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Computer self-efficacy and ICT integration in education: Structural relationship and mediating effects

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Abstract
Students become more actively involved in their studies when teachers integrate ICT into their lessons. Since computer self-efficacy is positively related to the integration of technology in education, improving pre-service teachers' computer self-efficacy could increase their intention to use technology. The present study explores the association between computer self-efficacy (basic technology skills, advanced technology skills, and technology for pedagogy) and pre-service teachers' intentions to use technology (traditional use of technology and constructivist use of technology). Data collected from 267 Bahrain Teachers College students were used to validate the questionnaires using confirmatory factor analysis. The Structural equation modeling approach was used to explore the hypothesized relationships. Mediation analysis was also performed, and the results indicated that basic technology skills and advanced technology skills mediated the relationship between technology for pedagogy and the traditional use of technology. Advanced technology skills did not mediate the relationship between technology for pedagogy and constructivist use of technology.

Keywords Information and Communication Technologies (ICT) · Self-efficacy · Structural equation modeling · Mediation analysis · Technology for pedagogy

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1 Introduction

The past decades have seen the rapid development in Information and Communication Technologies (ICT) and the pervasive use of digital devices in all sectors of life that transform the way of working and learning and our daily lives. The new generation of students is naturally conversant with computers, mobile phones, the internet, and social media. Considering these changes, educators attempt to embrace technology in teaching and learning to improve their instruction in the classroom, making lessons more exciting and motivating students with technology. The integration of ICT in teaching and learning has become a necessity in the teaching profession and modifies the way teachers organize their lessons (Finger et al., 2013; Tondeur et al., 2012; Khine, 2006a). Technology offers endless opportunities for students with rich multimedia resources, just-in-time learning, and personalized assessment of their success and deficit in acquiring knowledge and skills. For teachers, technology is an enabler that provides a flexible design of lessons to meet individual needs and keep track of the students' progress (Khine, 2006b; Geer & White, 2015).

Computers and technology devices are omnipresent in schools, and a new generation of students is using the digital device outside and inside the classrooms. Taber (2017) noted that technology tools increasingly support classroom teaching and learning. If such technology tools are widely adopted and used sustainably, they will support school learning. However, he warned that teachers do not get tempted by the novelty of technology but need to develop pedagogical skills and be familiar with the characteristics and capabilities of the technology. Numerous studies indicate that proper use of technology can motivate technology-savvy students, maintain students' interest in completing the assigned tasks, and allow teachers to provide students with enriching learning experiences. The use of technology makes it possible for students to explore knowledge on their own through rich multimedia resources on the internet, connect the new information with previous experiences and construct their meaning.

However, the successful implementation of technology integration in teaching depends on several factors, such as infrastructure, teachers' perceptions about technology use, readiness to incorporate technology, and self-efficacy. A study by Eksail and Afari (2020) contributed to the numerous studies on the acceptance of the technology and was the first study in Bahrain that explored pre-service teachers' intention to use technology in their teaching. The present study aimed to explore computer self-efficacy and ICT integration in education using data from pre-service teachers in Bahrain.

2 Information and Communication Technologies (ICT) in education

There are many obvious reasons why Information and Communication Technologies (ICT) must be used in education. It is abundantly clear that technology skills are one of the 21st -century competencies that equip learners for the future labor market.

Teachers can integrate technology in teaching to develop information searching, communication, problem-solving, and life-long learning skills among the students. As a result, schools worldwide invest a considerable amount of financial resources in building technology infrastructure and raising their teachers' level of ICT competencies. However, many obstacles still exist for teachers to use technology effectively and efficiently.

A recent systematic review by Turgut and Aslan (2021) revealed the factor affecting ICT integration in education. They observed that one of the most common issues is teachers' pedagogical competence and lack of ICT training. This view is supported in other studies that examine the hindrance of ICT utilization in schools. Esfijani and Zamani (2020) found that although teachers have adequate access to hardware in school and at home, they are unable to find software suitable for their teaching. This issue is common among teachers who teach in their national languages other than English. In another investigation, Graham et al. (2020) reported that it is vital to understand why teachers are not integrating ICT into their classrooms to assist in searching for remedies and enhancing ICT adoption. They suggest a need to foster pedagogical changes and improve conceptual understanding in teaching a specific subject. The findings indicate that teachers view technology integration as beneficial when it increases productivity. Another study by Dutta (2016) evaluated the effectiveness of E-learning projects in Bahrain public schools concerning staff training and engaging online learners among teachers and students. The results indicated that staff training helps improve the teaching and learning process, and in addition, E-learning improves students' skills for career perspectives.

2.1 Computer self-efficacy

Self-efficacy is the belief that one can perform a particular task. According to Bandura (1997), self-efficacy is the faith in one's capacity to manage and carry out the procedures of actions needed to generate given attainment. It, in turn, determines the steps an individual may take to achieve the goals. Bandura (1986) noted that self-efficacy could influence personal performance, participate more readily, and sustain more extended periods, thus attaining a higher performance rank. Self-efficacy perceptions tend to influence decisions about what behaviors to undertake (Woodcock & Jones, 2020; Wilson et al., 2020). Recently, there has been a renewed interest in computer self-efficacy due to the omnipresent computing devices. Computer self-efficacy refers to an individual's ability to apply specific computer skills to perform computer-related tasks. Loar (2018) noted that computer self-efficacy is associated with positive learning processes and outcomes, including training effectiveness, perceived ease of use, and intentions to use computers.

Gudek's (2020) study investigated computer self-efficacy and attitudes towards digital technology among 102 music teacher trainees. He found significant correlations between the level of computer self-efficacy and general computer knowledge and special computer knowledge. Gudek (2020) also found that attitudes towards digital technology significantly correlated with computer self-efficacy. The author suggests that instructors may plan technology-integrated lessons to improve instructional effectiveness and develop positive attitudes towards digital technology.

Baroudi and Shaya (2022) explored teachers' self-efficacy of 150 K-12 teachers from six Arab countries who taught language arts, science, history, and mathematics online during COVID-19. The results revealed a strong correlation between teachers' instructional strategies with self-efficacy and classroom management.

2.2 ICT integration and computer self-efficacy

It is occasionally found in school settings that teachers do not consistently maximize the use of ICT to enhance students' learning for various reasons. From teachers' perspective, computer self-efficacy is associated with technology integration, and developing teachers' computer self-efficacy could increase the use of ICT in the most effective ways. The use of technology by teachers is associated with several factors, including teachers' computer self-efficacy beliefs, levels of technological skills, prior experience, intention, and technological pedagogical content knowledge. There is also evidence that carefully designed professional development can improve teachers' computer self-efficacy and pedagogical skills in using ICT. Studies have shown strong connections between teachers' computer self-efficacy being a predictor of technology integration in teaching practices (Anderson et al., 2011; Menon et al., 2017). Past research suggests that preservice teachers with higher levels of technology self-efficacy are more confident about integrating technology in their future classrooms (Abbitt & Klett, 2007; Menon et al., 2017).

The study by Joo et al. (2018) addressed the issues related to the factors that influence pre-service teachers' intention to use technology and its relationships with teacher self-efficacy in Technology Acceptance Model (TAM) and Technological Pedagogical and Content Knowledge (TPACK) framework. This study involving a sample of 296 pre-service teachers, revealed that teachers' TPACK significantly correlated with self-efficacy and perceived ease of using technology. The teachers' TPACK also positively influenced their perceived ease of using technology and the perceived usefulness of technology in the classroom. The authors suggested that to encourage ICT use, the school administration must provide a stable infrastructure to use technology without any difficulties.

Several researchers have reported the role of teachers' self-efficacy in technology integration. One of the recent studies by Barton and Dexter (2020) investigated how professional learning about technology integration allows the reflection of self-efficacy. The authors interviewed six middle school math and science teachers to support teachers' technology integration. They found that professional learning supports teachers' access to three sources of self-efficacy information related to verbal persuasion, vicarious experiences, and mastery experiences. They argued that such information affords teachers to reflect, and the results can impact self-efficacy.

Using the TPACK framework and TAM model, Alharbi and Drew (2018) proposed a model to evaluate the role of individual differences in technology acceptance and the influence of self-efficacy in TPACK. They postulated that technology self-efficacy would affect perceived usefulness and perceived ease of use. Similarly, some of the TPACK constructs such as Technological Knowledge (TK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK) would affect perceived usefulness and perceived ease of use. However, their hypotheses are yet to be tested, and the model is to be validated in educational contexts.

Bakar et al. (2020) attempted to determine the relationships between mathematics teachers' self-efficacy in technology integration and TPACK. They administered a survey questionnaire to 66 secondary school mathematics teachers, and the results indicated that the mathematics teacher's self-efficacy with technology integration and TPACK were strongly associated. A study by Kundu et al. (2020) examined the correlation between teachers' self-efficacy and ICT infrastructure in schools with 400 teachers from 100 schools in India. The findings showed that teachers' overall ICT self-efficacy in three domains identified as technological efficacy, pedagogical efficacy, and integration efficacy was moderately low. It was also found that teachers' perceptions about ICT infrastructure in schools identified as training, ICT equipment, and management were also low. Significant and positive correlations were detected between all three domains of self-efficacy and three domains of ICT infrastructure. The authors suggested that training and ICT infrastructure play a vital role in improving teachers' ICT self-efficacy.

The study by Li et al. (2019a) involved 928 high school teachers to explore predictors that independently contribute to the technology used for different teaching purposes, either teacher-led presentations or student-centered teaching. A series of multilevel models were used to determine the independent effect of teachers' pedagogical beliefs, teachers' attitudes and beliefs towards technology and teachers' perceived teaching effectiveness. The results indicated that teachers' technology self-efficacy was significantly related to teachers' use of technology.

To explore the intention-behavior gap in the technology acceptance model Liu et al. (2019) conducted a study with 198 in-service language teachers in China. The study specifically examined the relationships between teachers' intention to use technology, their teacher-centered technology use, and student-centered technology use. The analysis showed a significant relationship between the teachers' intention to use technology and their teacher-centered technology use. However, no significant relations were found between teachers' intention to use technology and student-centered teaching. Further analysis of qualitative data revealed that facilitating conditions, prior technology experience, and technological pedagogical content knowledge (TPACK) were the main issues with student-centered technology use. Khine (2015) noted that TPACK, a theory that explains the set of knowledge that teachers need to use ICT effectively, is crucial for understanding successful technology integration in the teaching and learning process.

Several studies have documented the relationships between teachers' computer self-efficacy and their pedagogical use of technology. One such study was conducted by Mlambo et al. (2020) with 163 teachers in South Africa. The results showed that computer self-efficacy had a significant effect on the traditional use of ICT constructs and a significant relationship with the constructivist use of ICT. In addition, linear regression analysis found computer self-efficacy to significantly predict both traditional and constructivist use of ICT. The authors suggest providing training that emphasizes practical and hands-on sessions to the teachers. The authors believe that such training can impact teachers' computer self-efficacy.

Thurm and Barzel (2020) noted that teaching with ICT is not an easy task and teacher competencies about knowledge and beliefs are important factors in performing the teaching duties and suggested that professional development plays a crucial role in improving self-efficacy. The authors conducted a study using a quasi-experimental design involving 39 teachers in the experimental group who attended a professional development program, and 38 teachers who did not attend the program as a control group. A questionnaire was administered to measure the teachers' beliefs about teaching with technology, self-efficacy beliefs related to teaching with technology, epistemological beliefs, and frequency of technology use. The results revealed that the use of technology in the experimental group increased.

Taken together, these studies demonstrate a strong and consistent association between the use of ICT and self-efficacy. Although studies in other countries recognized the associations, research has yet to be systematically investigated in the Bahrain context. The present study explores the relationships between pre-service teachers' computer self-efficacy and intended ICT use.

2.3 Research hypotheses

The present study investigated the relationship between pre-service teachers' computer self-efficacy and their intended use of Information and Communication Technologies (ICT) for teaching. The proposed research model (see Fig. 1) was adapted from Teo (2009).

The model hypothesizes that pre-service teachers' computer self-efficacy beliefs are related to their intended use of technology for teaching. In addition, the study aimed to test and verify the mediation of technology for pedagogy (TP) between the traditional use of technology (TUT) and constructivist use of technology (CUT) through basic technology skills (BTS) and advanced technology skills (ATS).

The hypotheses for the study were as follows:

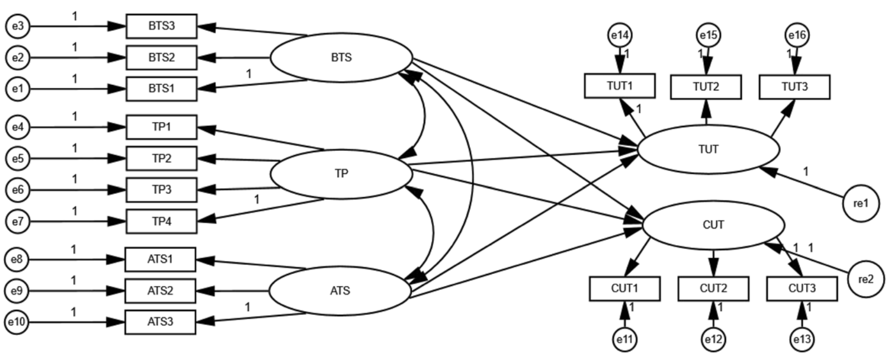

Fig. 1 Research model. Source: Adapted from Teo (2009)

Hypothesis 1 Computer self-efficacy dimensions (basic technology skills, advanced technology skills, technology for pedagogy) are significantly associated with:

- traditional use of technology

Hypothesis 2 Computer self-efficacy dimensions are significantly related to:

- constructivist use of technology

3 Methodology

3.1 Participants

Participants included 267 pre-service teachers (age M = 20.7, SD = 1.23; 212 females, 55 males). Pre-service teachers from Bahrain Teachers College, including year 1 (n = 85), year 2 (n = 58), year 3 (n = 48), and year 4 (n = 76), took part in the study. All the participants were preparing for careers in primary-school teaching. Bahrain Teachers College is one of the ten colleges of the University of Bahrain, with a student population of about 700. The researchers used convenience sampling to select participants for the study because of the easy accessibility of the participants.

This study followed strict ethical procedures. The study participants were informed explicitly about the nature and purpose of the research, its risk, and its benefits. Confidentiality is taken seriously and maintained for all parties involved in the study. The data collected are anonymous and without the names of the participants.

3.2 Measurement tools

Past research has disclosed the factors which impact teachers' technology use in education and their behavioral intention to use technology (Chang & Wang, 2008; Liu et al., 2009), but only a few have investigated how teachers use technology in teaching (e.g., Teo, 2009). For this reason, data for the present study involved administering all five-factor questionnaires consisting of 16 items developed by Teo (2009). He developed a scale to measure pre-service teacher's computer self-efficacy, which comprised three constructs of 3-items of Basic technology skills (BTS), 3-items of Advanced Technology Skills (ATS), and 4-items of Technology for Pedagogy (TP). Sample of the items are as follows: "I can use video editing software (e.g., photo stage, VSDC).", and "I search, evaluate, and select appropriate IT resources to support lesson activities."

Another scale to measure the use of technology for teaching comprised two constructs: Three items of Traditional Use of Technology (TUT) and three items of Constructivist Use of Technology (CUT). Examples of the items are “In my lesson, I will use technology to teach my students to master skills just taught” and “In my lesson, I will use technology to teach my students to work collaboratively.” The items were rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The items were translated from English to Arabic, then back-translated to ensure that the Arabic version maintained the meanings and concepts of the original.

4 Data analysis

The data were analyzed using the structural equation modeling (SEM) approach to explore the relationships among the latent variables using AMOS version 27 software (Arbuckle, 2020). According to Kline (2016), as an advanced statistical technique, SEM can be viewed as a combination of factor analysis and regression analysis. Confirmatory factor analysis (CFA) was conducted to assess the measurement model using AMOS version 27 using the maximum likelihood estimation (MLE) procedure. Convergent validity was conducted to assess whether scores on items assessing a single construct are strongly intercorrelated and measure the same underlying dimension (Schumacker & Lomax, 2016).

Construct validity was examined using standardized regression weights of measurement items, composite reliability (CR), and average variance extracted (AVE). The criterion of discriminant validity was that the square root of the average variance extracted (AVE) for each construct must be larger than the inter-construct correlation (Barclay et al., 1995).

Kline (2016) suggested that the model fit should be evaluated by the comparative fit index (CFI), Tucker-Lewis index (TLI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA). Finally, hypotheses in the research model were tested.

4.1 Mediating effect

Mediational analyses examining indirect effects were conducted with Mplus 8.3 (Muthen & Muthen, 1998–2019). The following were examined:

1. Whether the relationship between TP and TUT was mediated by BTS and ATS.
2. Whether the relationship between TP and CUT was mediated by BTS and ATS.

According to Wang et al. (2020), the direct effect is reduced but still significant (partial mediation) when mediator variables are introduced. Also, complete mediation indicates that the direct effect is not significant after introducing the mediator variables.

4.2 Descriptive statistics

The means were above the mid-point of 3.0, indicating an overall positive response to the five constructs in the model. The standard deviations ranged from 0.52 to 0.80, indicating that the item scores were spread narrowly around the mean. Skewness values ranged from −0.08 to 0.16, and kurtosis values ranged from −0.28 to 0.31. and this supports the univariate normality of the items (Kline, 2016). A measure of multivariate normality (Mardia's coefficient) was less than the recommended value (Raykov & Marcoulides, 2008). Hence, the requirement of multivariate normality was satisfied.

5 Findings

5.1 Measurement model

CFA was conducted with AMOS 27.0 (Arbuckle, 2020) using the maximum likelihood estimation (MLE) procedure to assess the measurement model. According to Schumacker and Lomax (2016), all the standardized factor loadings should be greater than 0.60. In the present study, all standardized factor loadings were statistically significant and ranged from 0.61 to 0.81 (see Table 2), indicating adequate estimation results (Hair et al., 2019). The suggested minimum value of the average variance extracted (AVE) for each factor is 0.5 (Fornell & Larcker, 1981; Nunnally & Bernstein, 1994). Table 2 shows that the average variance extracted (AVE) ranged from 0.51 to 0.61, indicating an acceptable level of convergent validity. The composite reliability (C.R) of each construct was higher than 0.70, indicating adequate reliability (Nunnally & Bernstein, 1994). All the squared multiple correlations (R^2) values were greater than 0.50. This suggests that more than 50% of the variance in each item had been explained by the model (Li et al., 2019b).

The discriminant validity was assessed by comparing the square root of the average variance extracted (AVE) for a given construct with the correlations between that construct and all other constructs. Table 1 shows that the diagonal elements in the correlation matrix have been replaced by the square roots of the AVE and were greater than the inter-construct correlation. This indicates that the discriminant validity in the proposed model was satisfactory (Schumacker & Lomax, 2016). The results of the model fit indicate that the measurement model fits the data well (χ^2=177.81, $\chi^2/_{df}$ = 2.04, TLI = 0.92, CFI = 0.94, SRMR = 0.07, RMSEA = 0.06 [0.04; 0.08]) (Table 2).

5.2 Structural model

The structural equation modeling (SEM) analyses were conducted with AMOS 27 (Arbuckle, 2020) using the maximum likelihood estimation (MLE) procedure.

Table 1 Descriptive statistics, intercorrelations and discriminant validity

	1	2	3	4	5
1. Basic Technology Skill (BTS)	**(0.78)**				
2. Advanced Technology Skill (ATS)	0.25**	**(0.75)**			
3. Technology for Pedagogy (TP)	0.41**	0.48**	**(0.71)**		
4. Traditional Use of Technology (TUT)	0.44**	0.41**	0.56**	**(0.72)**	
5. Constructivist Use of Technology (CUT)	0.58**	0.23**	0.42**	0.50**	**(0.71)**
Mean	4.10	3.28	3.89	3.70	3.61
Standard deviation	0.70	0.80	0.52	0.67	0.52
Skewness	-0.07	-0.08	-0.03	-0.08	0.16
Kurtosis	-0.28	0.21	0.31	0.12	0.13

** were significant at $p < 0.01$. Bold values in diagonal are the square root of AVE

Table 2 Confirmatory factor and reliability analysis

Constructs	Standardized Factor Loading	t-value
Basic Technology Skill (BTS) (C.R. = 0.83; AVE = 0.61)		
BTS1	0.79	**
BTS2	0.81	12.91
BTS3	0.75	12.20
Technology for Pedagogy (TP) (C.R. = 0.80; AVE = 0.51)		
TP1	0.66	8.57
TP2	0.76	9.43
TP3	0.68	8.56
TP4	0.74	**
Advanced Technology Skill (ATS) (C.R. = 0.80; AVE = 0.57)		
ATS1	0.61	5.66
ATS2	0.87	7.33
ATS3	0.77	**
Traditional Use of Technology (TUT) (C.R. = 0.77; AVE = 0.52)		
TUT1	0.71	**
TUT2	0.74	9.35
TUT3	0.72	9.06
Constructivist Use of Technology (CUT) (C.R. = 0.76; AVE = 0.51)		
CUT1	0.75	5.23
CUT2	0.68	5.18
CUT3	0.71	**

Model Fit Statistics ($\chi^2 = 177.81$, $\chi^2/df = 2.04$, TLI = 0.92, CFI = 0.94, SRMR = 0.07, RMSEA = 0.06)[0.04; 0.08]

** = Items constrained for identification purposes

C.R. = Composite Reliability; AVE = Average variance extracted

Table 3 Structural model test results

Hypothesized relationships	Standardized estimates	t-values	Hypothesis supported
Hypothesis 1			
BTS → TUT	0.22	2.58**	Supported
ATS → TUT	0.16	1.70 ns	Not Supported
TP → TUT	0.54	4.18***	Supported
Hypothesis 2			
BTS → CUT	0.75	7.23***	Supported
ATS → CUT	-0.06	-0.56 ns	Not Supported
TP → CUT	0.46	3.29***	Supported
Squared Multiple Correlation (R^2):			
TUT	0.52		
CUT	0.57		
Model Fit Statistics:			
χ^2= 177.62, df = 91, CFI = 0.94, TLI = 0.92, SRMR = 0.07, RMSEA = 0.06 [0.05; 0.07]			

**$p < 0.01$; ***$p < 0.001$; ns (non-significant)

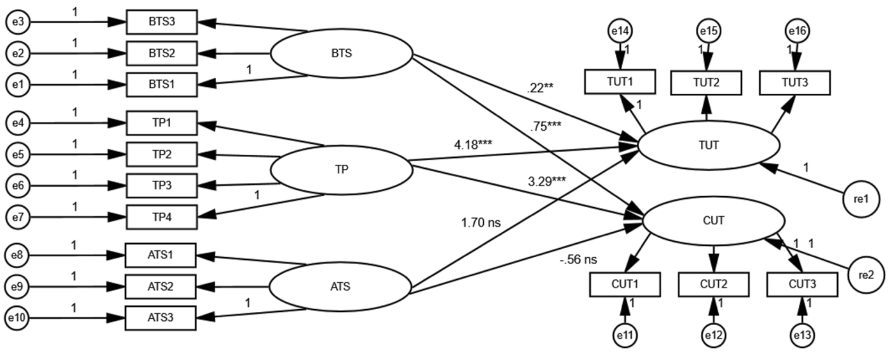

Fig. 2 Structural model with standardized coefficients

The connection strength (path coefficient) of SEM represents the response of the dependent variable to a unit change in an explanatory variable when other variables in the model are held constant (Bollen, 1989).

Figure 2 shows the SEM model. As suggested by the goodness-of-fit indices, the hypothesized model fitted the data well: $\chi^2(91, N = 267) = 177.62$, CFI = 0.94, TLI = 0.92, SRMR = 0.07, RMSEA = 0.06, RMSEA 90% confidence interval (0.05; 0.07). Four out of the six possible relationships were supported by the data in terms of statistically significant ($p < 0.05$) standardized estimates (see Table 3):

Hypothesis 1: The results reported in Table 3 indicate statistically significant relationships between basic technology skills and traditional use of technology. In addition, technology for pedagogy was statistically significantly related to the traditional use of technology. However, advanced technology skills were not statistically significantly related to the traditional use of technology.
Hypothesis 2: Basic technology skills and technology for pedagogy were statistically significantly associated with constructivist use of technology. However, a non-statistically significant relationship was reported for the association between advanced technology skills and constructivist use of technology.

The standardized path coefficients are represented in Fig. 2 for two endogenous variables of the traditional use of technology and the constructivist use of technology. BTS and TP were statistically significant factors of:

(1) Traditional use of technology with $R^2=0.52$ (52% of variance explained).
(2) Constructivist use of technology with $R^2=0.57$ (57% of variance explained).

5.3 Mediating effects

The indirect effects from TP to TUT through BTS and ATS were all statistically significant. In addition, the indirect effect from TP to CUT through BTS was statistically significant, but the indirect effect from TP to CUT through ATS was not statistically significant (see Fig. 3). TP had statistically significant indirect effects on TUT through the mediators of BTS (estimate = 0.098, SE = 0.003), and ATS (estimate = 0.082, SE = 0.003). On the other hand, TP had statistically

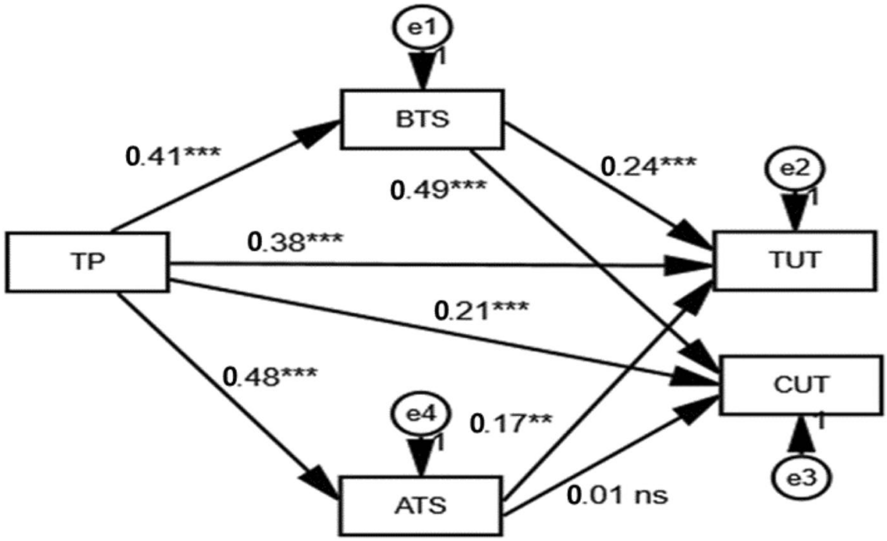

Fig. 3 Mediation model

Table 4 The standardized indirect effects of TP on CUT and TUT

Path	Estimate	SE
TP→ BTS → TUT	0.098**	0.003
TP→ ATS → TUT	0.082**	0.003
TP→ BTS → CUT	0.201**	0.002
TP→ ATS → CUT	0.005ns	0.003

**$p < 0.01$; ns (non-significant)

significant indirect effects through BTS (estimate = 0.201, SE = 0.002). However, the indirect effect of TP through ATS on CUT was not statistically significant (see Table 4).

The results revealed that Bahrain pre-service teachers' basic technology skills and advanced technology skills played a prominent mediating role in the relationship between technology for pedagogy and the traditional use of technology. These suggest that teacher educators should emphasize building pre-service teachers' ability to improve their basic and advanced technological skills to encourage them to integrate technology into their teaching.

6 Discussion

The relationship between pre-service teachers' computer self-efficacy and the intended use of technology in a teacher's college in Bahrain was examined. Structural equation modeling analysis suggested that pre-service teachers' perception of their basic technology skills was statistically significantly related to either traditional use of technology or constructivist use of technology. In addition, the statistical results showed that pre-service teachers' perceived ability to use technology for pedagogy was statistically significantly associated with either traditional use of technology or constructivist use of technology. However, pre-service teachers' perceived ability to apply advanced technology skills in teaching was not statistically significantly related to either traditional use of technology or constructivist use of technology. These results replicate prior studies conducted in a teacher training institute by Caner and Aydin (2021), Eksail and Afari (2020), and Teo (2009), which has contributed to the theory by emphasizing the relationship between pre-service teachers' belief about their ability to use technology and how they would use technology in teaching.

Correlational analyses suggested that teachers' beliefs about the traditional use of technology had a moderate and statistically significant correlation with constructivist use of technology. Suggesting that the idea of preservice teachers actively constructing their knowledge might significantly relate to traditional uses of technology. This might imply that pre-service teachers may find the need to use technology traditionally while utilizing student-centered learning in a constructivist classroom environment. This is consistent with studies by Teo et al. (2008), Chai et al. (2009), and Sugar et al. (2004).

Results of this study further indicated that pre-service teachers' ability to use technology for pedagogy has a positive indirect effect on traditional use of technology via both basic technology skills and advanced technology skills. In addition, pre-service teachers' ability to use technology for pedagogy has a positive indirect effect on constructivist use of technology via basic technology. However, pre-service teachers' ability to use technology for pedagogy did not have a statistically significant indirect effect on constructivist use of technology via advanced technology skills.

6.1 Recommendations

This study demonstrates the interplay between the various factors of intended technology use of teachers and their computer self-efficacy among teachers in Bahrain. The findings from this study can assist in designing professional development programs to equip teachers with the necessary technology and pedagogical skills in integrating ICT into their daily teaching.

According to Dutta (2016), professional development is essential for teachers as it enhances the teaching experience and helps teachers be more independent in technology use. It is recommended that future studies should involve larger samples of students from all universities in Bahrain.

6.2 Limitations

The present study is not without limitations. Since this study used data from a self-reported questionnaire, it may not be the most accurate source of data. Research from multiple perspectives, such as interviews, observations, and case studies, would provide a more comprehensive picture of the relationship between pre-service teachers' computer self-efficacy and their intended use of technology for teaching. This study involved a relatively small number of students from Bahrain Teachers College, so it is unlikely that the results of the study would apply to other universities in Bahrain.

6.3 Conclusion

The present study explores the relationship between Bahrain pre-service teachers' computer self-efficacy and their intentions to use technology in teaching. The results support existing literature about using technology to enhance classroom teaching and learning. The findings shed light on the relationship between pre-service teachers' beliefs about their ability to use technology and how they would use technology in their teaching. Further, the study also revealed the mediational role of basic and advanced technological skills in the association between technology for pedagogy and the traditional use of technology.

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Data availability The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest None.

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