The Influencing Factors of Teachers' Intention to use Technology in the Classroom: Case Study of one Smart Campus Environments in Shandong Province, China

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Abstract

The purpose of this study is to investigate the Factors of Teachers' Intention to use Technology in the Classroom. The perceived usefulness of smart education technology and the impact of using technology in smart environments. The perceived ease of use and Intention to use technology, and explore whether the actual teaching effect can be improved by the help of perceived usefulness. This provides a clearer outline of the subjective and objective factors influencing teachers' use of technology in smart environments. Drawing upon the Technology Acceptance Model (TAM), this study aims to systematically analyze and identify the key factors that affect Teachers' Intention to use Technology to improve talent quality and promote sustainable development of smart education technology environment. Specifically, analyze the impact of perceived usefulness and perceived ease of use of Teachers' Intention to use Technology, and propose strategies to enhance it. The quantitative research design using a questionnaire survey to collect data from the samples consisted of 110 teachers in a university in Shandong province, China. The results indicate that perceived usefulness and perceived ease of use have a positive impact on university Teachers' Intention to use Technology

Keywords: Teacher Intention, TAM, Information Technology Perception

Introduction

Research Background

This research paper focuses on the application of teaching technology for frontline teachers in smart campus environments. China's smart campus has undergone nearly 10 years of exploration, from the initial concept proposal to the pilot construction of various types of schools, and then introduce to China's national construction standards in 2018. However, there has been a lot of discussion about how to apply and what kind of smart campus should be construct. Front-line teachers, as individuals directly affected by the development of education information technology, as teachers play a vital role in shaping the future of smart campuses. Therefore, this study considers the subjective and objective attitudes of front-line teachers towards the promotion and application of new technologies as important reference variables for the future construction of smart campuses. (Liu & Chen, 2019) (Wu & Zou, 2020)

Previous Research

Previous researchers have conducted extensive investigations on factors related to technology use in the classroom, with a focus on theoretical frameworks for smart campuses, advantages of new technologies, big data analysis, and teaching process management at the macro level. For instance, Baek, Jung, and Kim (2008) found that experienced teachers often display less interest in technology, while less experienced ones are more likely to use it. Bdiwia (2019) emphasized the crucial role of teachers in smart classroom teaching activities and its impact on the initial outcomes of student participation. Furthermore, Hassan (2019) highlighted the creation of a "technical pressure" on teachers through the application of IT skills, leading to a clearer understanding of the motivations behind technology use by teachers. (Kudryashova, Khitrik, 2020) (Wang, et al., 2019) (Kudryashova & Khitrik 2020) (Wang, Sun & Huang, 2019

Objectives of Research

1. To study the influencing factor of teacher's intention to use technology in Smart Environments

2. To study the perceived ease of use of teacher's intention to use technology.

3. To study of perceived usefulness of teacher's intention to use technology in smart Environment University.

Scope of the study

This paper aims to analyze teachers' subjective Intention to use technology through the factors of perceived usefulness and perceived ease of use, particularly under the influence of different objective conditions, including fulfilling external personnel requirements, managing expectations, reducing work pressure and physical fatigue, and enhancing teaching effects with new technologies. Through quantitative research, this study examines the decisive factors that affect the utilization of intelligent technology by teachers in a smart campus environment and discusses the application of teaching technology for next-line teachers in the same setting. (Chen, Chen & Wu, 2018)

Contributions and Innovations

Previous research has primarily examined the factors related to smart campus construction based on expert and scholarly opinions. While this has addressed questions concerning the necessity and objectives of building a smart campus, this study employs a unique approach by collecting data directly from frontline teachers to extract relevant factors. This method allows for the identification of underlying perceptions of non-technical individuals. While the perspectives of experts and scholars are significant, incorporating the analysis of actual users or technology laypeople provides a more realistic and effective vision. Consequently, this study emphasizes the importance of technology's breadth of application, ease of use, and usefulness in smart campus construction.

By focusing on the perceptions of frontline teachers, this study makes a significant contribution to the field, providing valuable insights and recommendations for constructing and utilizing smart campuses.

Literature Reviews

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a study of information systems conducted in 1989 by Davis, based on rational behavior theory. (Davis, 1989; (Venkatesh, Morris, Davis & Davis, 2003). Initially, the model aimed to explain the factors influencing the widespread adoption of computers. According to the model, two key determinants play a crucial role: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which an individual believes that using a particular system enhances their work performance, while perceived ease of use reflects the degree to which an individual finds a system user-friendly.

Wu, & Wang (2005) applies the TAM to the context of mobile commerce and presents a revised version of the model. It highlights the ongoing relevance of the TAM to new technological contexts and is useful for understanding how the model can be applied in different domains.

Huang, Wu & Huang (2015) applies the TAM to the context of multimedia teaching resources and explores the factors that influence teachers' adoption of these resources. It is relevant for understanding how the model can be applied in educational contexts and for identifying specific factors that may affect technology acceptance in this domain.

Application of Technology Acceptance Theory

Since its proposal, the Technology Acceptance Model (TAM) has been widely used in the research of information technology, and numerous scholars have confirmed its strong explanatory power. Currently, the theory is also being applied to the field of e-commerce and the acceptance behavior of consumers in purchasing goods, thus broadening the scope of the model. As a result, research on the application of TAM theory is currently on the rise. (Chasuwan, Aujirapongpan & Ritkaew, 2022; Vongchavalitkul, Navavongsathian, Limsarun, Damrongpong & Yenyuak, 2022; Navavongsathian, Vongchavalitkul & Lumsarun, 2020; Chen, 2020; Li, 2018)

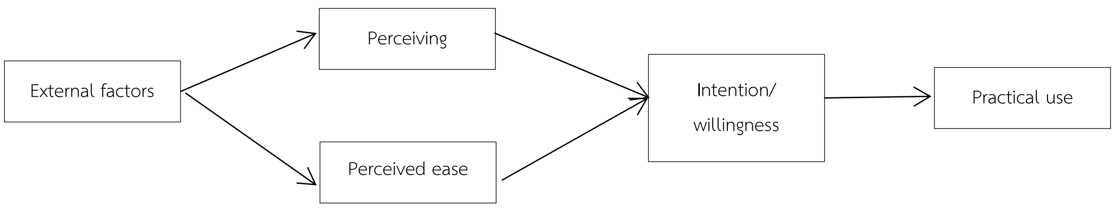


Figure 2-1 Technology Acceptance Model (TAM).

Application of Theory and Hypothesis Formulation

The information technology teaching ability of the University educators arises from their integration of technology into their classroom instruction. Using the theory of technology acceptance behavior (TAM) and a corresponding questionnaire survey, this study aims to empirically examine the factors influencing university professors' ability to teach with technology and to explore measures for improving it. Drawing from prior research, this paper considers perceptual usefulness and perceived ease of use as two essential factors influencing university professors' information technology teaching ability. (Hassan, 2019)

Hypothesis

Based on TAM theory and related analyses, this study proposes the following hypotheses:

Hypothesis 1: Perceived Ease of Use positively influence teacher's intention to use technology.

Hypothesis 2: Perceived usefulness positively the influence teacher's intention to use technology.

Research Methods

This study investigates The Influencing Factors of Teachers' Intention to use Technology using a questionnaire survey method. A questionnaire was designed based on the purpose of this study, titled "Questionnaire on the Influencing Factors of Teachers' Intention to use Technology". Data was collected from Front-line teacher in a university in Shandong, regarding the two influencing factors of perceived usefulness and perceived ease of use, as well as the level of professors' informatization teaching ability. The data was analyzed using SPSS 25 software, which included demographic characteristic data, two independent variables, and one dependent variable influencing factor data of the questionnaire. The survey was conducted online through "Questionnaire Star".

Study Design

This study is designed based on the theory of technology acceptance behavior (TAM). Data was collected for analysis, which was divided into six stages. The first stage is determining the research topic, followed by a literature research stage in the second stage. In the third stage, the "Questionnaire on the Influencing Factors of Teachers' Intention to use Technology" was designed based on the key influencing factors of Teacher's intention determined through literature research. Advisors and experts were consulted for guidance and revision. The fourth stage is the distribution and collection of questionnaires. A total of 150 Front-line teachers were randomly selected from a university in Shandong, and 110 valid questionnaires were collected. The fifth stage is the data analysis stage, which involves statistical analysis of the collected questionnaire data using SPSS 25 software to verify the hypotheses of the influencing factors of Teachers' Intention to use Technology. The sixth stage is the summary and discussion stage, where the research results were collated, strategic suggestions for improving the Factors of Teachers' Intention to use Technology were proposed, and this paper was written.

Background description of the questionnaire:

The Likert five-level scale integral method was used to measure the questionnaire, which was distributed to 165 professional teachers from the three professional classifications of liberal arts, science, and engineering. 10 questionnaires were sent per unit, resulting in a total of 110 questionnaires sent and recovered. (Niu & Ma, 2019)

Reliability analysis

There is currently no uniform standard for the analysis of Cronbach's α coefficient (or halving coefficient). However, according to most scholars, a Cronbach's α coefficient (or halving coefficient) above 0.9 indicates that the reliability of the test or scale is very good, while a range between 0.8-0.9 indicates that the reliability is good, 0.7-0.8 suggests that the reliability is acceptable, 0.6-0.7 indicates that the reliability is average, and 0.5-0.6 implies that the reliability is not ideal. The Cronbach's α coefficient value of 0.927 obtained in this study indicates that the questionnaire is very reliable. This value meets the requirements for high reliability indicators, and the questionnaire items have consistency and stability. (Saleh, et al., 2019)

Validity analysis

Under the guidance of relevant experts, the rationality and effectiveness of the questionnaire items were assessed using the expert judgment method. The identities of the experts were anonymized at their request, and the results of their evaluations are presented in Figure 4.

Research Results

Studies have found that experienced teachers can play a key role in the adoption of new technologies. Therefore, it is important to encourage them to actively participate in technology-related work, as they are more likely to successfully integrate technology into the learning process, leading to improved development of technology and teaching quality. On the other hand, less experienced teachers may need more exposure to the strengths, knowledge, and skills of ICT in order to shape their perception of their experiences.

Figure1

Factors		Frequency	Percent
gender	Male	47	42.7
	Female	63	57.3
	Total	110	100.0

seniority	Under 5 Years	39	35.5
	6 – 10	16	14.5
	11 – 15	13	11.8
	16 - 20	14	12.7
	Over 20 years	28	25.5
	Total	110	100.0

Figure 1 shows that the sample was divided into two gender groups, with approximately 43% men and 57% women. The gender ratio was nearly balanced. In te rms of teaching experience, 50% had less than 10 years of experience, 24% had 10-20 years of experience, and 26% had more than 20 years of experience. Thus, the sample composition was relatively balanced and aligned with the typical distribution of faculty in general universities.

According to Figure 2, intermediate lecturers make up 37.3% of the sample, while professors and associate professors represent 35.4%. The majority of participants hold intermediate and senior professional titles. In terms of academic discipline, liberal arts teachers account for 50% of the sample, with a relatively balanced distribution of science and engineering teachers. This discipline and title structure of the data collection object is representative of the science field.

Figure 2

Factors	Frequency	Percent
Job title		
Teaching assistant	30	27.3
Lecturer	41	37.3
Associate Professor	26	23.6
Professor	13	11.8
Total	110	100.0
Subject Category		
Liberal arts	55	50.0
Science	25	22.7
Engineering	30	27.3

Total	110	100.0

Figure 3

Case Processing Summary			
		N	%
Cases	Valid	109	99.1
	Excluded[a]	1	.9
	Total	110	100.0
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics	
Cronbach's Alpha	N of Items
.927	4

Table 4 Expert validity test evaluation form.

Expert number	Evaluation of the Overall Validity Design of the Questionnaire				
	very suitable	suitable	basically suitable	inappropriate	very inappropriate
1	√				
2	√				
3	√				

Regression analysis

The table shows that a linear regression analysis was performed with SumPU and SumPEOU as independent variables and SumATT as the dependent variable. The resulting model formula is: SumATT = 0.295 + 0.443*SumPU + 0.477*SumPEOU, with an R square value of 0.613, indicating that SumPU and SumPEOU can explain 61.3% of the variance in SumATT. The model also passed the f-test (F=84.602, p=0.000<0.05), indicating that at least one of SumPU and SumPEOU has a significant impact on SumATT. The Durbin-Watson (D-W) value was near 2, indicating that there was no autocorrelation in the model and no correlation between the sample data, indicating a good model fit. The regression coefficient for SumPU is 0.443 (t=3.962, p=0.000<0.01), suggesting a significant positive impact of SumPU on SumATT. The regression coefficient for SumPEOU is 0.477 (t=4.097, p=0.000<0.01), indicating a significant positive impact of SumPEOU on SumATT. In summary, both SumPU and SumPEOU have a significant positive impact on SumATT.

Figure 5 :

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.783[a]	.613	.605	.48501
a. Predictors: (Constant), SumPU, SumPEOU				

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Itself.
		B	Std. Error	Beta		
1	(Constant)	.295	.284		1.040	.301
	SumPEOU	.477	.116	.418	4.097	.000
	SumPU	.443	.112	.405	3.962	.000
a. Dependent Variable: ITU						

The path diagram in Figure 6 illustrates the results of the model, displaying the coefficients used to analyze the influence relationship between X and Y. It shows that the influence coefficient of SumPU on ITU is equivalent to the influence coefficient of SumPEOU. Hence, it can be inferred that perceived usefulness and perceived ease of use play almost an equally significant role in shaping the attitude of use.

Based on the above coefficient result, it can make a regression equation as follows:

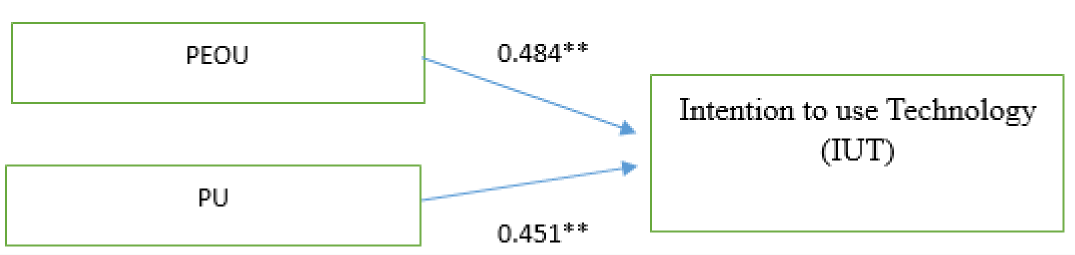
y= a+ b1x1 + b2x2

Where: y = Intention to use Technology (ITU).

a = Constant, b = Coefficient

x1 = Perceived ease of use (PEOU)., x2 = Perceived usefulness (PU).

Intention to use Technology = 0.295 + .477 PEOU + .443 PU



Discussion

The development of educational technology has always been oriented towards education, with a focus on improving its effectiveness. This includes a wide range of aspects such as content coverage, goal alignment, target accuracy, teaching method flexibility, use of diverse teaching aids, and positive impact on students. The innovation in educational technology and means inevitably leads to the innovation of the entire educational process. This poses a challenge as the progress of philosophical productive forces must promote the reform of production relations. The educational relationship between these forces includes the teacher-student, teaching-learning, management-service, decision-execution, planning-reviewing, and school-social relationships. In order to provide a more comprehensive analysis, future research should continue to explore these aspects.

1. The advancement of technology and teaching reform is largely driven by state and higher education authorities. Under the influence of strong external factors, it has become crucial to effectively align a school's positioning, professional characteristics, and talent training goals, and make scientifically appropriate arrangements. This is an important yardstick for assessing a school's leadership level.

2. The promotion of new technologies and the enhancement of teachers' professional abilities should be closely integrated. Technical frameworks and functional applications must be designed according to teachers' cognitive and skill levels, to achieve a dynamic balance between the technology and its actual bearers.

3. In the future, promoting the construction of an education governance system supported by intelligent technology, modernizing and developing education governance capabilities in the intelligent era, innovating educational governance scenarios and models, and expanding the scope and object boundary of education governance, will become important research topics. It is also necessary for education practitioners and researchers to

focus on the human-centered design of the educational environment, and enhance the objective evaluation index of humanistic care and well-being.

Recommendations

In this study, a theoretical test model of technology acceptance was adopted to explore the factors influencing teachers' use of technology. Multi-sample collection analysis was conducted, and the results indicated that perceived ease of use and perceived usefulness are equally important in promoting the use of smart campus education technology. Therefore, system construction should be scientifically designed to be both appropriate and easy to use, while also being effective. Based on the correlation analysis, the following conclusions were drawn:

Under the theoretical model of technology acceptance, this study aimed to explore factors that influence teachers' use of technology. Multi-sample data analysis was conducted, which revealed that teachers recognize the achievements of smart campus construction and the potential for comprehensive progress through the application and promotion of new technologies. When comparing perceived usefulness and perceived ease of use, it was found that ease of use was more important than usefulness. Therefore, teachers should be able to experience the convenience provided by the system, and the system platform should provide direct help for teachers in teaching and work assistance. The unfriendliness of the operation interface and unscientific function design could affect the actual promotion effect of the system.

The questionnaire analysis showed that external pressure and the expectations of others were the main reasons for teachers to actively use technology. This suggests that strong management promotion and self-social belonging are internal driving forces that promote teachers to accept the use of new technologies. Although most respondents expressed intention to use smart education technology, they paid little attention to reducing work pressure and fatigue during use. This indicates that both middle and senior teachers and junior teachers have a strong sense of self-efficacy for career development requirements, but may not prioritize their own health. This finding should be an important consideration for future research on teachers' well-being.

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