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RESEARCH PAPERS

Understanding early childhood student teachers' acceptance and use of interactive whiteboard

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Abstract

Purpose – The purpose of this paper is to understanding early childhood student teachers' self-reported acceptance and use of interactive whiteboard (IWB), by employing the Unified Theory of Acceptance and Use of Technology (UTAUT) as the research framework.

Design/methodology/approach – A total of 112 student teachers enrolled in science-related papers from Bachelor of Early Childhood Education completed the questionnaire, measuring their responses to performance expectancy, effort expectancy, social influence and facilitating condition and behavioural intention. Structural equation modelling was used as the main technique for data analysis.

Findings – The results of this study showed that performance expectancy and effort expectancy were found to have a direct and statistically significant positive effect on behavioural intention. Of the four variables in the UTAUT model, the model accounted for 41 per cent of the variance in behavioural intention to use IWB among student teachers. The findings obtained in this study fail to verify the predictions about IWBs experiences having moderating effects towards the relationships.

Originality/value – This is the first paper that investigated the acceptance and use of IWB among early childhood science student teachers based on the UTAUT model. The findings have uncovered the important distinction of performance expectancy and effort expectancy in IWB acceptance and use. Hence, it provides several prominent implications for the research and practice.

Keywords Students, Higher education, Education and training, Technology, Interactive whiteboard

Paper type Research paper

Introduction

For many educational systems, the developments in information and communication technologies (ICT) have drastically reshaped teaching and learning practices. Studies have demonstrated that ICT can enhance teaching and learning. As a result, many governmental agencies have set up relevant curriculum standards to direct the implementation of technology in education system. Alongside, many schools are equipped with a high level of technology resourcing. One of the most promising recent revolutions in educational technology is interactive whiteboard (IWB), which using a combination of a computer and a data projector. IWB is the multitouch, multiuser interactive learning board that groups of learners to work simultaneously on its surface and provide an interface allowing tactile, widely observable and collaborative interaction (Betcher and Lee, 2009; Higgins, 2010).

There is a growing amount of research suggests that the use of IWBs improves teaching and learning for science. With the multimodality features provided by IWBs, young children are able to deal with multiple relations underpin the science concept. Multimodal representation styles are essential when explaining specific scientific concepts and ideas (Hennessy *et al.*, 2007; Preston and Mowbray, 2008). According to Murcia and Sheffield (2010), if compared with secondary students, young children are having high level of inquisition and imagination towards whatever that they see and

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touch and this is where IWBs play an important role in demonstrating skill and creating excitement about the scientific concepts. IWBs have been used successfully with kindergarten children at Abbotsleigh Junior School over the past five years in innovative ways to enhance teaching and learning and assessment in science (Preston and Mowbray, 2008). According to Betcher and Lee (2009), personal computer has no doubt continued to have huge impact on classrooms all over the world, but in most cases it is still more of a learning tool for students than a teaching tool for teachers.

Clarke (2004) reported that the UK Government has already invested heavily (approximately 50 million pounds) in the installation of IWBs in schools with the purpose of imparting an impact on teaching and learning. Lately, IWBs have made a rapid penetration into Australian schools and it has been the increasingly widespread availability of IWBs in teacher education institutions (Campbell and Kent, 2010). In year 2007, IWBs were introduced into the curriculum at teacher education programme in University of New England, Australia (Gregory, 2010). Furthermore, as part of the 2007-2008 State Budget, $28 million was allocated to the installation of IWBs-related technologies in New South Wales (NSW) state schools (Moses, 2007).

Random interviews with student teachers has revealed that the introductions of IWBs have created much excitement, concern and angst among them. Majority of them possess little experience and understanding about IWBs. Often when asking about innovative lessons with IWBs, they are unaware of subtle changes in the way teacher educators interact with them. This may due to the fact that IWBs are a relatively new teaching resource in Australia (Kearney and Schuck, 2008) and the implementation of IWBs is still in an immature stage especially in early education (Vincent, 2007). Gregory (2010) revealed that a large numbers of faculty members had not received training to be able to conduct and transfer IWB skills and knowledge to the student teachers. Naturally, levels of acceptance and use of IWBs among student teachers has become an important research topic. Having student teachers who are competent in using and managing IWBs are extremely important as they are expected to be on the frontline of the reform in the future when they enter the teaching profession. It is noteworthy to point out that the biases and stereotypes among student teachers may hold about the implementation of IWBs in schools. Indeed, many prior studies conveyed that student teachers' behavioural intention has a significant positive influence on their actual teaching practices in schools (Chen, 2010; Park, 2009; Teo and van Schaik, 2009). Besides, there is little conclusive and unproven evidence available about the IWBs acceptance and use among early childhood student teachers.

Given the crucial roles of student teachers in the process of implementing IWB and its features that seem to have important synergies for teachers dealing with young children, understanding IWB adoption is a worthwhile issue of enquiry and fruitful to explore. By understanding forces which shape student teachers' acceptance, it could reduce the level of resistance or rejection among them towards IWBs use. Indeed, in achieving excellence use of IWBs in early education programme, it is crucial to understand the dimensions that influence student teachers' behavioural intention regards to IWBs as a means for policymakers and teacher educators to design a curricula and syllabi which not only can improve the learning experience of student teachers in a teacher education programme but also ensure the new, upcoming teachers are capable to integrate IWB and become immanent in future teaching practices. In response, the purpose of the study is to understand factors that drive early childhood science student teachers to accept and use of IWBs and exploring the possible group differences based on IWB experience.

Theoretical framework

Acceptance of technology has been a topic that has occupied researchers for the last two decades. Various theoretical models have emerged to understanding variables that cause individuals to accept, reject or continue the use of new technology (Ajzen, 1985; Venkatesh and Davis, 2000; Venkatesh *et al.*, 2003). In this study, the theoretical grounding for exploring factors influencing student teachers' use of IWBs are drawn based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Figure 1). Venkatesh *et al.*'s (2003) model has become one of the most recently tested models in explaining user behaviour across a broad range of end-user in technology acceptance studies (Birch and Irvine, 2009; Chan *et al.*, 2010; Cheng *et al.*, 2011; Loo *et al.*, 2009; Schaik, 2009; Yang, 2010; Zhou *et al.*, 2010). The UTAUT model aims to explain users' intention to use an information system and their subsequent usage behaviour. This model was validated and found to have an R^2 of 70 per cent, indicating that the model explains 70 per cent of the variance in user intentions to use technologies, thereby outperforming its originating models (Venkatesh *et al.*, 2003).

The UTAUT model is based on the synthesis of eight well-established theories or models to assess the likelihood of success for new technology introductions (Venkatesh *et al.*, 2003). The eight theories or models include the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975), the technology acceptance model (TAM) (Davis, 1989), the motivational model (MM) (Davis *et al.*, 1992), the theory of planned behaviour (TPB) (Ajzen, 1991), the combined TAM and TPB (C-TAM-TPB) (Taylor and Todd, 1995), the model of PC utilisation (MPCU) (Thompson *et al.*, 1991), the innovation diffusion theory (IDT) (Moore and Benbasat, 1991) and social cognitive theory (SCT) (Bandura, 1986). Based on the review and synthesis of the eight theories, four core determinants of information system usage behaviours are formulated: performance expectancy, effort expectancy, social influence and facilitating conditions.

The construct of performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh *et al.*, 2003, p. 447). This construct is derived from the notions of perceived usefulness (TAM/TAM2 and C-TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT) and outcome expectations (SCT) (Venkatesh *et al.*, 2003). In the present context, performance expectancy refers to student teachers' belief that using IWB will help them to attain benefits related to teaching and learning practices.

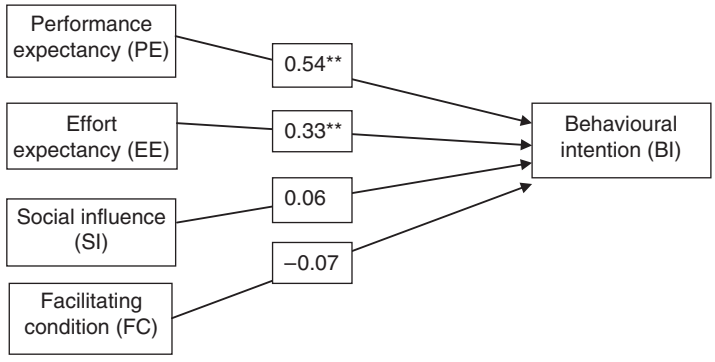

Figure 1.
Standardised path coefficients

Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh *et al.*, 2003, p. 450). Perceived ease of use (TAM/TAM2), complexity (MPCU) and ease of use (IDT) captured the concept of effort expectancy in UTAUT (Venkatesh *et al.*, 2003). The effort expectancy affects behavioural intention more saliently in the early adoption (Venkatesh and Davis, 2000). In the present context, effort expectancy refers to student teachers' belief that IWB would be free of effort and without annoying disturbances.

Social influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh *et al.*, 2003, p. 451). It integrated the aspects of subjective norm (TRA, TAM2, TPB/DTPB and C-TAM-TPB), social factors (MPCU) and image (IDT) (Venkatesh *et al.*, 2003). Also, the social influence affects behavioural intention more saliently in the early adoption (Thompson *et al.*, 1994; Venkatesh and Davis, 2000). In this study, social influence refers to the social factors, influencing the intentions to use IWB. This includes support and encouragement from educators and the university.

Finally, facilitating conditions is defined as "the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system" (Venkatesh *et al.*, 2003, p. 453). This construct is derived from the notions of perceived behavioural control (TPB/DTPB, C-TAM-TPB), facilitating conditions (MPCU) and compatibility (IDT). Venkatesh *et al.* (2003) noted that facilitating conditions influenced behavioural intention more saliently among experienced group. In the present study, facilitating conditions refer to the university environment and infrastructure that exerts an influence over student teachers' desire to use IWB. This includes knowledge and skills, individuals support and IWB accessibility.

In this research study, it is deemed to be more accurate to treat behavioural intention as dependent variable rather than actual behavioural due to the fact the implementation of IWB in teacher educational programme is still in its infancy stage and most of them possess little experience in using IWB in the classrooms. Besides, given that the use of IWBs were fully voluntary among student teachers and all the participants were female with ages between 18 and 21 years, the moderating factors of voluntary, gender and age suggested in the UTAUT model were excluded from the research model. Against this background, it is hypothesised that the four independent variables in the UTAUT model (performance expectancy, effort expectancy, social influence and facilitating condition) will exert significant influence on the behavioural intention to use IWBs and levels of student teachers experiences could moderate its relationships.

Method

Measures of the constructs

A self-report questionnaire was developed for the survey. Participants were asked to provide demographic information and respond to 16 items on the five constructs (performance expectancy, effort expectancy, social influence, facilitating condition and behavioural intention) in the study. Those items were adapted from the UTAUT model to make them relevant to the context of IWB acceptance and use among student teachers. The UTAUT model was tested and found to have an R^2 of 70 per cent indicating that the model explains 70 per cent of the variance in user intentions to use information technology (Venkatesh *et al.*, 2003). Besides, these items have been used in several previous studies of technology acceptance (Chan *et al.*, 2010; Zhou *et al.*, 2010; Yang, 2010; Cheng *et al.*, 2011). Respondents were asked to indicate the items on a

four-point Likert scale ranging from strongly disagree (1), slight disagree (2), slight agree, (3) and strongly agree (4). Each item was coded so that the higher the score, the more positive the level of entire constructs would be. All items were presented in English. The Appendix lists the items used in this study.

Subjects and procedure

Data used to test the research model were generated using convenience sampling approach. An invitation to participate in this study was made to student teachers enrolled in science-related papers from Bachelor of Early Childhood Education during the second semester of the 2011 academic year. A total of 112 respondents completed the survey questionnaire. All participants were female. This phenomenon was inevitable due to the cultural preponderance of female student teachers in the early childhood education programmes. Most of them (90.1 per cent) have not attended any formal IWBs training or workshop but they have little experience with using IWBs (48.7 per cent). The participation was voluntary and anonymous and no course credits were given. All participants were briefed on the purpose of the study and told of their rights to withdraw during or after the data collection. The questionnaires were distributed and collected during the final hour on the last day of lecture. On the average, students took about 15 minutes to complete the questionnaire.

Data analysis

The statistical analyses in this section include examining the descriptive statistics and assessed the reliability and validity of the measurement items used in this study. This was to ensure that the data would be adequate for structural equation modelling (SEM). Besides, standard two step of SEM has been employed in this study. Based on Schumacker and Lomax (2010), the first step involves examining the measurement model for all latent variables in the research model. This followed by examining the structural model whereby assessments on the contributions and significance of the manifest exogenous and endogenous variables towards IWB acceptance among student teachers were performed.

Results

Descriptive statistics

The descriptive analyses of the constructs are reported in Table I. All mean scores are above the midpoint of 2, ranging from 2.8 to 3.2. This indicates an overall positive response to the constructs in the study. The standard deviation (SD) values suggest a narrow spread around the mean. Univariate normality was assessed through the inspection of the skewness and kurtosis, with values <3.0 and 10, respectively, indicative of acceptable normality (Kline, 2005). The skewness and kurtosis indices for

Table I. Descriptive statistics of the study constructs

Construct	Item	Mean	SD	Skewness	Kurtosis
PE	3	3.23	0.50	−0.09	−0.43
EE	4	2.77	0.58	−0.48	1.04
SI	3	2.81	0.56	0.00	−0.22
FC	3	3.24	0.64	−1.12	1.56
BI	3	2.82	0.54	0.18	−0.39

all constructs are acceptable and internal reliability was also adequate. The data in this study are regarded as normal for the purposes of SEM.

Evaluation of the measurement model

The measurement model was assessed using confirmatory factor analysis (CFA). This was conducted with AMOS using the maximum likelihood estimation (MLE) procedure. Table II shows the result of the CFA. The factor loadings of the individual items in the five constructs are all above 0.67. This means at least half the variances in all the indicators were explained by their respective latent constructs. The principal component analysis also noted that these five constructs in the proposed model explained 55 per cent of the total variance. All standardised regression weights are above 0.60, except for SI3. However, that item was above 0.54 and it *t*-value was significant at the 0.000 level. A value of 0.50 or greater in standardised regression weights are considered appropriate (Hair *et al.*, 2010).

Test of convergent validity were conducted using average variance extracted (AVE) and composite reliability (CR) measurement. According to Hair *et al.* (2010), in order to ensure the AVEs index are adequate for testing SEM, it should equal or exceed 0.50. Table II shows that the AVE for each measure is above 0.58. This means that more than one-half of the variance observed in the items was accounted for by their hypothesised factors. The CR of each construct was assessed using Cronbach's α. The CR for all the factors in the measurement model ranges from 0.70 to 0.82 and it exceeds the recommended threshold value (Hair *et al.*, 2010).

To examine discriminant validity, this study compared the shared variance between factors with the AVE of the individual factors. Discriminant validity is present when the variance shared between a construct and any other constructs in the model is less than the variance that constructs shares with its indicators (Fornell *et al.*, 1982).

Latent variable	Item	Factor loading	SRE	Average variance extracted[b] ($\geqslant$0.50)*	Composite reliability[c] ($\geqslant$0.50)*
PE	PE1	0.679	0.61	0.65	0.79
	PE2	0.840	0.79		
	PE3	0.897	0.85		
EE	EE1	0.812	0.70	0.63	0.80
	EE2	0.815	0.71		
	EE3	0.814	0.79		
	EE4	0.724	0.67		
SI	SI1	0.799	0.64	0.61	0.67
	SI2	0.787	0.76		
	SI3	0.760	0.54		
FC	FC1	0.820	0.69	0.72	0.82
	FC2	0.912	0.97		
	FC3	0.818	0.68		
BI	BI1	0.771	0.60	0.58	0.70
	BI2	0.740	0.71		
	BI3	0.782	0.65		

Notes: SRE, standardised regression weight. [a]*t*-value (critical ratio) shows whether the parameter is significant at the 0.05 level; [b]AVE, average variance extracted = $(\sum\lambda 2)/(\sum\lambda 2) + (\sum(1-\lambda 2))$; [c]composite reliability = $(\sum\lambda 2)/(\sum\lambda 2) + (\sum(1-\lambda 2))$

Table II. Results of the measurement model

Table III shows the shared variances between factors were lower than the AVE of the individual factors, suggesting that discriminant validity was present in the proposed research model.

The five absolute fit indices: ratio of χ^2 to its degree of freedom (χ^2/df), goodness-of-fit (GFI), comparative fit index (CFI), Tucker-Lewis index (TLI) and standardised root mean square error of approximation (RMSEA) were employed in order to check model fit of the measurement model. Absolute fit indices measure how well the proposed model reproduces the observed data. According to Hair *et al.* (2010), the value of GFI and CFI should be >0.95 and that of the RMSEA <0.05 to be considered good fit. For χ^2/df, the value below 3 is considered acceptable. Finally, the TLI value should be >0.90. As shown in Table IV, all values are above the recommended thresholds for acceptable model fit and it confirms that the measurement model has exhibited a good fit.

Evaluation of structural model

A similar set of model-fit indices, χ^2/df, GFI, CFI, TLI and RMSEA, was used to test the structural model of the study. Table IV shows the results of the model test. Except for the χ^2, all values are above the recommended thresholds for acceptable model fit ($\chi^2 = 141.200$, $p < 0.01$; $\chi^2/\text{df} = 2.477$; GFI $= 0.932$; CFI $= 0.975$; TLI $= 0.966$ and RMSEA $= 0.07$). In the case of the χ^2, it has been found to be too sensitive to sample size differences, especially when it involves large samples. Hair *et al.* (2010) noted that, as the sample size increases, there is a great tendency for the χ^2 to indicate significant differences.

	CTE	PU	PEU	ATCU	BI
PE	(0.81)				
EE	0.08	(0.79)			
SI	0.20**	0.03	(0.78)		
FC	0.02	0.20**	0.05	(0.84)	
BI	0.48**	0.40**	0.15*	0.13*	(0.76)

Table III.
Discriminant validity for measurement model

Notes: Diagonal in parentheses: square root of average variance extracted from observed variables (items); off-diagonal: correlations between constructs. *$p < 0.05$; **$p < 0.01$

Fit indices	Values of measurement model	Values of structural model	Criteria[a]
χ^2 statistic	124.45**	133.30**	Insignificant but significant p-value can be expected
χ^2/df	1.30	1.33	<3
RMSEA	0.05	0.05	<0.08
GFI	0.90	0.90	$\geqslant 0.90$
CFI	0.94	0.94	$\geqslant 0.90$
TLI	0.93	0.93	$\geqslant 0.90$

Table IV.
Good-of-fit indices for the measurement model and structural model

Note: **$p < 0.01$

Sources: [a]References were taken from Hair *et al.* (2010) and Kline (2005)

Hypotheses testing

Figure 1 shows the standardised path coefficients for the UTAUT model regards to IWB acceptance and use among early childhood student teachers. From the figure, the paths for performance expectancy and effort expectancy were found to have a significant positive influence on behavioural intention to use IWBs ($\beta = 0.54$, $p < 0.00$ and $\beta = 0.33$, $p < 0.00$, respectively). Behavioural intention was found to be significantly determined by performance expectancy and effort expectancy with an R^2 of 0.41. That is, performance expectancy and effort expectancy had explained 41 per cent of the variance in behavioural intention of IWBs use among student teachers.

The study also investigated the experience differences. The results of the analyses of path-by-path comparison for the inexperienced group and the experienced group are shown in Table V. Unexpectedly, PE → BI, EE → BI, SI → BI and FC → BI did not differ between the inexperienced and experienced groups.

Discussion and conclusion

This study aims to examine the key predictors underlying early childhood student teachers towards IWBs acceptance and use. Based on the UTAUT as a research model, the results of this study showed that performance expectancy and effort expectancy have significant effect on behavioural intention to use IWBs, while social influence and facilitating condition does not. This is noteworthy in that, of the four variables in the UTAUT model, the model accounted for 41 per cent of the variance in behavioural intention to use IWB among student teachers. This suggests that the UTAUT is fairly efficient as a model to predict the behavioural intention to use IWBs among early childhood student teachers. As anticipated, performance expectancy and effort expectancy were found to have a direct and statistically significant positive effect on behavioural intention. These findings support the earlier studies (Venkatesh and Zhang, 2010; Wang and Shih, 2009; Wang *et al.*, 2009). The present study confirms the importance of performance (benefit) and effort (ease of use), and further shows that those factors can enhance IWB use among student teachers. It should also be noted that this pattern was in the direction theorised in the original UTAUT model (Venkatesh *et al.*, 2003). From the effect sizes, the most dominant determinant of behavioural intention is performance expectancy and followed by effect expectancy. This means, student teachers will engage themselves when they are able to see the value and benefits of using IWB. The high relationship between performance expectancy and behavioural intention also implies that efforts to prepare new teachers to use IWBs effectively should synchronise the implementation with its pedagogical benefits.

	χ^2	df	$\Delta\chi^2$ from revised model
Unconstrained revised model[a]	271.670	200	
Constrained paths[b]			
PE → BI	272.574	201	0.90 (ns)
EE → BI	273.191	201	1.51 (ns)
SI → BI	272.391	201	0.72 (ns)
FC → BI	272.612	201	0.94 (ns)

Notes: ns, not significant. [a]Paths for the groups were allowed to be freely estimated; [b]the path specified was constrained to be equal across the two groups

Table V. Path-by-path comparison for the experienced group and the inexperienced group

Unexpected interesting findings from this study were that social influence and facilitating condition did not have significant influence on IWBs among early childhood student teachers and this is not in accordance with the findings of Venkatesh *et al.* (2003). This finding might result from the limitations of the UTAUT's applicability to different user populations and setting, and its levels of voluntariness. This study focused on early childhood student teachers towards IWBs use, and this purposive sampling may have led to the insignificant relationships. For example, the results from the descriptive analysis indicated that all participants were at a young age of between 18 and 21 years, making them less likely to be influenced by others. Rhodes (1983) in the meta-analytic review of age effects has confirmed that affiliation needs an increase with age. This means, social influence might have less or no influence on behavioural intention among younger generation. This statement supported by Venkatesh *et al.* (2003) and conveyed that social influence was a stronger determinant of behavioural intention for older users than for younger users. Another plausible explanation for the insignificant relationships are of regard to the levels of voluntariness. Advocates noted that social influence was only significant in mandatory conditions of technology use (Hartwick and Barki, 1994; Venkatesh and Davis, 2000). Since student teachers tend to be relatively independent and have considerable autonomy over type of technology use, this result can be accepted.

This study further investigates if any IWBs experience differences exist in the effect of the determinants on behavioural intention. The findings obtained in this study fail to verify the predictions about IWBs experiences having moderating effects towards the relationships. The findings showed that IWBs experience did not moderate the effects of PE → BI, EE → BI, SI → BI and FC → BI. This reflects that whatever experiences an individual has those with higher performance expectancy and effort expectancy towards IWBs behavioural intention could have greater levels of intention to use IWBs than those in early stages of experiences towards IWBs. These results were not coherent with the UTAUT model and prior empirical studies (Chan *et al.*, 2010; Cheng *et al.*, 2011; Yang, 2010; Zhou *et al.*, 2010). This may be due to the fact that the IWB implementation in educational programme is still in an immature stage and lead to the situation whereby majority of the experienced participants (47 per cent) only possess very little experience in using IWB. The little experiences that have had among the participants were not statistically strong enough to moderate the relationships between performance expectancy and expert expectancy towards behavioural intention. However, this justification needs further examination and evaluation by having in-depth study on participants' experience.

Although care has been taken to ensure that the methodology in this study is sound, there are limitations. In this study, the participants are from a single university. Given the importance of selected demographic such as gander, age and voluntariness of use theorised in the original UTAUT model, future research should be replicated by using a larger sample and test for the model invariance across those selected demographic and background. Also, it is reasonable to expect that having multi-group comparison between student teachers and practicing teachers could further enhance the applicability and robustness of the UTAUT model. This is an important consideration given that practicing teachers are more likely than student teachers to be requested in regards to the use of technology. Finally, the selected determinants used in this study were not able to reflect the overall intention use of IWBs among early childhood student teachers as the total variance accounting for behavioural intention was only 41 per cent, leaving 59 per cent unexplained. Congruent with this finding,

future research should include different types of contextual variables in the study to account for the unexplained variance for intention use of IWBs.

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Appendix

Construct	Item	
Performance expectancy (PE) (adapted from Venkatesh *et al.*, 2003)	PE1	I would find using IWBs useful for teaching science
	PE2	Using the IWBs for teaching and learning in the science classroom would enable me to accomplish tasks more quickly
	PE3	Using the IWBs for teaching science would increase my productivity
Effort expectancy (EE) (adapted from Venkatesh *et al.*, 2003)	EE1	It would be easy for me to become skillful at using IWBs
	EE2	I would find it easy to use IWBs for teaching science
	EE3	Learning to use the IWBs for teaching science would be easy for me
	EE4	IWBs are difficult to understand
Social influence (SI) (adapted from Venkatesh *et al.*, 2003)	SI1	Educators who influence my behaviour would expect me to use IWBs for teaching science
	SI2	People who are important to me will think that I should use IWBs
	SI3	This university has been helpful with learning to use IWBs
Facilitating conditions (FC) (adapted from Venkatesh *et al.*, 2003)	FC1	I have the resources to practice with IWBs
	FC2	I have the knowledge and skills to use IWBs
	FC3	When I need help to use the IWBs, someone is there to help me

(*continued*)

Table AI. Constructs and corresponding items

Table AI.

Construct	Item	
Behavioural intention (BI) (adapted from Venkatesh *et al.*, 2003)	BI1	Whenever possible, I intend to use the IWBs for teaching science
	BI2	I think most of my teaching lesson will be conducted via IWBs
	BI4	I plan to use the IWBs for teaching science during my teaching practicum

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