajar tatap muka tradisional. Situasi ini memaksa siswa dan guru untuk beradaptasi dengan normal baru pada kegiatan belajar-mengajar. Penelitian ini bertujuan untuk menguji faktor-faktor yang mempengaruhi *intensi perilaku* dalam menggunakan e-learning yang berhubungan dengan Technology Acceptance Model (TAM) khususnya pada mahasiswa PGPAUD. Faktor yang termasuk dalam model adalah persepsi kemudahan penggunaan, persepsi kegunaan, sikap, intensi perilaku, efikasi diri, norma subjektif, dan aksesibilitas sistem. Teknik Partial Least Square-Structural Equation Model (PLS-SEM) digunakan dalam penelitian ini dengan SmartPLS sebagai perangkat lunak komputasinya. Dengan menggunakan sampel mahasiswa yang belajar di PGPAUD Universitas Muhammadiyah Jember Indonesia, hasil penelitian ini menunjukkan bahwa *perceived usefulness* mempengaruhi *behavioral intention* secara langsung sedangkan *self-efficacy* mempengaruhi *behavioral intention* baik secara langsung dan tidak langsung melalui *perceived usefulness*.

Kata Kunci: *model penerimaan teknologi; intensi perilaku; e-learning; model persamaan struktural-kuadrat terkecil parsial.*

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INTRODUCTION

At the end of 2019 until mid-2020, severe cases of pneumonia-like disease caused by a novel coronavirus firstly detected in Wuhan city – China and spread all over the world coded as Covid-19 pandemic. Many countries do the lockdown policy, so that many education institutions like schools and universities are one of the most impacted sectors as a consequence of that policy. The government of Indonesia closed all schools and universities in all regions. As a replacement, school and universities have a mandate to conduct e-learning during the lockdown period, to maintain academic continuity and minimizing infection and morbidity. This situation led to drastically change the perspective and action in educational activity, especially the usage of technology for teaching and learning. Massive amounts of people are forced to accept technology as a part of the educational system where many years recently e-learning was mostly involuntary settings, even though a recent trend shows that more e-learning systems are provided by higher education institutions.

This situation creates various kinds of obstacles both for lecturers and students. In terms of lecturers, not all lecturers can use effective e-learning process. This creates pressure for both the lecturers and students. This can be seen from the results of preliminary interviews conducted with students. SF, one of the students from a Muhammadiyah University of Jember – Indonesia, stated that the online learning process they have experienced with their lecturers varies greatly in their method of teaching. Some choose to use video conferencing and teach as usual in class. Some use project-based and provide material with assignments on Google classes or Canvas. Some only use WhatsApp in the class group to give assignments without any material given. This variation also shows that there are no fixed standards in online learning at universities. Lecturers can give lectures according to their abilities and comfort. This makes the students felt that the learning process is less effective.

From the student's point of view, some complained that online learning is very complicated because they have never used it before. Some of them complained about the facilities and infrastructure provided. Online learning, primarily using video conferencing, consumes a large amount of data for the internet. This was complained by students considering the price of data packages that are not cheap. Besides, some students live in rural areas that are not reached by adequate signals so the effectiveness of using video conferencing is lacking. The disturbed connectivity makes both the display of sound and video disturbed as well. They are unable to capture the material given by the lecturer effectively. Presentations made by students were also disrupted because sometimes they were constrained by signals and the ability to operate applications for the video conference.

The University has provided data quota assistance by working with one of the internet providers in Indonesia for online teaching and learning activities. Nevertheless, students still complain about online learning, especially in terms of signal availability and the ineffectiveness of online teaching methods.

Aside from the aspect of the video conferencing method, students also complained that online learning made the lecturer give them a lot of assignments beyond the tasks given when they did not do online learning. These tasks make them feel that online learning is difficult to be done.

Early childhood education teachers are the first liner facing the newest digital native generation, asides from parents. The changing behavior towards e-learning and the integrated technology learning system continues to grow, along with the growth of digital native generations, even though without the pandemic. The pandemic situation forcing them more to adapt to the condition to use technology as a learning and teaching medium. However, the students here are in-service teachers and pre-service teachers facing (or will face) children in educational contexts. Research evaluating of effectiveness of online learning is so varied. Some are showing that it was effective (Ismawati & Prasetyo, 2020) and the others were less effective (Nurdin & Anhusadar, 2020). Hence, the evaluation of Early

Childhood Teacher Education programs' students' acceptance towards technology for learning and teaching need to be conducted.

Teacher's technology integration is affected by their beliefs in the technology being used (Kim, Kim, Lee, Spector, & DeMeester, 2013). Researchers have built models to make an explanation about attitude and behavior of technology usage known as Technology Acceptance Model/TAM (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 2000). Introduced and developed by Davis (1989), Technology Acceptance Model (TAM) was specifically designed to predict computer usage behavior. Nowadays, TAM is widely used and tested technology acceptance research-related and has been validated (Adams, Nelson, & Todd, 1992; Davis et al., 1989; Teo, Lee, Chai, & Wong, 2009; Venkatesh & Davis, 2000) across genders (Padilla-Meléndez, Del Aguila-Obra, & Garrido-Moreno, 2013; Yuen & Ma, 2004), cultures (Straub, Keil, & Brenner, 1997; Teo et al., 2009), and learning scenario (Padilla-Meléndez et al., 2013).

Performing TAM in educational research in a normal situation was conducted by several researchers (Al-Adwan, Al-Adwan, & Smedley, 2013; Alharbi & Drew, 2014; Holden & Rada, 2011; Park, 2009; Teo et al., 2009). Survey research has been conducted to examine the potential effect of the pandemic situation towards attitude and behavior (Van, McLaws, Crimmins, MacIntyre, & Seale, 2010). However, study about TAM in the educational setting during pandemic situation need to be conducted for giving a better explanation of technology acceptance in a pandemic situation. The research was mainly focused to assess technology acceptance among early childhood teacher education program's students in Muhammadiyah University of Jember, Indonesia.

This study intended to determine the relationship between variables in the theoretical technology acceptance model (TAM) theoretical framework. The main objective of this study is to explore the determinant factors that influence behavioral intention to use e-learning based on TAM factors tested on of Early Childhood Teacher Education programs' students. This study conducted during a pandemic situation where learning activities are forced to be conducted online (e-learning). This research is expected to providing additional better information to education managers in the better implementation and service of e-learning during the pandemic.

METHOD

The survey questionnaires were administered to all early childhood teacher education program in a Muhammadiyah University of Jember – Indonesia. The total amount of students is 79 people. Participants who give feedback responses in this study consist of 67 females. There is no single male in this program because, in Indonesia, early childhood education is considered as occupation specialized for women. During the COVID-19 pandemic, all learning activity held by university changed into e-learning. The participants have pass several series of online lectures. They do both synchronous and non-synchronous e-learning. The data collected using online questionnaires by Google Form. Close-ended questionnaires employed to obtain data for the main analysis in this study and some open-ended questionnaires for additional information which are more likely to be used for managerial decisions

The questionnaires consist of 16 statements represent 16 indicators (observed variable) from 6 constructs (latent variable). Five-point Likert scale is used to measure each item, ranging from 1 - strongly disagree to 5 – strongly agree. A few modifications to the questionnaire items are conducted by the researcher to gain a better fit in e-learning behavioral intention during the pandemic situation context. This study removing 1 subjective norm (SN) item which is "I like using e-learning based on the similarity of my values and social values underlying its use (N2)" in Park (2009) proposed questionnaires because this question is not relevant in this study. After all, using e-learning is mandatory in a pandemic situation. The researcher also modifies 2 statements (A1 and B2) in Park's (2009)

items become as stated in table 3, so that it fit with the context of learning in pandemic situation.

This study employs a modified Technology Acceptance Model (TAM) for the better fit in an educational context (Park, 2009), rather than classical TAM proposed by Davis (1989). So, this study use TAM with 7 constructs and each constructs has its indicators. The difference between the two models is the exogenous construct, where Park (2009) incorporates 3 additional constructs namely self-efficacy (SE), subjective norm (SN), and system accessibility (SA) as an explanatory of external factors in Davis (1989) model which only consist of 5 constructs, namely perceived ease of use (PE), perceived usefulness (PU), attitude (AT), Behavioral Intention (BI), and external factors.

Each construct has its own indicators that reflect the construct itself, so that they have to surpass validity and reliability test before hypothesis test. The construct and indicators details shown at table 2. The model of analysis in figure 1 show the relationship of each construct and its own indicators. It can be seen that all the constructs are going to behavioral intention construct, so the final purpose of this analysis is to explore determinant factors of behavioral intention towards technology usage. Perceived ease of use (PE), perceived usefulness (PU), and attitude (AT) are variables in the middle of the stream. They can be have a direct effect to behavioral intention (BI) or becoming mediating variable for exogenous variable. The exogenous variables are the variable that only have one role, which is independent variable, namely self-efficacy (SE), subjective norm (SN), and system accessibility (SA).
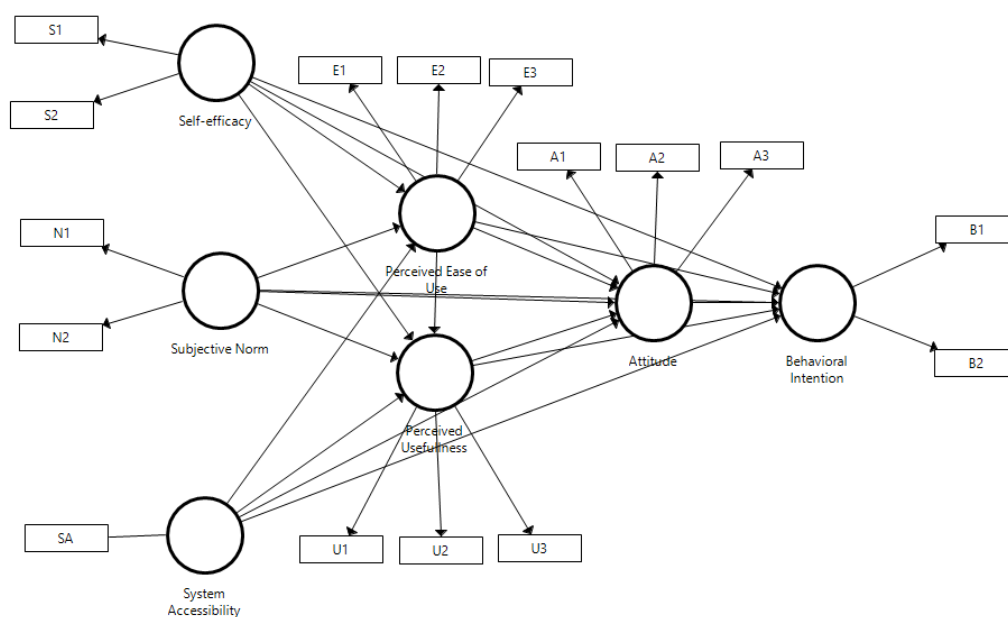

Figure 1. Model Analysis of Technology Acceptance Model (TAM) Towards Behavioral Intention

This study incorporates structural equation modeling (SEM) statistical analysis to explain the relationship between variables in the model which contain constructs (latent variable) and indicators (observed variable). Normally, 200 observation is the minimum appropriate sample size for SEM analysis, but this study consists of only 67 samples or observation. So, this study employs Partial Least Square based SEM (PLS-SEM) using SmartPLS (v3.2.9) software package.

PLS path modeling firstly developed by (Wold, 1982). PLS calculation is a series of regressions analysis on their weight vectors (Henseler, Ringle, & Sarstedt, 2012). The weight vectors acquired at convergence satisfy exact point equations (Djikstra, 2010). PLS for latent variables later developed by (Lohmöller, 1989) and widely known as PLS-SEM. PLS-SEM can be employed when sample size relatively small or the data are in non-normally distributed

and the primary objective of the research is predicting or identifying the main key construct (Hair, Hult, Ringle, & Sarstedt, 2017)

PLS-SEM statistical procedure using SmartPLS (v3.2.9) providing pre-hypothesis testing analysis i.e. descriptive statistics, test for reliability of measurement, multicollinearity test, and R-square. This software package also provides hypothesis testing including direct effect, indirect effect, and total effect.

RESULT AND DISCUSSION

The result of data collection process shown that the total amount of students is 79 people. Participants who give feedback responses in this study consist of 67 females. There is no single male in this program because, in Indonesia, early childhood education is considered as occupation specialized for women. 36 of participant were aged 16-22 years old, and the rest are above with 6 of them were over 35 years old. 21 participant are normal students with 0 years of teaching experience, and the rest 46 of the participant are real in-service teacher with teaching experiences ranged from 1 year up to more than 9 years. The details of participant demographic information are shown in Figure 2.
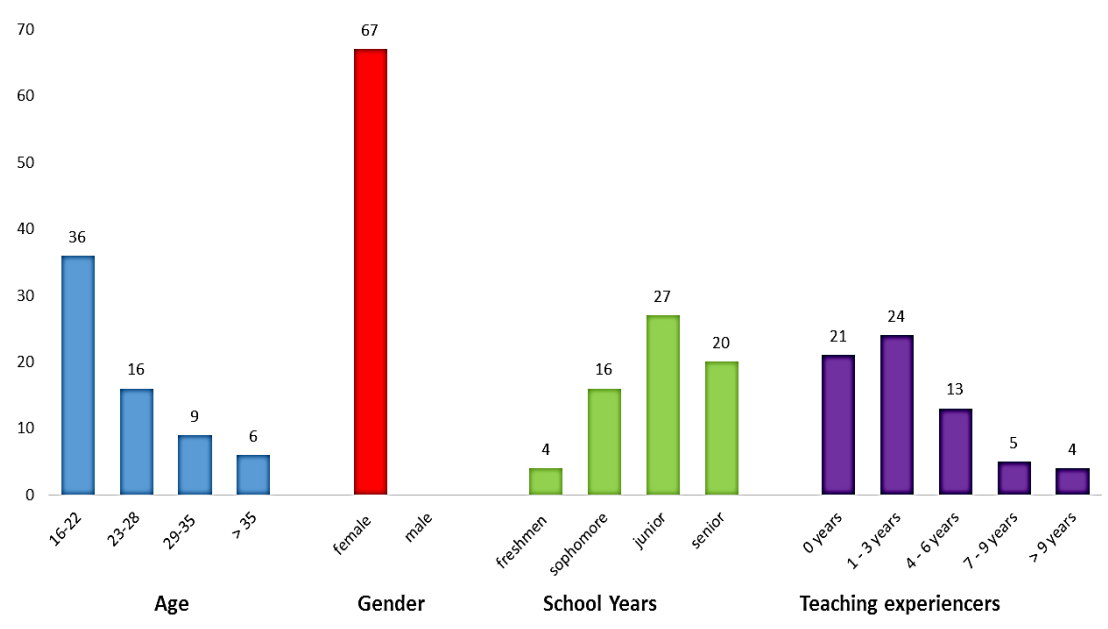
Figure 2. Participant Demographic Information

Before hypothesis test, each item and construct have to surpassed the reliability and validity test. Good Item reliability reflected by loading factor score on each item exceeded .07 (Hair, Black, Babin, Anderson, & Latham, 2006). Construct reliability measured by composite reliability (CR) and Average Variances Extracted (AVE) score. CR recommended an adequate score for good construct reliability is .70 and above (Nunnally & Bernstein, 1994). Meanwhile, AVE score above .50 also as suggested by Hair, et al (2006) to be considered as good construct reliability. The result of data analysis shows that no single item and construct were below the criterion threshold. Good validity of measurement can be obtained from confirmatory factor analysis (CFA). There was no single item dropped or deleted during CFA process due to under .70 loading factors score. This indicates that the used measurements have a good validity. The items and construct reliability and validity test result can be seen in table 1.

Table 2 shows the hypothesis testing result in all of the construct's path. Using a 5% (.05) significance level, the p-value under .05 indicates that the coefficient or loading factor is not equal to zero ($\beta \neq 0$). In other words, there is a significant relationship between constructs.

Despite that, some of the hypothesis testings in this study still incorporate 10% (.10) significance level cut-off, labeled with single asterisks in Table 2.

Table 1. Summary Statistics of Mean, Standard Deviation, Construct Loading Factors, and Reliability

Construct	Indicators	Mean	Std. Dev	Loading	Reliability CR	AVE
Perceived ease of use (PE) (adapted from Davis, 1989; and Park, 2009)	I find e-learning system easy to use (E_1)	3.40	.95	.88	.91	.78
	Learning how to use an e-learning system is easy for me (E_2)	3.55	1.07	.90		
	It is easy to become skillful at using an e-learning system (E_3)	3.52	1.01	.87		
Perceived of usefulness (PU) (adapted from Davis, 1989; and Park, 2009)	E-learning would improve my learning performance (U1)	3.55	.94	.90	.88	.71
	E-learning would increase academic productivity (U2).	3.43	1.03	.92		
	E-learning could make it easier to study course content (U3)	2.73	.97	.69		
Attitude (AT) (adapted from Davis, 1989; and Park, 2009)	Studying through e-learning is a good idea during pandemic (A1).	4.25	.90	.57	.77	.53
	Studying through e-learning is a wise idea (A2).	3.64	.94	.87		
	I am positive toward e-learning (A3).	2.88	1.00	.72		
Behavioral Intention (BI) (adapted from Davis, 1989; and Park, 2009)	I intend to check announcements from e-learning systems frequently (B1).	3.73	.92	.86	.84	.73
	I intend to be a heavy user of the e-learning system even though the pandemic is over (B2).	2.82	1.22	.85		
Self-efficacy (SE) (adapted from Park, 2009)	I feel confident finding information in the e-learning system (S1).	3.30	.95	.78	.81	.68
	I have the necessary skills for using an e-learning system (S2).	3.37	.83	.87		
Subjective norm (SN) (adapted from Park, 2009) based on Malhotra and Galetta (1999)	What e-learning stands for is important for me as a university student (N1).	3.84	.97	.87	.80	.66
	For me to prepare for a future job, it is necessary to take e-learning courses (N3).	4.09	.88	.75		
System accessibility (SA) (adapted from Park, 2009)	I have no difficulty accessing and using an e-learning system in the university (SA).	3.28	1.09	1.00	1.00	1.00

Scale: 1 strongly disagree – 5 strongly agree. All loading was significant at 5% based on p-value

Hypothesis result shows that behavioral intention (BI) is significantly determined by perceived usefulness (PU) (β = .45 ; p < .05) and self-efficacy (SE) (β = .39 ; p < .05). Meanwhile, attitude (AT), perceived ease of use (PE), system accessibility (SA), and subjective norm (SN) did not have significant effect to behavioral intention (BI) with p-value

under .05. So, it can be concluded that behavioral intention (BI) only determined by perceived usefulness (PU) and self-efficacy (SE) while other factors are not.

Table 2. Parameter Estimates, p-value, and hypothesis result

Hypothesis Path	Direct Effect	p-values	Indirect Effect	Total Effect	R^2	Hypothesis Result
AT -> BI (H1a)	.08	.478		.08	.63	Not Supported
PU -> BI (H1b)	.45	.001	.05	.50		Supported**
PE -> BI (H1c)	-.03	.848	.08	.05		Not Supported
SA -> BI (H1d)	-.11	.358	.16	.05		Not Supported
SN -> BI (H1e)	.12	.258	.07	.18		Not Supported
SE -> BI (H1f)	.39	.005	.19	.58		Supported**
PE -> AT (H2a)	-.10	.571	.10	.01	.60	Not Supported
PU -> AT (H2b)	.57	.000		.57		Supported**
SA -> AT (H2c)	.10	.291	.17	.27		Not Supported
SE -> AT (H2d)	.10	.417	.20	.30		Not Supported
SN -> AT (H2e)	.24	.060	.04	.28		Supported*
PE -> PU (H3a)	.18	.225		.18	.50	Not Supported
SE -> PU (H3b)	.34	.007	.06	.39		Supported**
SA -> PU (H3c)	.29	.097	.04	.33		Not Supported
SN -> PU (H3d)	.06	.701	.06	.12		Not Supported
SE -> PE (H4a)	.32	.047		.32	.48	Supported**
SA -> PE (H4b)	.24	.051		.24		Supported*
SN -> PE (H4c)	.32	.023		.32		Supported**

*Note. **significant at a=.05, *significant at a=.10*

In terms of attitude (AT), only the H2b and H2c hypothesis is eligible to result in a significant relationship. The perceived usefulness of e-learning (PU) has a significant effect on the attitude of using e-learning (AT) with β=.57 and p < .05. Subjective norm (SN) perform a significant effect to the attitude of using e-learning (AT) in .10 level of significance (β = .24; p < .10) Meanwhile, perceived ease of use (PE), system accessibility (SA), and subjective norm (SN) have no significant effect to behavioral intention (BI) with p-value under 0.5. So, it can be concluded that attitude (AT) only determined by the perceived usefulness of e-learning (PU) and Subjective norm (SN) while other factors are not. Surprisingly the attitude (AT) did not have a significant influence on BI (β = .08; p =.478).

Perceived usefulness of e-learning (PU) only significantly determined by self-efficacy (SE) with β = .34 and p < .05. In contrast, perceived ease of use (PE) are significantly determined by all its determinant constructs. Self-efficacy (SE) and subjective norm (SN) are significant at .05 level (p = .047; p = .023, respectively) and system accessibility (SA) is significant at .10 level (β = .24; p = .051). It can be concluded that the perceived ease of using technology influenced by individual factors represent by self-efficacy (SE), social factors represent by subjective norm (SN), and organizational factors represent by (SA).

Discussion

From the result explained above, it is known that behavioral intention (BI) is only determined by perceived usefulness (PU) and self-efficacy (SE) while other factors are not. This result are in line with the previous studies (Lee, Cheung, & Chen, 2005; Park, 2009; Park, Nam, & Cha, 2012), TAM can be used to explain student acceptance of technology where self-efficacy (SE) and perceived usefulness (PU) are the key factors to explain behavioral intention (BI) in the use of e-learning at early childhood teacher education program students.

Self-efficacy (SE) have direct effect on behavioral intention (BI) supported by previous finding (Lee et al., 2005; Park, 2009). Online learning is considered to be very useful for this purpose where people are not permitted to carry out learning activities as usual in the classroom. Online learning is considered as the most possible alternative to be carried out in maintaining the continuity of education at various levels, including the university level. Other than that, SE also has an indirect influence on BI through PU but the coefficient is smaller than direct influences. Theoretically, this can be explained by the motivation theory from Bandura. Bandura's motivation theory explains that self-efficacy is a motivation that comes from within or internal motivation. This internal motivation can make individuals more eager to learn something (Bandura, 2012), including learning how e-learning is done.

Attitude (AT) aspect is only determined by the perceived usefulness of e-learning (PU) and Subjective norm (SN) while other factors are not. This result are in line with Park (2009) where perceived usefulness of e-learning (PU) and Subjective norm (SN) are the determinant factors that influence behavioral intention of technology usage. This result also supported by Luan & Teo (2009) where PU have effect on attitude and Al-adwan et al. (2013) in terms of PE effect on attitude.

Surprisingly the attitude (AT) did not have a significant influence on BI, where some TAM study, attitude are determinant factors of behavioral intentions (Luan & Teo, 2009; Padilla-Meléndez et al., 2013; Park, 2009; Park et al., 2012), this result are contrary to original TAM assertions. But, some researchers such as Teo and Schaik (2009) and Al-adwan et al. (2013) have the similar result with this study which found out that attitude has no significant influence in behavioral intention. Furthermore, Davis (1989) in developing TAM admit that role of attitude are modest in predicting technology acceptance. In pandemic situation context, this result is probably because participants have mixed attitudes about online learning during this pandemic. This can be seen from the attitude of those who view that online learning is a wise and good step to maintain the continuity of learning in a pandemic situation, while on the other hand they also do not want to continue online learning as they do now when the pandemic is over later.

Perceived usefulness of e-learning (PU) only significantly determined by self-efficacy (SE). Meanwhile, other constructs that have a path to perceived usefulness (PU) such as perceived ease of use (PE), system accessibility (SA), and subjective norm (SN) did not have a significant effect on perceived usefulness (PU). This can be concluded that individual factors represent by SE is the only key factor of determining how someone perceived usefulness of technology rather than social (SN) and organizational (SA) factors. This result are in line with Park (2009) in term of relationship between SE to PU, but contrary in term of PE, SN, and SA to PU. In other hand, compared to Park et al. (2012) result, this study are supporting Park et al. (2012) in term of insignificance effect of SA to PU, but contrary to relationship of PE, SE, and SN to PU.

In contrast, perceived ease of use (PE) are significantly determined by all its determinant constructs. Self-efficacy (SE) and subjective norm (SN) and system accessibility (SA) are significant determinants of PE. It can be concluded that the perceived ease of using technology influenced by individual factors represent by self-efficacy (SE), social factors represent by subjective norm (SN), and organizational factors represent by (SA). This result are supported by Park (2009) and Park (2012) in term of the significant effect of SE and SA towards PE. Nevertheless, both studies are contrary in resulting insignificant effect of SN towards PE, while this study perform significance result. The explanation is possibly because students learned how to use facilities for online learning from their friends so when their friends consider online learning is difficult they also come to consider it is difficult and vice versa. This can be explained by shared reality theory (Echterhoff, 2012) were to achieve a shared reality, people cannot simply replicate others' observable behavior. They need to obtain a sense of other's states about the world (Echterhoff, 2012), in this case, about online learning.

The other finding are perceived ease of use (PE) has no direct influence on both attitude (AT) and behavioral intention (BI). The result are supported by the research conducted by Lee et al. (2005) and Park et al (2012). The result means that whether students perceived the technology is easy to use, it will not affect their attitude and behavior towards usage of it. This is likely to occur because what makes students more engaged in online learning is not in terms of ease of use of online facilities but rather towards whether the content of learning is useful for them.

The managerial or practical implication of this study are, improving the effectiveness of using e-learning so that it could help students to improve their performance and effectiveness in learning, rather than on the actual usage of technology. Moreover, perceived ease of use of e-learning are not significant towards attitude and behavioral intention. For decision makers, the application of e-learning should be focused on increasing internal motivation of users and improving the quality of the contents, so it can be perceived as a useful content for users. With focusing only to main determinant factors, it is expected to effectively improving usage of e-learning.

Finally, this type of study might need to be implemented in another setting to deepen the analysis. This study didn't separate the analysis of the in-service teacher and on the pre-service teacher. Future research might implement a comparison analysis of both groups. The technology acceptance model could also be implemented to the lecturer that it could enrich the point of view on the e-learning transformation during the COVID-19 pandemic.

CONCLUSION

Based on the explanation above, it could be concluded that in this case, self-efficacy and perceived usefulness are the aspects that influence behavioral intention in the use of e-learning by early childhood teacher education program students the most. Attitude aspect does not have any effect because they have to do it anyway, willingly or not. Everyone is forced to adapt to online learning which is a brand new thing for them.

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