Research Article

TPACK (Technological Pedagogical Content Knowledge) Influence on Teacher Self Efficacy, and Perceived Usefulness, Ease of Use and Intention to Use E-Learning Technology

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Abstract

This study aims to determine the effect of TPACK on teacher self efficacy, perceived usefulness, perceived ease of use, and intention to use, as well as the influence TPACK (Technological Pedagogical Content Knowledge) on Teacher Self Efficacy, Perceived Usefulness, Perceived Ease of Use, of the intention to use technology. The number of respondents in the study is 500. The method used is quantitative research with data analysis techniques using partial least squares (PLS) regression, and with the data collection process conducted through a questionnaire. The results show that TPACK affects teacher self efficacy, perceived usefulness and perceived ease of use. This study also explains that these affect the intention to use technology e-learning. In the study, it was found that TPACK did not significantly affect the intention to use technology. The relationship between TPACK and Intention to Use has a negative relationship.

Keywords: TPACK Influence On Teacher Self Efficacy, Perceived Usefulness, Perceive Ease Of Use, and Intention To Use

Introduction

Communication and information technologies are currently experiencing very rapid progress. Along with this development, such technology is widely used in various kinds of institutions, including educational ones, where it is seen as a fairly effective learning medium. Such use of technology in education institutes also has an impact on the growing public desire to understand more about it.

To create a learning environment that is conducive to technology, it is essential that both teachers and students have positive experiences with the use of e-learning technology (Baek et al., 2008)). Prior studies have discussed how to

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increase the positive perception of technology users and their intention to use technology by adopting the technology acceptance model (TAM) (Cheung, 2013); (Teo, 2008); (Ju Young Joo, 2018), (Davis, 1989). These were the first experts to define TAM as a theory that explains the factors that affect the intention to use information technology to improve the performance of an organisation. Perceived ease of use and the perceived benefits of the technology are the most critical concepts that affect the intention to use it; therefore, the external factors that Influence Examines both of these concepts. Recent studies have highlighted the external factors that influence the perceived ease of use and perceived benefits of TAM (Venkatesh, 2012).

Technological Pedagogical Content Knowledge (TPACK), as proposed by Mishra and Koehler, refers to the integration of knowledge through teaching, content, and technology. In addition to improving their ability to use technology, teachers must also improve the integration of knowledge through teaching, content, and

Theoretical Framework

TPACK

Technological Pedagogical Content Knowledge (TPACK) was introduced by Koehler (2006) and is a framework that is used to identify the knowledge of teachers in teaching activities effectively within a technological framework. The basic TPACK concept emphasises the relationship between the subject matter, technology and pedagogy (CS Chai, 2017) and their interaction in producing technology-based learning (Syaeful Malik, 2018). The TPACK concept appears in technology-based learning models of pedagogical content knowledge (PCK) (Syaeful Malik, 2018). TPACK discusses the complexities of teaching and learning which manifest classrooms are upgraded with technology (Ceren Ocak, 2019). Construction TPACK, the seven domains of knowledge as content knowledge (CK) and technology content knowledge (TCK), investigated separately in an integrative perspective, as often happens with TPACK surveys (Handan Atun, 2019).

According to Syaeful Malik (2018), the TPACK scheme is a material-cutting connection between components. When influential in the learning context, pedagogy and technology are considered. Components, namely C, P, and K, become C. (Content Knowledge). P becomes

technology (2006). In the new learning environment of the 21st century, TPACK has become mandatory in the area of teacher knowledge.

The definition of self-efficacy is an individual's belief in their capacity to plan and execute tasks. Teachers' self-efficacy refers to their private confidence in their ability to plan instruction and achieve instructional goals (Gavora, 2010).

Researchers have been actively discussing the self-efficacy of teachers because they have paid more attention to the influence of self-efficacy on teacher behaviour since the 1970s; in particular, self-efficacy as the most powerful factor affecting the behaviour of teachers (Ju Young Joo, 2018). Teachers who have higher self-efficacy will have the ability to use more advanced methods and modern teaching. Based on the above discussion, this study focuses on "The Effect of Teacher Efficacy Against TPACK, Perceived Usefulness, Perceived Ease Of Use, and Intention To Use e-learning technology".

(Pedagogical Sciences) and T becomes (Knowledge Technology). According to valtonen (2019), TP denotes the ability to utilize various ICT tools and applications. i.e. understanding of how to utilize Web 2.0 tools (e.g., Wiki, Blogs, and Twitter). PK refers to the knowledge of various teaching and learning approaches, theories of learning, and assessment methods, with no specific content area references. i.e. Knowledge of inquiry-based learning methodology. CK refers to subject-matter knowledge, independent of any considerations for teaching the subject. i.e. understanding of mathematics, the arts, and literature, etc. PKC refers to the ability to combine CK and PK in a way that facilitates learning and comprehension of the subject material. i.e., the ability to teach mathematics using examples and analogies. TPK means Knowledge of how to utilize appropriate ICT to support specific teaching and learning approaches, regardless of subject matter. i.e. Knowledge of the applications Kahoot and Padlet for student engagement and brainstorming, respectively. TCK is the ability to represent, research, and create content using ICT without regard to instruction. Utilization of ICT knowledge by subject matter experts. i.e., the ability to utilize subject-specific simulations, a navigation app in geography, or SPSS in statistics. TPACK refers to the knowledge of how to combine different subject areas, as well as how to use appropriate pedagogical approaches for specific content with the appropriate

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technologies. Knowledge of how to use the Padlet application to facilitate brainstorming and idea sharing among biology students.

Previous research has dealt with the validation of the factorial structure of the dimensions of knowledge and the intersection of TPACK, especially with the use of self-report measures (Koehler, 2006) (Scherer, 2018); (Schmidt, 2009) (Voogt, 2013) (Andreas Lachner, 2019). Researchers have investigated the issues related to defining TPACK components and component boundaries (Angeli, 2009); Scherer, Tondeur, & Siddiq, 2017); if the construction is intended to be understood as integrative or transformative (Graham, 2011); the validity of the TPACK measurements (Koehler, 2006); and the relationship between TPACK and PCK (Ralph Saubern, 2019).The relationship between TPACK, the perceived ease of use, perceived benefits and intention to use technology have been discussed in the context of the technology acceptance models (TAM) (Ju Young Joo, 2018).

Teacher Self-Efficacy

The concept of teacher self-efficacy refers to their confidence in their ability to assist students in achieving the desired outcomes (Guskey & Passaro, 1994) and is a strong predictor of student motivation (Schunk, 1991) and academic achievement (Caprara et al., 2006; Ross, 1992), as well as lower teacher stress and fatigue (Schunk, 1991; Caprara et al., 2006; Ross, 1992). (Schwarzer & Hallum, 2008; Wang, Hall, & Rahimi, 2015). The positive effects of self-efficacy are generally explained by the theory of self-efficacy (Bandura, 1997), which states that the more capable an individual is, the more likely they are to persist in the face of adversity and engage in challenging tasks. Self-efficacy in the context of education produces positive classroom behavior and effective teachers. Recent research conducted by Zee and Koomen (2016) reveals a positive correlation between teacher self-efficacy and support teaching, classroom organization, and emotional support.

Other studies have examined the self-efficacy of teachers in specific teaching fields (Burke, 2005). This research shows that teachers not only experience different levels of self-efficacy in various areas of teaching, but also with students individually in their classrooms (Zee et al., 2016).

The Teachers' Sense of Self-Efficacy Scale (TSES) has been used to measure teachers' sense of self-efficacy (Hoy, 2001). This was designed to assess the three-dimensional self-efficacy of aspects of teaching, namely instructional strategy self-efficacy, student engagement self-efficacy, and classroom management self-efficacy. To measure teachers' self-efficacy using the Scale Self-Efficacy of Teachers (TSEs) (Tseschen-Moran & Woolfolk Hoy, 2001).

The self efficacy of teachers has become a major research focus. The level of self-efficacy of high school teachers has been shown to be associated with the teaching of positive behaviours, including class organisation, clear expectations, and the quality of teaching (Schwarzer & Hallum, 2008). Teachers who have high self-efficacy will show increased classroom management techniques and promotion of positive strategies to deal with challenging behaviour (Emmer & Hickman, 1991). Besides, teachers have reported levels of stress and lower fatigue in combination with higher levels of self-efficacy (Schwarzer & Hallum, 2008; Love et al., 2019)

Perceived Usefulness (PU)

Davis et al. (1989) define PU as the "subjective probability of potential users that use a particular application system will Enhance the performance of its work in the context of the organization". By definition, Suki (2011) found that PU plays a determining role in usage behaviour and intentions. Subramanian (1994), using structural equation modeling (SEM), reaffirmed the two measures of confidence (PU and PEOU) using a new dataset for two different technologies, and discovered that PU, not PEOU, has a direct effect on usage behaviour.

Perceived use (PU) refers to "the extent to which an individual believes that using a particular technology will enhance the performance of the work" (Davis, 1989). PU is hypothesized to be a direct predictor of behavioral intention (BI) to use technology within the framework of TAM (Park, 2014). Previous research has demonstrated that PU is positively associated with the intent to continue in the context of e-text (Baker-Eveleth, 2015; Stone, 2013).

Usability, also known as perceived usefulness, is defined as the extent to which an individual believes that using technology will enhance his or her job performance (Davis, 1985). The design is influenced by usability. Past research has demonstrated that the significance of the most useful constructs influences attitudes, intentions, and behaviors (Jogiyanto, 2008, p. 114).

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There are six indicators for measuring construction purposes, including increased work productivity, work facilitation (making the job easier), and actual system use (Davis, 1989). Perceived ease of use, henceforth referred to as ease of use, is defined as the extent to which technology will be effortless to use (Davis, 1985).

Perceived Ease Of Use

The relationship between PEOU, PU and attitude in TAM theory has been verified empirically in the IT literature. Several studies have used measures of different uses and found them to be consistent with the results of TAM; convictions have a close correlation with attitude (Burton-Jones, 2011). Many studies have also tested the effect of external variables on PEOU (Suki, 2011) and found that such effects are entirely independent of it (Norazah Suki, 2011). Here, we define ease of use as the extent to which the use of 3G mobile services by customers is considered easy or not.

Perceived ease of use is "the extent to the which a person believes that using the technology would be free of effort" (Davis, 1989). In the context of this study, PEOU refers to the extent to which users believe that they will continue to use e-learning free of effort. If a system is relatively easy to use, people will be more willing to learn about its features and eventually intend to continue using it. Studies show that PEOU is positively related to the intention to continue web-based learning (Hamida, 2016).

Perceived ease of use influences usability constructs, attitudes, intentions, and the utilization of actual technology in e-learning. However, the construction of usability has the most significant effect, whereas the other constructions have no significant effect (Jogiyanto 2008, p. 115).

The perceived ease of use is specified for potential users who anticipated an easy target. In other words, these technologies make it easy for users to request and utilize Reviews (Chuttur 2009; Surendran, 2013).

Intention To Use

The intention to use technology can be defined as the extent to which users want to use technology in the future. Experts have suggested that the intention to use technology is a form of behavioural acceptance of technology relevant to the perceived ease of use and perceived benefits (Chow et al., 2012; Lee & Lehto, 2013; Teo, 2011). Teachers are more likely to intend to use technology when they experience its ease of use and usefulness in learning and teaching (Teo, 2011). Besides, the self-efficacy of teachers has been considered essential to explain their use of technology in the classroom (Albion, 2001). In addition, pre-service teachers tend to range with TPACK developed confidence and intend to use technology in their teaching (Alsofyani et al., 2012; Liu, 2011).

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Hypotheses
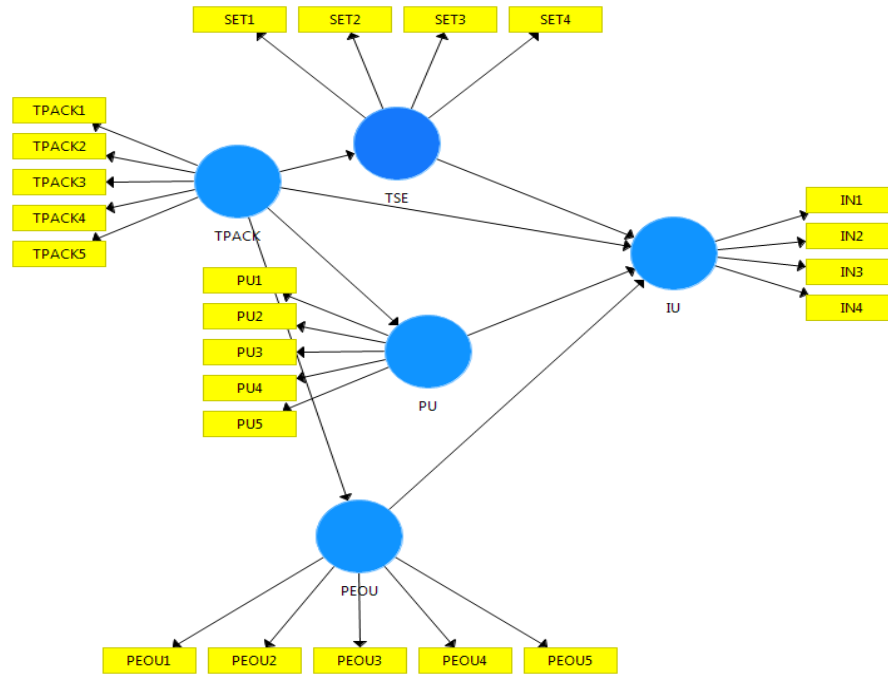
Figure 2. Research Model

Source: processed data

H1: TPACK positively influences teachers' self efficacy.

H2: TPACK positively influences the perceived usefulness of technology.

H3: TPACK positively influences the perceived ease of use of technology.

H4: Teacher self-efficacy positively influences the intention to use technology.

H5: TPACK positively influences the intention to use technology.

H6: Perceived usefulness positively influences the intention to use technology.

H7: Perceived ease of use positively influences the intention to use technology.

Research Methodology

Based on the aforementioned research hypothesis, the purpose of this study is to acquire adequate knowledge and credible TPACK regarding the influence of perceived usefulness, perceived ease of use, and intention to use technology. This study employs a survey in order to obtain suitable data and a comparative approach based on facts obtained directly from the source. In addition, the study employs a quantitative methodology in which all data are represented numerically and then analyzed to generate a score. The sample size for this study was 499 respondents. The primaries consist of the data employed for the independent variables and the dependent variable TPACK Perceived Usefulness, Perceived Ease Of Use E-learning.

Operating Variables

Values can vary over time for the same object or individual, or in the same time period for different objects. The operational functions of the study's variables are categorized into two groups: independent and dependent variables.

a. Independent variables are those that influence or cause the change or emergence of dependent variables. TPACK is the independent variable in this study.

b. dependent variable is an affected variable.

In this study, perceived usefulness, perceived ease of use, and intention to use technology are the dependent variables.
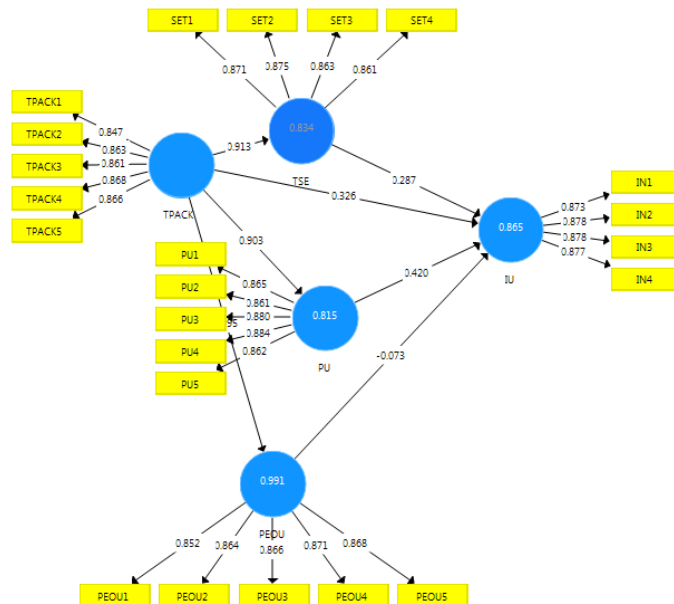
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Table 2 Operational Variables

Variable	Researchers	Indicators
TPACK	Schmidt et al. (2009), USTA, (2019), Sunyoung Park and Eugene Lim (2017), Ceren Ocak & Evrim Baran, (2019), Michael Phillips, (2019), Tae S. Shin (2019), Isma Widiaty (2019), Anita Woolfolk Hoy (2017), Jo Tondeur (2017)	Technological Knowledge, Content Knowledge, Pedagogical Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge
Teacher self-efficacy	Schwarzer et al. (1999), Maykel Verkuyten, (2017), Eugene Lim (2017)	Self efficacy for instructional strategies; self efficacy for classroom management; Self-Efficacy For Student Engagement
Perceived ease of use	Davis (1989), Wan Salihin, (2016), I Made Narsa (2019), Ismail Bilgiçli (2019)	Ease of learning; ease of achieving goals; clear and understandable; flexible; free of difficulty; ease of use
Perceived usefulness	Davis (1989), Wan Salihin (2016), I Made Narsa (2019), Ismail Bilgiçli (2019)	Work done more quickly; work becomes easier; improved job performance; increased productivity; enhanced effectiveness; UsefulTeach More Quickly
Intention to use technology	Taylor and Todd (1995), Todd (2019)	Intention to use technology in teaching

Source: processed data

Results And Discussion

An indicator is said to be valid if it has a loading factor above 0.5 against the intended constructs.

Output SmartPLS for loading factors provides the following results:

Figure 3 SmartPLS output results after removing the invalid indicators
Source: processed data

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All the indicators shown in Figure 3 have loading factor values above 0.5, so it can be said that they are valid or have met the convergent validity.

Furthermore, reflective indicators also need to be tested by cross loading discriminant validity, as follows:

Table 3 Loading Factors

	Intention To Use	Perceived Ease Of Use	Perceived Usefulness	TPACK	Teacher Self-Efficacy
in1	**0.873**	0.803	0.791	0.801	0.794
IN2	**0.878**	0.791	0.789	0.788	0.788
IN3	**0.878**	0.780	0.804	0.778	0.777
IN4	**0.877**	0.770	0.798	0.768	0.788
PEOU1	0.767	**0.852**	0.775	0.842	0.795
PEOU2	0.786	**0.864**	0.796	0.863	0.807
PEOU3	0.750	**0.866**	0.776	0.862	0.786
PEOU4	0.780	**0.871**	0.783	0.868	0.792
PEOU5	0.793	**0.868**	0.801	0.866	0.793
PU1	0.791	0.777	**0.865**	0.768	0.799
PU2	0.780	0.779	**0.861**	0.771	0.786
pu3	0.803	0.807	**0.880**	0.804	0.798
PU4	0.804	0.803	**0.884**	0.800	0.783
PU5	0.773	0.794	**0.862**	0.786	0.777
set1	0.773	0.792	0.764	0.790	**0.871**
set2	0.786	0,816	0.793	0.814	**0.875**
set3	0.772	0.774	0.780	0.766	**0.863**
SET4	0.784	0.808	0.805	0.800	**0.861**
TPACK1	0.753	0.834	0.751	**0.847**	0.773
TPACK2	0.786	0.862	0.796	**0.863**	0.807
TPACK3	0.736	0.848	0.754	**0.861**	0.766
TPACK4	0.780	0.871	0.783	**0.868**	0.792
TPACK5	0.793	0.808	0.801	**0.866**	0.793

Source: processed data

An indicator is considered valid if it has the highest loading factor on the targeted construct relative to other constructs. In two stages, discriminant validity was evaluated by observing the value of cross loadings and comparing the value of the square of the correlation between the AVE construct value and the construct correlation with AVE roots. The criteria for cross-loading are that each indicator measuring a construct must have a higher correlation with that construct than with other constructs. The output of cross loading is displayed in Table 3, where it can be seen that the loading factor of each indicator for konstruknya is greater than that of other constructs. Alternatively, discriminant validity can be determined by comparing the value of the square root of the average variance extracted (AVE) to the recommended values of greater than 0.5. Table 4 displays the AVE values for the study.

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Table 4. Discriminant Validation

	Cronbach's Alpha	Rho_A	Composite Reliability	Average Variance Extracted (Ave)
Intention To Use	0.899	0.899	0.930	0.768
Perceived Ease Of Use	0.915	0.915	0.937	0.747
Perceived Usefulness	0.920	0.920	0.940	0.758
TPACK	0.913	0.913	0.935	0.741
Teacher Self Efficacy	0.891	0.891	0.924	0.753

Source: processed data

Table 4 shows that the AVE values of all the variables are above 0.5. The lowest value is 0.741, for the TPACK construct. Reliability testing was conducted by observing the value of the block of composite reliability indicators measuring the construct. Composite reliability results are quite reliable if their values are above 0.3, but will be more satisfactory if these are greater than 0.7. Furthermore, reliability testing may be confirmed by Cronbach's alpha; if the resulting output has a value above 0.3 it is said to be reliable. In this study, all constructs have Cronbach's alpha and composite reliability values above 0.7, meaning the constructs used are reliable.

Hypothesis Test
Table 5 Path Coefficient (Mean, STDEV, T-Values, P-Values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (| O / STDEV|)	P Value
PEOU -> IU	0.414	0.429	0.167	2.484	**0.013**
PU -> IU	0.482	0.481	0.048	10.112	**0.000**
TPACK -> IU	-0.085	-0.102	0.167	0.512	**0.609**
TPACK -> PEOU	0.973	0.974	0.012	81.975	**0.000**
TPACK -> PU	0.898	0.898	0.010	87.285	**0.000**
TPACK -> TSE	0.799	0.800	0.018	43.770	**0.000**
TSE -> IU	0.154	0.158	0.032	4.838	**0.000**

Source: processed data

The influence of TPACK on teachers' self-efficacy in this study is significant, with a t-statistic of 43.770 (> 1.96). The original value estimate is a positive sample, is 0.799, which indicates that the direction of the relationship between TPACK and perceived ease of use is positive. Therefore, the first hypothesis (H1), which states that TPACK has a positive and significant effect on teachers' self-efficacy, is accepted.

The value of the t-statistic variable for perceived utility with TPACK is 87.285, which is greater than 1.96. The original value estimate is 0.898, which indicates that the relationship between perceived usefulness and TPACK is in a positive direction. Consequently, the second hypothesis (H2), which states that TPACK has a positive and

statistically significant effect on perceived ease of use .

Table 5 shows that the relationship between TPACK and perceived ease of use is significant, with a t-statistic value of 81.975 (>1.96). The original value estimate is a positive sample, is 0.973, which indicates that the direction of the relationship between TPACK and perceived ease of use is positive. Consequently, the third hypothesis (H3), which states that TPACK has a positive and statistically significant effect on perceived usability.

The influence of teacher self-efficacy on intent to use is statistically significant, with a value of 4.83 (>1.96) The original value estimate is 0.154,

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which indicates that the relationship between teacher self-efficacy and intention to use is in a positive direction. Consequently, the fourth hypothesis (H4), which asserts that teacher self-efficacy has a significant positive effect on intention to use, is supported. This is consistent with research conducted by Djigi et al. (2014), Navidnia (2009), and Senler and Sungur-Vural (2013), which states that awareness, openness, and the suitability of the terms therein is a sense of self-efficacy of teachers, which can foster a higher level of preparation for education, and lead to a greater sense of their capacity to effectively engage with and manage students, and use effectiv Compared to teachers with low self-efficacy, teachers with high self-efficacy have a greater desire to implement technology in their classrooms. This is due to the fact that teachers with high self-efficacy are more likely to perceive some of the benefits he would expect from training, and the things that are believed to be able to support learning activities will be implemented to make teaching and learning activities more effective. Teacher self-efficacy has become a major research topic. It has been shown that high self-efficacy is associated with positive teaching behaviors, such as outstanding class organization, clear expectations, and the quality of instruction (Schwarzer & Hallum, 2008). Emmer & Hickman (1991) demonstrated a rise in classroom management techniques and the promotion of positive strategies to address disruptive behavior.

Table 5 shows that the influence of TPACK on intention to use is not significant, because the t-statistic value is 0.512 (<1.96). This is in line with the estimated negative value of the original sample of -0.085, which indicates that the direction of the relationship between TPACK and intention to use is negative. Therefore, hypothesis five (H$_5$), which states that TPACK has a significant positive effect on intention to use is rejected.

The t-statistic value of 10.112 (>1.96) in Table 5 indicates that the influence of perceived usefulness on the intention to use is statistically significant. The original value estimate is 0.482, which indicates that the relationship between perceived usefulness and intention to use is in a positive direction. Therefore, hypothesis number six (H6), which states that perceived usefulness has a positive and statistically significant effect on the intention to use e-learning technology. This study's findings concur with those of Jogiyanto (2008, p. 114), indicating that

perceived usefulness is the most influential factor on attitudes, intentions, and behaviors.

The effect of intention to use is significant based on the structural test model, with a t-statistic of 2,484 (> 1,96). The original value estimate is 0.414, which indicates that the relationship between perceived of use and intention to use is in a positive direction. Therefore, hypothesis seven (H7), which states that perceived of use intention to use e-learning technology is positively and significantly impacted. Consistent with previous research, which found that if a system is relatively simple to use, people will be more willing to learn about its features and ultimately intend to continue utilizing it, the results support the hypothesis.

Experts have suggested that the intention to use technology is a form of behavioral acceptance of technology related to its perceived ease of use and benefits. The results of the study were released today (Chow et al., 2012; Lee & Lehto, 2013; Teo, 2011). When teachers experience the technology's ease of use and utility for learning and teaching, they are more likely to intend to utilize it (Teo, 2011). In addition, teachers' self-efficacy has been deemed crucial for understanding their use of technology in the classroom (Albion, 2001). In addition, pre-service teachers A person who employs TPACK is typically self-confident with TPACK-developed self-confidence and intends to use technology in the classroom (Alsofyani et al., 2012; Liu, 2011; Maeng et al., 2013).

This research has determined, based on the preceding discussion, that TPACK influences teacher self efficacy, perceived usefulness, and perceived ease of use of technology. In addition, the study describes how these three factors influence the intention to utilize technology in teaching and learning. In the research, it was discovered that does not influence intention to use; the original values are negative, indicating a negative relationship between TPACK and intention to use.

Conclusion

1. TPACK positively influences teacher self efficacy, with a significance level of 43.770 and a positive direction between them relationship.
2. TPACK positively influences perceived usefulness of technology, with a significance level of 87.285 and a positive direction of their relationship.

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3. TPACK positively influences the perceived ease of use of technology, with a significance level of 81.975 and a positive direction of the relationship between them.
4. Teacher self-efficacy positively influences the intention to use technology, with a significance level of 4.838 and a postive direction of their relationship.
5. TPACK does not significantly affect the intention to use technology, with a significance level of 0.512 and a negative direction of the relationship.
6. Perceived usefulness positively influences the intention to use technology, with a significance level of 10.112 and a positive direction of the relationship.
7. Perceived ease of use positively influences the intention to use technology, with a significance level of 2.484 and a positive direction of the relationship.

Suggestions

In the era of modernization, everything that is owned in the world of education will be connected to technology without exception. Therefore, teachers should participate in the digital age by applying the method of learning through media technology, as the use of technology is believed to improve the effectiveness and efficiency of teaching and learning. To increase the willingness of teachers to use technology, they can improve their perception of the use, perceived ease of use and confidence. Teachers can use TPACK (Technological Pedagogical Content Knowledge), which is a framework to identify the knowledge of teachers in effective teaching activities with a technological framework.

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