

Jordanian Pre-Service Teachers' and Technology Integration: A Human Resource Development Approach

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ABSTRACT

The purpose of this study was to test a model in which technology integration of pre-service teachers was predicted by a number of university-based and school-based factors. Initially, factors affecting technology integration were identified, and a research-based path model was developed to explain causal relationships between these factors. The results supported the hypothesized causal model. The model parameter estimates clearly revealed that a number of factors influenced pre-service teachers' technology integration in their field training. With regard to the university-based factors, the modeling of technology was a highly influential factor impacting pre-service teachers' technology self-efficacy, technology proficiency, and usefulness of technology. Technology self-efficacy was the most important factor with the highest direct effect on technology integration. With regard to the school-based factors, the support structure was the most influential factor with the highest direct effect on technology integration. This study provides some evidence that this model is helpful in determining pre-service teachers' efforts to integrate technology into their classroom practice during field training.

Keywords

Pre-service teachers, Technology integration, Human resource development, Jordan

Introduction

In recent years, the use of computer technology in education has gained global acceptance. Computer technology is widely used as an instructional tool in almost every teaching-learning setting and its use is continuing to expand (Hogarty, Lang, & Kromrey, 2003). There is a general belief that technology integration in the curriculum may result in improvement of classroom instruction (Libscomb & Doppen, 2004) and ultimately may provide students with the needed skills to survive and compete in the twenty-first century digital society (Norris, Sullivan, Poirot, & Soloway, 2003). Further, it may improve students' learning (Mills & Tincher, 2003); critical thinking skills (Harris, 2002); and achievement, motivation, and attitudes (Waxman, Lin, & Michko, 2003).

Technology can provide powerful tools for students' learning, but its value depends upon how effectively school teachers use it to support instruction in the classroom (Fulton, Glenn, & Valdez, 2004). One promising area of research involves the study of technology integration in the classroom by pre-service teachers. Pre-service teachers are viewed as the transmitters of up-to-date knowledge and can effectively link theory into practice. The ability of pre-service teachers to integrate technology into the curriculum is needed to guarantee their future success and the success of their students. To this end, many teacher-education programs are concerned with how to properly provide pre-service teachers with the technology-related attitudes and skills needed to integrate technology into classroom practices (Wilson, 2003). It is well documented in the literature that the teacher-education courses that expose pre-service teachers to technology play a major role in pre-service teachers' overall use of technology and may assist them in learning to integrate technology into their future classroom practice (Collier, Weinburgh, & Rivera, 2004; Pope, Hare, & Howard, 2002).

Models of technology use by pre-service teachers have been developed over the past few years. For example, Venkatesh, Morris, Davis, and Davis (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT). They suggested that eight elements play an important role in technology acceptance: gender, age, experience, voluntariness of use, performance expectancy, effort expectancy, social influence, and facilitating conditions. These variables were found to predict 70% of the variance in user intentions toward computer technology. Yuen and Ma (2002) used the Technology Acceptance Model (TAM) with pre-service teachers to examine the influences of perceived usefulness and perceived ease of use on their intention to use. The results of the study indicated that perceived usefulness had a significant positive effect on intention and usage but not on perceived ease of use. Likewise, Smarkola (2007) and Ma, Andersson, and Streith (2005) used a modified version of the TAM

to examine determinants for pre-service teachers' use of computer technology. They discovered that perceived usefulness and ease of use of the technology were the key factors.

Dexter and Riedel (2003) found that pre-service teachers' comfort with technical skills (e.g., word processors and Internet browsers) and availability of computers at school site was rated the highest in their effect on technology integration in the teaching process. In their study, based on individual interviews, pre-service teachers indicated that technology was not modeled by instructors via the courses taught. Chen (2004) found that pre-service teachers increased their confidence in using computer technology by having experiences from a previous computer course. Chen (2004) asserts that "teachers need to have the confidence and positive attitudes towards computers that will motivate them to integrate computers into their instructional strategies" (p. 50). Moreover, Anderson and Maninger (2007) found that pre-service teachers' self-efficacy was the best predictor of technology use in the classroom. Further, Smarkola (2008) used the decomposed theory of planned behavior to examine pre-service teachers' intentions to use computer technology in their teaching. The results indicated that usefulness of computers and computer confidence were the best predictors.

Based on the above discussion, it is obvious that regardless of the level of available infrastructure and support from administration, there is concern as to whether pre-service teachers are prepared to integrate the technology that is available to them into teaching (Brown & Warschauer, 2006; Firek, 2002; Ma, Andersson, & Streith, 2005). Some of these factors were modeling of technology, computer self-efficacy, computer proficiency, and perceived usefulness of technology. The present research is an attempt to modify previous research models by proposing a new model that is more relevant to pre-service teachers.

Teacher-education research suggests that pre-service teachers need to observe university faculties modeling technology in their courses to learn how technology can be effectively used to enhance instruction (O'Bannon & Judge, 2004; Schrum, Skeeel, & Grant, 2003). It is through these courses that pre-service teachers are to receive all the training that they will need to integrate technology into their teaching upon entering their classroom practice (Banister & Vannatta, 2006). On the other hand, it is suggested that modeling technology in university courses may improve students' technology self-efficacy, technology proficiency, and the perceived usefulness of technology. Further, overall support and technology availability also influenced the use of technology in the classroom.

The first university-based factor is technology self-efficacy. Technology self-efficacy refers to pre-service teachers' perceptions of their ability to use technology effectively in the classroom. According to Social Learning Theory (Bandura, 1997), successful past experience with technology (vicarious experiences) would be expected to lead to higher self-efficacy whereas poor past performance would tend to lower self-efficacy (Wood & Bandura, 1989). It is therefore likely that those pre-service teachers who receive some type of training about how to use relevant dimensions of technology may develop and report more positive efficacy beliefs (self-confidence levels) than those who do not receive such training (Dawson & Rakes, 2003). These high self-efficacy beliefs, in turn, would lead to pre-service teachers' successful integration of technology in instruction (Bandura, Adams, & Beyer, 1977; Wall, 2004).

The second university-based factor is technology proficiency. Pre-service teachers are expected to be knowledgeable about current technology and how it can be used to promote learning (Jacobsen, Clifford, & Friesen, 2002). It is well established in the literature that improvements in university students' technology proficiencies were reported during their courses of study in which technology was integrated (Anderson & Boarhwick, 2002). This technology proficiency, in turn, is one of the most important characteristics influencing pre-service teachers' success at integrating technology in instruction (Hernandez-Ramos, 2005; Kanaya, Light, & Culp, 2005).

The third university-based factor is the perceived usefulness of technology, meaning the degree by which pre-service teachers feel technology is useful for present and/or future work. When pre-service teachers are exposed to technology during coursework, various aspects of such technology may enhance their perceptions of the usefulness of the technology in their future jobs. In turn, such perceived usefulness of technology plays a critical role in predicting integration of technology in the classroom (Mathieson, Peacock, & Chin, 2001).

Previous research has also emphasized the importance of other factors impacting technology integration in the classroom. Among these highly influential factors is overall support and technology availability. Overall support is support that is technical in nature or comes from teachers and administrators. Both types of support have often been

considered to be influential factors in teachers' technology-integration practices (Grant, Ross, Wang, & Potter, 2005; O'Dwyer, Russell, & Bebel, 2004). Moreover, research has also emphasized the importance of the support that comes from the school principal as well as from cooperating teachers, which is the primary stimulus for incorporating technology in the classroom (Zhao & Frank, 2003). The other factor that is important to pre-service teachers' technology integration is the availability of the technology. Access to technology has been thought of as a main obstacle for technology integration for the last decade (Culp, Honey, & Mandinach, 2003). Without adequate technology, pre-service teachers may have little opportunity to integrate technology into the classroom (Morris, 2002). Field placements in technology-enriched environments have been found in the research to be a positive factor contributing to technology integration (Karagiorgi, 2005). Although pre-service teachers are prepared to use technology in their field placements, the lack of support and technology availability (access to computers and software) also play an important role in integrating technology into the classroom (Vannatta & Fordham, 2004; Wozney, Venkatesh, & Abrami, 2006). In short, pre-service teachers' integration of technology is indeed influenced by factors found in both the university environment and field-training environment.

Statement of the problem

How to prepare pre-service teachers to integrate technology in the classroom has been a subject of concern in recent years. Even though the integration of technology in the classroom has the potential to enhance students' learning, the research continues to report that pre-service teachers are not utilizing technology in the classroom during their field training (Morris, 2002). The primary purpose of this study is to develop and test two path models, one related to the university environment, and the other related to the school environment. The first path model describes an antecedent variable (the modeling of technology in teacher-education courses) that influence multiple university-based variables (technology self-efficacy, technology proficiency, and perceived usefulness of technology) of pre-service teachers' efforts to integrate technology in the classroom. The second path model tests the effects of two school-based variables (overall support and technology availability) on pre-service teachers' effort to integrate technology in the classroom.

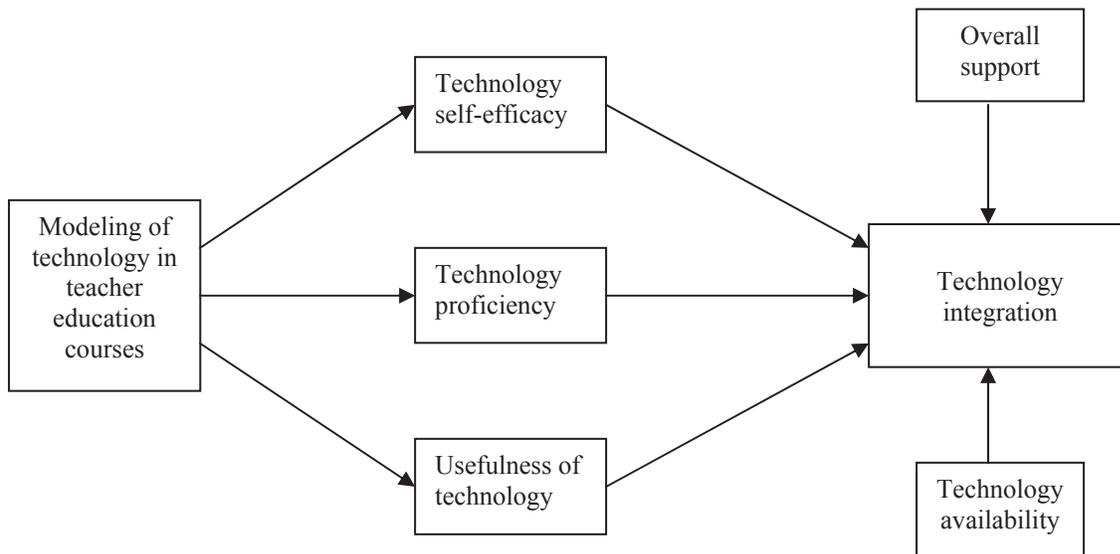


Figure 1. A model of pre-service teachers' integration of technology

Overview of the model

The first research model hypothesized a positive link from the modeling of technology in teacher-education courses to three university-based factors (technology self-efficacy, technology proficiency, and usefulness of technology). The aforementioned university factors are also hypothesized to positively influence technology integration. The second research model hypothesized a positive link from two school-based factors (overall support and technology availability) to technology integration. The two path models are isolated but are related through their impact on technology integration, meaning that in order for the first path model to take place, the second path model should be in place. Figure 1 presents the hypothesized relationships.

Methodology

Research design

The design employed in this study was a descriptive survey research design in which factors impacting pre-service teachers' technology integration were investigated through survey instrument. Path models of the direct effects of prediction variables were tested. To assess the adequacy of the models' fit, path analysis was conducted using LISREL 8.51 procedures (Joreskog & Sorbom, 1993).

Study context

The present study took place in one of Jordanian public universities. The undergraduate program prepares classroom teachers in capstone courses related to the curriculum, teaching sources, teaching methods, and technology use in a variety of subjects including Arabic language, Islamic studies, social studies, science, math, and vocational education. Within this program, faculty members utilize instructional technology (e.g., Blackboard and Integrity systems) and micro-teaching to deliver high-quality instruction. Moreover, students are required to interact with this technology in the form of discussion boards, digital drop boxes, video watching, and presentations. On the last semester prior to graduation, pre-service teachers are required to attend practicum training in hosting schools, teaching actual classes. Pre-service teachers usually teach all courses for grades 1 to 4 five days a week from 7:30 AM to 2:15 PM. Further, pre-service teachers are required to spend three hours per week on the university campus, meeting with faculty members to discuss their field experience and effective methods of integrating technology into classroom instruction.

Population and sample

The target population for this study was the 1120 classroom teachers who attended the teacher-education program at a public university in Jordan for the academic years 2006 through 2009. The sample of this study comprised 1,008 pre-service teachers who volunteered to participate in the study. All pre-service teachers were seniors in their final semester prior to graduation. The study sample was mostly females (83%).

Instrumentation

A 36-item survey was used in this study. The instrument was developed from several sources. The first part of the instrument, the technology self-efficacy sub-scale with 10 items, was adopted from the computer attitude measure developed and tested by Gressard and Liroyd (1986). An example of items includes "I have a lot of self-confidence when it comes to working with computer technology" and "I think using a computer would be very easy for me." Few of the scale items were reworded (e.g., the term "very difficult" was changed to "very easy"). This self-efficacy subscale has been found to be a valid and reliable measure. The coefficient alpha reliability for the subscale was .91 (Gressard & Liroyd, 1985) and .89 (Gressard & Liroyd, 1986). Respondents were asked to rate each item along a five-point Likert scale as follow: (1) strongly disagree, (2) disagree, (3) uncertain, (4) agree, and (5) strongly agree. A higher score on the total score indicates a more positive self-efficacy beliefs related to computer technology. The second part of the instrument, the perceived usefulness of computer technology, is adapted from the TAM (Davis, Bagozzi, & Warshaw, 1989) and included six items. This subscale is intended to assess the learners' perceptions of

the usefulness of technology. An example of items in this subscale includes “using technology would enhance my effectiveness on the job” and “using computers would make it easier to do my job.” The coefficient alpha reliability for the subscale was .94 (Arbaugh, 2000), emphasizing its reliability for future use. Respondents were asked to rate each item along a five-point Likert scale as follow: (1) strongly disagree, (2) disagree, (3) uncertain, (4) agree, and (5) strongly agree. A higher score on the total score indicates a more positive perceived usefulness of technology.

An Arabic version of the two subscales was achieved through a standard three-step protocol. First, the two subscales were translated from English into Arabic language by a professional scholar fluent in both English and Arabic. Second, the two subscales were translated back from Arabic into English language by a second professional scholar, also competent in both English and Arabic. In the final step, a third professional scholar, fluent in both English and Arabic, compared and evaluated the original English and back-translated copies in order to verify the accuracy and validity of translation. Then, nine specialists in education and technology reviewed the two developed subscales, and two of them asked for minor modifications. The final copy of the questionnaire took these modifications into consideration.

The researchers developed the other five scales used in the study with the assistance of several content judges who had expertise in the use of technology in the classroom. Scale items were drafted by the researchers and submitted to several content judges for review. Based on their feedback, items were added, dropped, or reworded where necessary. A pilot-study preliminary questionnaire with a group of 25 students and instructors was conducted. Pilot testers read the items aloud in order for the researchers to determine if their interpretations of items matched the intended meanings. Feedback from this pilot study led to minor modifications in the wording of several items. The five subscales along with examples of items were as follow: modeling of technology (technology integration was discussed in one or more of my courses this semester); technology proficiency (I have the skills necessary to use computers for instruction); technology integration (I had opportunities to integrate technology into my student teaching experiences); overall support (the classroom teacher I worked with was supportive of using computers in the classroom); and technology availability (materials such as software and printer supplies) for classroom (computers are readily available for use).

Exploratory factor analysis was conducted to provide some evidence of construct validity for the measures. In the present study, exploratory common factor analysis was used to identify the underlying latent structure of the data. The criteria for determining how many factors to extract included the eigenvalue greater than one rule and a visual inspection of the scree plot. The initial analysis was run without specifying how many factors to retain. This procedure resulted in seven factors with 36 items, explaining 54.34% of the common variance. Items were retained on factors with a minimum loading of .30, but were not retained if they had a cross loading above .20. Factor loadings for items retained in this solution ranged from .33 to .83, with an average loading of .61 on major factor and .05 on the rest of the factors. The results of the factor analysis closely paralleled the hypothesized variables and the following scales and items emerged: modeling of technology (6 items) technology self-efficacy (7 items), technology proficiency (5 items), usefulness of technology (6 items), technology integration (4 items), overall support (4 items), and technology availability (4 items). All of these scales used a five-point Likert scale, with values ranging from 1 (strongly disagree) to 5 (strongly agree). Estimates of reliability using Cronbach’s alpha were acceptable for all scales ranging from .73 to .90 (see Tables 1 & 2).

Data collection

The researchers, who have been major participants in the teacher-education program for the past five years, contacted pre-service teachers in person at school and through on-campus meetings to participate in the study. The researchers explained to the participants the purpose of the study and encouraged them to read the statements carefully before ticking the appropriate choice. The volunteer participants were also insured confidentiality and anonymity. Further, participants were also informed that the instrument takes approximately 15 to 20 minutes to complete. Finally, instruments were handed out and collected by the researcher.

Data analysis

The Pearson product moment correlation coefficient was the statistical measure used to determine the strength of the associations among the hypothesized variables (Table 1). An alpha level of .05 was used to determine the

significance of relationships. All variables were tested using covariance matrices generated by PRELIS and utilized the maximum-likelihood method to estimate parameters in the path model. In path models there are two types of variables: exogenous and endogenous (Klem, 1995). Exogenous variables have no causal links toward them from other variables in the model (e.g., modeling of technology, overall support, and technology availability). Additionally, the value of the exogenous variable is not explained by those other variables. In contrast, an endogenous variable has causal links coming toward it in the model (e.g., technology integration, technology self-efficacy, technology proficiency, and usefulness of technology), and its value is explained by one or more of the other variables (Schumacker & Lomax, 2004). Also, endogenous variables can be both dependent and independent variables (e.g., technology self-efficacy) (Klem, 1995).

Results

Correlation analysis

Prior to structural modeling (path analysis), the correlations among the variables were obtained. The correlation matrix shown in Table 1 indicated that the modeling of technology was positively associated with technology self-efficacy ($r = .50, p < .01$); technology proficiency ($r = .49, p < .01$), and usefulness of technology ($r = .52, p < .01$). Technology self-efficacy was positively associated with technology integration ($r = .52, p < .01$); technology proficiency was positively associated with technology integration ($r = .39, p < .01$); and usefulness of technology was positively associated with technology integration ($r = .36, p < .01$). As shown in Table 2, technology availability was positively associated with technology integration ($r = .39, p < .01$), and overall support was positively associated with technology integration ($r = .44, p < .01$).

Table 1. Reliabilities, means, standard deviations, and correlations for university variables

Scale	α	Mean	SD	N	1	2	3	4	5
1 Modeling of technology	.89	3.39	.80	995	–				
2 Self-efficacy	.90	3.77	.64	999	.50**	–			
3 Proficiency	.82	3.70	.66	992	.49**	.52**	–		
4 Usefulness	.86	3.19	.78	974	.52**	.37**	.45**	–	
5 Technology integration	.80	4.07	.59	1002	.38**	.52**	.39**	.36**	–

** Correlation is significant at the 0.01 level (two-tailed).

Table 2. Reliabilities, means, standard deviations, correlations for school variables

Scale	α	Mean	SD	N	1	2	3
1 Technology availability	.87	3.58	.72	1002	–		
2 Overall support	.73	3.59	.71	1000	.24**	–	
3 Technology integration	.80	4.07	.59	1002	.39**	.44**	–

** Correlation is significant at the 0.01 level (two-tailed).

Path analysis

Six fit indices were examined in this study, including the chi-square test. These indices were the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), the non-normed fit index (NNFI), the root mean square error of approximation (RMSEA), and the standardized root mean residual (SRMR) (Byrne, 1998). A value of .90 or above for the GFI and AGFI is usually recommended for an acceptable level of fit (Hair et al., 1998). Finally, RMSEA values less than .10 represent models with a good fit to the data (Byrne, 1998). Similar to the RMSEA, the SRMR represents the square root of the mean residuals between the implied model and the data. Values less than .05 are generally indicative of a good fit of the model to the data (Byrne, 1998). The last two fit indices (CFI and NNFI) are considered incremental fit indices because they measure the proportionate improvement in fit of the proposed model relative to a baseline represented by the null model. These measures have the advantage of being less influenced by sample size when compared to other indices, such as GFI. Generally, values above .90 are considered sufficient (Byrne, 1998).

The chi-square value ($\chi^2(339) = 1621.07, p < .01$) was significant. A significant chi-square value indicates that the proposed path model does not completely fit the observed covariances and correlations (Hair et al., 1998). However, the chi-square by itself should not be used as the sole indicator of model fit due to its high sensitivity to sample size and violation of multivariate normality. Therefore, consideration of other fit indices is considered essential. For example, the values for GFI (.91), AGFI (.90), CFI (.92), and NNFI (.91) indicated that the model fit the data sufficiently (Byrne, 1998). The RMSEA (.06) and the SRMR (.04) value indicated that there was a minimal amount of error associated with the tested path model (Byrne, 1998). The standard errors of all the estimates were small enough to say that the estimates are relatively precise. The *t*-values for the paths above were the absolute value of 1.96, indicating that paths were significant at the .01 level (Joreskog & Sorbom, 1989). Finally, the modification indices provided by LISREL did not suggest any significant changes to improve the model, implying that this model fits the data relatively well. Eight separate paths were tested in this model. The results of the path analysis are summarized in Figure 2, which displays the standardized path coefficients (beta weights) as well as the explained variance (R^2) for the dependent variables. As can be seen, all eight of the hypothesized paths were supported ($p < .01$).

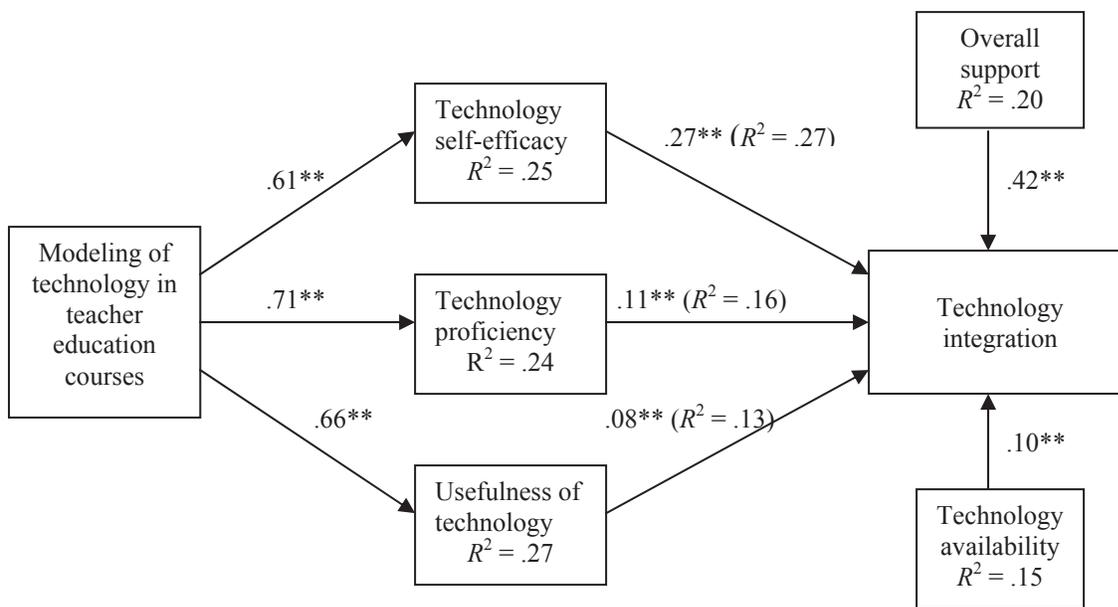


Figure 2. A model of pre-service teachers' integration of technology

With regard to the university-based factors, the model shows that the modeling of technology has a direct positive effect on technology self-efficacy (beta = .61), technology proficiency (beta = .71), and usefulness of technology (beta = .66). Technology self-efficacy has a direct positive effect on technology integration (beta = .27); technology proficiency has a direct positive effect on technology integration (beta = .11); and usefulness of technology has a direct positive effect on technology integration (beta = .08). With regard to the school-based factors, technology availability has a positive direct effect on technology integration (beta = .10) and overall support has a positive direct effect on technology integration (beta = .42) (see Figure 2). Overall, this model had an adequate predictive power as shown by the R^2 statistic. From the first path model, modeling of technology explained 25% of the variance in technology self-efficacy, 24% of the variance in technology proficiency, and 27% of the variance in usefulness of technology. Furthermore, 27% of the variance in technology integration was explained by technology self-efficacy, 16% of the variance was explained by technology proficiency, and 13% of the variance was explained by usefulness of technology. From the second path model, technology availability explained 15% of the variance in technology integration, and overall support explained 20% of the variance in technology integration.

Discussion

This study represents a research-based effort to evaluate one critical factor (the modeling of technology), leading to the development of several consequence factors (technology self-efficacy, technology proficiency, and usefulness of technology), which are fundamental antecedents to pre-service teachers' technology integration efforts. The theory and research suggest that technology integration is also influenced by situational factors in the field-training practice, including technology availability and overall support to use technology. The present study developed two research-based path models, hypothesizing a direct positive link from faculty modeling to three university-based factors (technology self-efficacy, technology proficiency, and usefulness of technology) that are mediators to technology integration. Also, the study hypothesized a direct positive link from two school-based factors (overall support and technology availability) to technology integration.

The results are consistent with the conceptualization of technology self-efficacy, technology proficiency, and usefulness of technology as mediators between the modeling of technology and technology integration by pre-service teachers. Specifically, the modeling of technology was associated with higher levels of technology self-efficacy, higher levels of technology proficiency, and higher levels of perceived usefulness of technology. Technology self-efficacy, technology proficiency, and usefulness of technology, in turn, were positively associated with pre-service teachers' technology integration efforts. The results are consistent with previous research that pre-service teachers need to observe university faculties modeling technology in their courses to learn how technology can be effectively used to enhance instruction (Banister & Vannatta, 2006).

In this study, university faculties modeled technology in instruction (e.g., used the Blackboard system), which in turn, impacted students' confidence in interacting with the technology via the discussion board, digital drop box, and e-mails. This finding is congruent with a social-learning perspective on the development and role of self-efficacy as contributor to the direction, intensity, and persistence of effort related to the use of technology in the classroom. (Bandura, Adams, & Beyer, 1977). Moreover, the modeling of technology impacted students' proficiency and skills in dealing with various technological tools during instruction. It is well established in the literature that improvements in university students' technology proficiencies were reported during their courses of study in which technology was integrated (Topper, 2004). This technology proficiency, in turn, is one of the most important characteristics influencing pre-service teachers' success at integrating technology in their instruction (Hernandez-Ramos, 2005). Further, the modeling of technology by faculty members affected students' perceived usefulness of technology in their present role as students and in their future careers as classroom teachers (Dawson & Rakes, 2003).

Overall, these results suggest that the higher the modeling of technology in the university teacher-education courses, the higher the mediating factors (technology self-efficacy, technology proficiency, and perceived usefulness of technology) and the higher the mediating factors the higher pre-service teachers are integrating technology in their field training classrooms.

The second path model speculated that technology integration is influenced by two school-based factors (overall support and technology availability). Results of the study supported the hypothesized model. In this study, pre-service teachers received support from technicians, teachers, and principals, which, in turn, affected their technology integration in instruction. These results are consistent with previous research indicating that such support is often considered to be an important factor in teachers' technology integration practices (Zhao & Frank, 2003). The other factor that is important to pre-service teachers' technology integration efforts is the availability of technology. In this study, pre-service teachers indicated that technology was available in the practising schools (e.g., computers, printers, software), which had an impact on the teachers' ability to integrate technology in instruction. This finding is consistent with previous research emphasizing that without adequate technology, pre-service teachers have little opportunity to integrate technology into the classroom (Morris, 2002). Based on these results, we can speculate that the higher the support structure and technology availability, the higher the technology integration efforts by pre-service teachers.

Conclusions and recommendations

In conclusion, the importance of the present study lies essentially in gaining a deeper understanding of the factors that influence pre-service teachers' effort to integrate technology in the field-training classrooms, which can help

administrators in higher education settings recognize the importance of faculty usage of technology in university courses to foster positive technology self-efficacy beliefs, proficiency, and usefulness. Further, this study informs professionals in K–12 schools of the status of their current support structure and the availability of technology to ensure successful integration of technology by pre-service teachers. Finally, we suggest a number of practical and theoretical recommendations for the field of study.

From the practical standpoint, faculty members in higher education institutions should pay close attention to setting conditions that enhance the development of pre-service teachers' technology self-efficacy, technology proficiency, and usefulness of technology. This includes the modeling of technology in the courses that they teach. Thus, preparatory activities such as familiarizing students with the technology, discussing how it will be used to meet learning objectives, and providing opportunities to experience some early successes with the technology appear to be important strategies contributing to the formation of these factors and motivating pre-service teachers to integrate technology into their field training. Another recommendation is that university administration set policies demanding faculty members and pre-service teachers to attend technology training programs (e.g., ICDL, IC3) to enhance the teaching-learning process, have technology mentors on-campus to better meet the needs and questions of pre-service teachers as they progress through their field training, and ensure that pre-service teachers attend field-training in schools that support the use of technology in instruction and have adequate technology available on-site. The final recommendation is that the Ministry of Education ensure that their schools are prepared with the technology needed to deliver effective instruction (e.g., adequate computers and Internet connections) and that school teachers and administrators support the use of technology in instruction.

From a theoretical standpoint, researchers should attempt to fully develop a path model of structural relations between constructs investigated in this study. This can be done through interviews and focus groups that include faculties, pre-service teachers, cooperating teachers, and school principals to determine other factors that may contribute to technology integration and other contexts such as individual variables that may play a part in this nomological network. This research can be replicated with all public and private universities in Jordan to confirm the findings in this study. Furthermore, researchers should attempt to test competing models to technology integration practices by pre-service teachers in Jordan to develop theories related to the field of study. Also, national and international researchers should cooperate to study how culture can play a part in these models.

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