



Impact of Technostress on Continuance Intentions to Use Mobile Technology

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Abstract With rapid development of emerging technologies, teachers have been required to integrate mobile technology into their practices to improve learning outcomes. However, teachers have been reluctant to integrate technology into teaching because of technostress. Many studies have investigated the reasons and consequences of technostress in different contexts more than education, specifically teachers in K-12. To shed light on the boundary condition of using new technology, this study investigated technostress as a boundary condition that influences perceived usefulness for continuance intentions of using portable technology. Therefore, the authors introduced a model to describe the relationship among technostress, perceived usefulness, and K-12 teacher attitudes toward and continuance intentions to using mobile technology in the Palestinian context. 367 teachers from different backgrounds participated in the quantitative study. SPSS and AMOS were used to find the path coefficients of the model. The findings revealed that technostress has non-significant direct effects on continuance intentions of using portable technology, where perceived usefulness plays a

crucial role in continuance intentions. Technostress has negative effects on both perceived usefulness and teachers' attitudes toward mobile technology. Participants in the study were from northern Palestine, which limited generalizing the findings on other technological tools. Longitudinal future studies are recommended to understand the impact of perceived usefulness and its relationship with technostress, which is important to deepening our understanding of continuance intentions in using mobile technology.

Keywords Technostress · Perceived usefulness · Continuance intentions · Mobile technology · TAM

Introduction

The rapid innovation and emerging new developments of Information and Communication Technologies (ICTs) have many benefits for individuals and societies. For example, ICTs can reduce the required time to finish specific tasks and increase productivity among end-users. Acceptance and adoption of a new technology depends in large part on its usefulness and efforts needed to learn how to use it (Kim & Park, 2018). The perception of benefits of using technology for end-users is one factor mentioned in well-known models of acceptance technology. These include Technology Acceptance Model (hereafter TAM), developed by Davis (1989), and Unified Theory of Acceptance and Use of Technology model (hereafter UTAUT), developed by Venkatesh et al. (2003). The TAM model considers the perceived usefulness of technology as an important factor before its acceptance and use (Davis, 1989). Based on new studies conducted by Khlaif (2018), teachers like to use mobile technology for academic

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purposes if they believe that their practice will benefit and it will enhance their teaching performance.

The Expectation Confirmation Model (hereafter ECM) is a well-known model that uses theories for understanding the continuation of the use of emerging technology; it states that an individual knowing the benefits of a given technology important in that individual's deciding to continue using it (Steelman & Soror, 2017). The crucial role of the usefulness of a given technology in its acceptance and adoption has been validated by many previous studies (Leong et al., 2018; Khlaif, 2018; Yang & Wang, 2019). Studies show that continuance intentions impact use of mobile technology (Cheng & Yuen, 2018). Teachers are motivated to use mobile technology to enhance their performance and achieve their learning goals (Domingo & Gargante, 2016). However, the literature indicated that even though teachers know about the benefits of mobile technology in teaching, integration of mobile technology has fallen short of education requirements from the school administration (Goh & Sigala, 2020). Moreover, other studies reported that perceived usefulness of technology integration and continuance of use it was not significant in impacting technology integration (Moorthy et al., 2019). Mobile technology has a positive impact on increasing learners' engagement in classroom activities and facilitating access to digital resources (Domingo & Gargante, 2016). The aim of using new technology is to mitigate the daily difficulties among teachers and reduce the time required to finish class activities, but using a new technology might increase a teacher's workload, especially if it takes a significant amount of time to learn how to use it and integrate it into practice (Wang et al., 2020).

In our study, we defined technology adoption based on Kollmann's (2004) definition, which stated that "the adoption of technology as the use of technology for the first time, and technology acceptance as the continued use of technology" (3). Kollmann's definition gives a clear picture and describes the three phases of technology acceptance: attitudes, adoption, and acceptance. Others consider phases as pre-adoption, post-adoption, and continuance intentions (Gupta et al., 2020). In our study, small devices that have editing functionality, are portable, and have an Internet connection are considered mobile technology.

In the Palestinian context, mobile technology like tablets and mini laptops has been recently introduced into the Palestinian educational system (Khlaif, 2018). Despite the benefits of using mobile technologies in education, including in previous studies and made clear in the many teacher technology training professional development programs conducted by the Ministry of Education in Palestine (MoE), teachers in Palestine are reluctant to use them in their teaching practices (Khlaif, 2018). Previous studies reported that new technology intertwines teachers'

free time with their work time and blurs the distinction between work and family life (Khlaif, 2018; Salazar-Concha et al., 2021). The lack of boundaries between professional and social lives through working online might increase technostress among employees, including fear, fatigue, and pressure (Oksanen et al., 2021). Steelman and Soror (2017) considered technostress a psychological state that can be used to evaluate the usefulness of technology. It is crucial to understand the influence of teacher technostress on mobile technology integration in the classroom. Tarafdar et al. (2020) defined technostress as the overall stress experienced by an individual through a new or updated technology. Research on technostress had been conducted since 1982 (Salazar-Concha et al., 2021). The use of emerging technology such as mobile technologies and educational and social media platforms by teachers could lead to them experiencing different levels of technostress (Joo et al., 2018).

There is a shortage of studies that investigate continuance intentions of using mobile technology, and a need for future research (Al-Emran et al., 2020). For example, some previous studies focused more on the acceptance and adoption of mobile technology (Al-Emran et al., 2020; Khlaif, 2018). Other studies investigated the continuance of use of technology in terms of user-perceived value and digital technostress caused by the impact of using new technology on users. In the context of mobile technology, perceived usefulness is expected to positively influence continuance intention. However, Huang (2019) found that perceived usefulness has declined to impact learner satisfaction about using desktops significantly. Based on previous findings, additional factors could influence the impact of perceived benefits, value of mobile technology integration, and the continued use in the learning process (Huang, 2019; Khlaif, 2018; Kumar & Chand, 2019). These factors are called boundary conditions, which put limitations on using the new technology (Verkijika, 2019). Boundary conditions in the use of mobile technology could provide a clear picture about the reluctance of use among teachers, despite facilitation provided by school administrations (Huang, 2019; Verkijika, 2019). Different studies have explored factors impacting the adoption of mobile technology, including individual factors (gender, education level, attitudes) and contextual factors (infrastructure, professional development) (Al-Emran et al., 2020; Khlaif, 2018). However, to the best of our knowledge, there is a shortage of investigation into the impact of technostress on continuance intentions in using mobile technology (Pani-soara et al., 2020; Verkijika, 2019). Therefore, this study introduces technostress as a condition that can clarify the impact of perceived usefulness on mobile technology integration in teaching and learning in the Palestinian context, from a teacher's perspective (Verkijika, 2019). A

study conducted by Joo et al. (2018) reported the negative impact of technostress among teachers on using a new technology. Researchers believe that users stop using new technology when they experience high levels of technostress (Yang & Wang, 2019; Panisoara et al., 2020).

There is a contradiction among the findings of these previous studies, a motivation to conduct the new study. Moreover, there is a shortage of studies investigating the direct, indirect, and total effect of technostress, perceived usefulness, and teacher attitudes on continuance intentions of using mobile technology for academic purposes in the Palestinian context, another motivation to conduct the study. Therefore, our study's purpose is to investigate the impact of technostress on continuance intentions of using mobile technology in K-12 schools in Palestine, as well as develop a model that describes how technostress and perceived usefulness influence the continuation of mobile technology integration in schools, also in the Palestinian context.

We expect that the current study's findings will enrich the body of knowledge and literature and clarify the relationship among different factors on continuance intentions, including technostress, perceived usefulness, and attitudes toward mobile technology. The findings could enhance the design of professional development programs on integration of mobile technology among teachers.

Literature Review

Our study was motivated by the contradictions in the findings of previous studies in terms of factors that influence the use of mobile technology among teachers and the benefits of mobile technology for teachers, as well as the lack of studies on the technostress factor as a boundary condition and its relationship with usefulness of using mobile technology. The major benefits of teacher and student mobile technology use include the ability to use technology from anywhere and at any time (Boonjing & Chanvarasuth, 2017), easy-to-access educational resources (Upadhyaya, 2021), and the ability to stay connected. The literature revealed various factors affecting the use and continuance of mobile technology in education, including facilitation condition, social facilitation, contextual factors, individual factors, teacher attitudes, and individual characteristics (Bernacki et al., 2020; Kim et al., 2020).

Moreover, different models have investigated the relationship among the factors influencing mobile technology adoption and acceptance, including TAM (Davis, 1989) and UTAUT model (Venkatesh et al., 2003) (and its different versions). In addition, the EMC model examines the factors impacting the continuation of using technology among users. These studies revealed different factors and

the findings of the studies contradicted other studies that found the impact of individual characteristics on continuance intentions to use technology.

The findings of a qualitative study conducted by Khlaif (2018) about adoption and acceptance of mobile technology revealed that facilitation conditions and social influence positively impact the acceptance and adoption of tablets in middle school settings in Palestine. Despite the fact that teachers know mobile technology improves quality and accessibility of educational resources in rural areas in Palestine, they are reluctant to use it even if it puts them at professional risk. Moreover, Ifenthaler and Schweinbenz (2016) conducted a study about the factors influencing students using tablets in the classroom; the findings revealed that contextual, individual, and technological factors influenced student attitudes toward adoption and acceptance of technological innovations. Rafique et al. (2020) reported on the factors behind low adoption of mobile applications for libraries in higher education. The findings of their study revealed that perceived usefulness and perceived ease of use have a direct significant impact on the intention to use mobile applications. Moreover, the frequency of using a system and quality of a system have a significant influence on intentions to use that system.

Digital Technostress

Digital technostress is stress caused by using digital technologies to accomplish a specific task (Kim & Lee, 2021). Most studies conducted on technostress were focused on business and health sectors more than education (da Silva Cezar & Maçada, 2021). Tradaflar et al. (2019) found five technostress creators, including techno-overload, which refers to increased employee work due to use of a new technology that needs additional time for training. Emerging technology can lead to teachers working longer and faster (Tradaflar et al., 2019; Kumar & Chand, 2019). Techno-invasion refers to the blurring of the lines between social and professional life due to longer work hours and connectedness, especially involving forced use of new technology (Kim & Lee, 2021). In addition, techno-complexity refers to a lack of adequate skills and knowledge to use the new technology at work and the need to put in much time and effort into training (da Silva Cezar & Maçada, 2021).

Techno-insecurity refers to employee fears that they will be replaced with an employee who already knows how to use the new technology, leading to employee feelings of job insecurity. Finally, techno-uncertainty refers to the uncertainty behind learning and adapting to the use of new or updated technology (da Silva Cezar & Maçada, 2021). Our study focused on techno-overload as an example

related to the reasons of technostress because different technological initiatives related to mobile technology that our study could use. The findings of previous studies revealed that technostress is influenced by different intrinsic factors (individual characteristics) (Kumar & Chand, 2019) and external factors (contextual factors) (Pflügner et al., 2020).

Continued use of a given technology has become a focus for researchers for decades because it provides a clear answer about whether a specific technology is benefit for the users or not. It is crucial for individuals that technology meet their expectations from using it. Individuals will continue integrating technology in their lives as long as it meets their expectations (Khlaif et al., 2021).

Consequences of Technostress

Many studies have investigated the consequences of technostress among end-users of technology. For example, recent studies emphasized that technostress negatively influences employees' productivity (Maier et al., 2019; Tarafdar et al., 2015). Furthermore, end-users lose motivation to use technology when they experience technostress in their jobs while using digital technologies (Merikivi et al., 2017; Wang et al., 2017). In terms of teacher technostress, Kumar and Chand (2019) reported that quality of teaching online was negatively affected by technostress, and teachers were less productive in designing online activities. Joo et al. (2018) connected the negative impact of teacher self-efficacy, Technological Pedagogical Content Knowledge (hereafter TPACK) skills, and individual characteristics. Furthermore, da Silva Cezar and Maçada (2021) reported that technological characteristics play important roles on individuals' stress while using technology. In 2017, Rui-Juan et al. conducted an empirical study on teacher technostress in China, which confirmed that techno-exhaustion and workload negatively influence teacher job satisfaction and retention (da Silva Cezar & Maçada, 2021).

Continuance Intention

Gupta et al., (2020) wrote that continuance intentions contrast pre-adoption because continuance plays an important role in assessing user behavior toward a specific technology due to their collected experience with a given technology. In addition, Kim and Lee (2016) stressed that continuous use of a given technology can reflect user behavior toward an information system or mobile technology. Choudrie et al. (2018) reported that the technology adoption process is one step in the overall phase of

technological diffusion. Researchers in previous studies mentioned that initial adoption of technology is the critical step for successful integration, as users continuing to use the technology, rather than their initial acceptance and adoption of it, is key to success and long-term usage of the technology. However, continuance intentions are associated with volitional behaviors (people who decide to use technology or not as an optional choice). Researchers emphasized the importance of understanding continuance intentions with technology to successfully develop a plan to implement IT across different contexts (Choudrie et al., 2018; Kim & Lee, 2016). Continuance Intention is defined as a user's ideas and views on continuing to use a new or updated technology (Gupta et al., 2020). Users' behavior toward using a new technology depends heavily on their continuance intentions (CIs) (Gupta et al., 2020; Wang et al., 2017). Therefore, in our study, mobile technology continuance intention refers to long-term use of mobile technology by teachers for academic purposes.

For our study, we believe teacher continuance intentions are an important indicator of long-term mobile technology integration for academic purposes in K-12 settings.

Many previous studies focus on continuance intentions in information systems without focusing on the influence of teacher technostress on continuance intentions with mobile technology for academic purposes. Moreover, many studies conducted research using the TAM model to predict user intention to use technology by connecting perceived usefulness and ease of use without incorporating technostress.

Research Question and Hypotheses

The following research question has driven our study: How does technostress influence continuance intentions to use mobile technology in K-12 settings in the Palestinian context? We derive our hypothesis from this question and the previous literature.

The TAM model is the most used to study technology acceptance among users in different contexts. The theoretical foundation of the TAM model was the theory of reasoned action (TRA) developed by Davis (1989) to investigate the factors affecting user intentions to use and accept a new technology. Venkatesh et al. (2003) emphasized that perceived usefulness, attitudes toward technology, and perceived usability play crucial roles in adoption and acceptance new technology and continuance of use. Davis's model stressed the importance of the value of a technology and ease of use which can directly and indirectly predict the intention to use technology (Zhao et al., 2020).

Perceived usefulness is defined as the extent to which users believe that using new technology will be beneficial in improving their performance and increase their productivity in a short time with little effort (Leong et al., 2018). In the mobile technology context, perceived usefulness is considered as the benefit of using mobile technology in learning and teaching which can improve learning outcomes, facilitate teaching, and reduce teacher efforts and preparation time for class activities (Kim & Lee, 2016; Salo et al., 2022). The findings of previous studies revealed that when users know the benefits of a new technology, they are inclined to develop a positive attitude toward using and adopting it (Choudrie et al., 2018; Salazar-Concha et al., 2021). Therefore, perceived usefulness influences user attitudes and intentions to continue using mobile technology.

Researchers have (Salazar-Concha et al., 2020) emphasized the role that knowledge of the benefits of a new technology plays on intentions to use it. Other studies conducted by Joo et al. (2016) and Amoroso et al. (2021) confirmed that perceived usefulness significantly influences continuance intentions of using technology. Continuance intention in using mobile technology “requires the voluntary intention of a teacher to continue using” (p. 21,475) mobile technology for academic purposes. Perceived usefulness is considered an important factor in adopting and continued use of a given technology (Goh & Sigala, 2020). However, other studies reported a weak or non-significant relationship between pre-adoption (Moorthy et al. 2019) and continued use of a given technology (Tarafdar et al., 2020). A study conducted by Salazar-Concha et al. (2020) found that teacher intentions to use mobile technology are higher when they know the value and benefits on their teaching practice compared to when they do not. Other findings revealed no significant influence of perceived usefulness to continued use of mobile technology related to teacher attitudes and beliefs on the use of mobile technology in teaching (Salazar-Concha et al., 2020). Therefore, there are boundary conditions on the influence of perceived benefits of using technology in education. Technostress due to techno-overload was one of the boundary conditions in the current study, which is expected to be one of the internal factors that can impact subsequent perceived usefulness. The proposed model in our study is presented in Fig. 1, which shows the relationship between the variables of the study. Technostress has direct effects on all the variables in the study, and continuance intention is influenced directly by perceived usefulness and teacher attitudes toward mobile technology.

Therefore, we expected to see a relationship between technostress, teacher attitudes toward mobile technology, perceived usefulness, and continuance intentions to use

mobile technology in K-12 settings. Therefore, we proposed the following hypotheses:

H1: Perceived usefulness has a positive impact on intentions to adopt, accept, and continued use of mobile technology.

H2: Perceived usefulness has a positive impact on teacher attitudes toward continued use of mobile technology.

H3: Teacher attitudes toward accepting continued use of mobile technology positively influence continuance intentions of using mobile technology.

H4: Teacher technostress negatively influences intentions to accept and adopt mobile technology.

H5: Teacher technostress negatively influences teacher continuance intentions of using mobile technology.

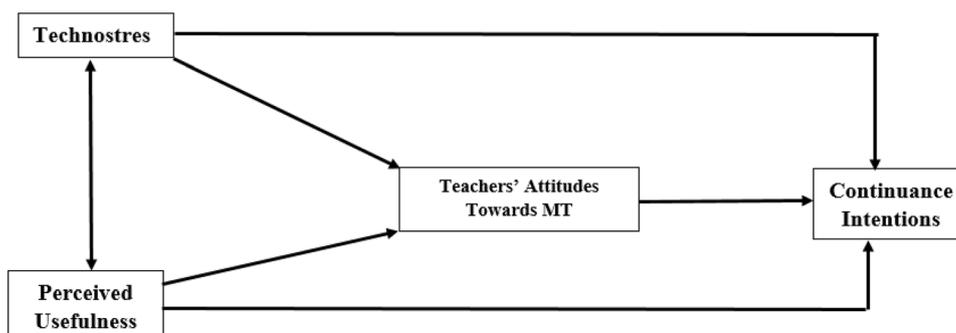
H6: Teacher technostress indirectly has a significant negative impact on the continuation to use mobile technology.

Methodology

We used a quantitative approach to collect data from K-12 teachers from different locations in Palestine to develop and evaluate the model proposed for our study (Fig. 1). The focus of the study was on using mobile technology in academic settings in K-12 education. To recruit participants, we use a convenience sample because it enables us to collect data quickly with low cost and easy-to-access data (Emerson, 2015). Convenience sampling is applicable for both quantitative and qualitative research (Etikan et al., 2016).

Participants

The participants of the study were teachers in K-12 settings in Palestine with diverse backgrounds, teaching in different locations, topics, and grades. The main criteria in choosing the participants were teaching in K-12 settings, experience in using mobile technology for academic purposes, and owning a mobile device. The researchers informed the participants the purpose of the study and the criteria in choosing the participants. All participants in the study participated anonymously and on a voluntary basis. A total of 387 participants finished the survey, and 367 surveys were retained for data analysis. 20 surveys gave missing data in more than 10% of the fields; therefore, we reported them but excluded these surveys from data analysis. Table 1 shows demographic information about the participants. The participants of the study were 30.5% male and 69.5% female, with different experience with mobile

Fig. 1 Hypothesized study model**Table 1** Participants characteristics

Variable	Level	Count	#
Gender	Male	112	30.5%
	Female	255	69.5%
Education level	Diploma	29	7.9%
	Under	154	42.0%
	Graduate	184	50.1%
Experience with mobile technology	No	32	8.7%
	1–5	157	42.8%
	6–10	59	16.1%
	More than 10	119	32.4%

technology varying from no experience (8.7%), 1–5 years (42.8%), 6–10 years (16.1%), and more than 10 years' experience (32.4%).

We used an online survey for data collection. The survey was developed based on the theoretical framework of the study (TAM) (“Appendix A”). The survey was composed of two main sections: participant demographic information and items of the dimensions of the model.

The questionnaire used in the study was composed of 13 items related to four constructs (“Appendix A”). The survey items were developed and adapted from the findings of previous studies that investigated the adoption, acceptance, and continuance intentions of different technological initiatives, including mobile technology. The items of the perceived usefulness construct were adapted from the TAM model with slight changes by adding the concept of “mobile technology” and rephrasing it to be suitable for the context of the study. The items of attitudes toward mobile technology and the intentions to adopt and accept mobile technology were adopted from three studies (Joo et al., 2016; Verkijika, 2019). The items of the technostress construct were adapted from the study of Steelman and Soror (2017) and Tu et al.’s (2008) scale. We used a

5-Likert scale ranging from 1 “strongly disagree” to 5 “Strongly agree.” The first part of the survey collected information about the participants such as teaching experience with mobile technology, and their gender. After developing the survey items, we sent it to four experts in education and educational technology to review their clarity.

Data Analysis

We performed three phases of data analysis in the study, including exploratory factor analysis (EFA) to build the model through determining the main dimensions and internal reliability of each dimension of the instrument, using confirmatory factor analysis (CFA) to confirm the constructs through determining the loading factors for each construct, and building and testing the model through the use of AMOS 24. SPSS version 26 was used for the EFA analysis. The adequacy and the appropriateness of the sample were checked using Bartlett’s test of sphericity and Kaider-Olkin (KMO). The value of KMO was 0.85 which consider as suitable for conducting CFA.

The factor loading for each item on its dimension was found by using the rotation method and principal axis factoring. The items with factor loading less than 0.3 and cross loading items were removed from the survey. The CFA phase confirmed the four dimensions of the model. Cronbach Alpha for all the factors were between 0.88 and 0.94 (Table 2) and the internal reliability was accepted. The total variance of the constructs in the proposed model in the study explained was 78.2%.

Maximum likelihood estimations were performed in path analysis and CFA through using AMOS (version 24). The model validity was examined through AVE, normed chi-square, composite reliability, normed fit index (NFI), average variance extracted (AVE), root-mean-square error of approximation (RMSEA), and Tracker-Lewis index (TLI).

Table 2 Cronbach's Alpha

Construct	Cronbach's Alpha	Composite reliability	AVE
Perceived usefulness	0.92	0.93	0.89
Attitudes toward technology	0.88	0.89	0.83
Continuous intentions	0.89	0.91	0.81
Technostress	0.94	0.95	0.85

Results

The convergent validity and the reliability were evaluated by estimating the coefficients of composite reliability, Cronbach's alpha and AVE. Table 4 shows the results of all constructs.

Model Measurement

We assessed the measurements of the proposed model through AMOS version 24. The convergent validity and the reliability were evaluated by estimating the coefficients of composite reliability, Cronbach's alpha, and AVE. Table 2 shows the results of all constructs. The reliability of the dimensions in the model was above the threshold value (0.7) determined by Hair et al. (2016) and Neneh (2019). Likewise, the AVE values were above the 0.5 thresholds (Verrijika, 2019). Table 3 presents the fit indices for the presented measurement model, and the results of all indices are accepted measures.

The goodness-of-fit indices presented in Table 3 are considered good for the proposed model ($\chi^2/df = 2.842$, GFI = 0.996, AGFI = 0.961, CFI = 0.998, RMSEA = 0.048). The measurements of the model indicated that the proposed model has good convergent validity and reliability. Moreover, the square roots of AVE of all dimensions were greater than correlations between the dimensions. Therefore, the proposed model has good reliability and validity (Rönkkö & Cho, 2020).

In Table 4, the percentage of female teachers is approximately 70%, and this is considered a good representation of the community. The Ministry of Education in Palestine has begun to disavow the feminization of education but also began appointing female teachers in male schools. As for educational level, we find that the percentage of diploma holders is about 8% which is low, also due to the Ministry's strategy in hiring qualifying teachers. We find that the percentage of those who do not use mobile technology is only about 9%, which means that those who responded to the tool are teachers who were exposed to technology and were pressured to use it. Table 4 presents numbers and percentages for variables levels.

Path Coefficients of the Model

The descriptive analysis and the correlations of the study are presented in Table 5. The mean values of continuance, perception, and attitude of mobile technology are generally satisfactory (i.e., 3.71, 3.7 and 3.64 consequently); on the other hand, technostress is generally low (i.e., mean values of 1.96). As expected, acceptance was positively associated with perception and attitudes toward mobile technology, and negatively associated with the technostress (Table 3) sample. Moreover, technostress had a negative direct effect on other measured constructs (teacher attitudes and perceived usefulness). Moreover, the validity of the constructs was assessed by the information presented in Table 5, which includes the correlation coefficients and the Fornell-Larcker Criteria.

From Table 5 and Fig. 2, we predicted a direct impact of perceived usefulness on the continued use of mobile technology. In addition, perceived usefulness has indirect influence on continuance intentions to use mobile technology through mediating teacher attitudes toward mobile technology. The model was used to test the hypothesized of the study. The findings revealed that perceived usefulness positively influences continuance intentions to use mobile technology, with a direct influence of 50%. Moreover, we noticed that perceived usefulness and teacher attitudes have a positive effect on continuance intentions to use mobile technology, but we did not see a direct effect of technostress on continuance intentions to use mobile technology. However, technostress has a negative effect on both

Table 3 Goodness-of-fit indices for the proposed model

Parameters	Score
Chi square	$\chi^2 (1) = 2.842, P = 0.092$
Goodness-of-fit index	0.996
Adjusted goodness of fit index	0.961
Comparative fit index	0.998
Increment fit index	0.998
Root mean square error of approximation	0.048
Hoelter	855

Table 4 The descriptive statistics and correlations

Correlations						
	<i>M</i>	<i>SD</i>	Perceived	Attitude	Acceptance	Technostress
Perceived	3.7	0.95	(0.89)			
Attitude Toward MT	3.64	0.98	0.817**	(0.85)		
Continuous Intentions	3.71	1	0.853**	0.842**	(0.90)	
Technostress	1.96	0.97	− 0.291**	− 0.393**	− 0.279**	(0.85)

Diagonal is square root of AVE

**Correlation is significant at the 0.01 level (2-tailed)

perceived usefulness and teacher attitudes to using mobile technology by K-12 teachers in the Palestinian context.

Teacher attitudes toward mobile technology have a positive direct effect on continuance intentions to use mobile technology. All hypotheses of the study that expected the direct negative influence of technostress on continuance intentions to use mobile technology were rejected, which means there is a non-significant direct influence of technostress on continuance intentions to use mobile technology among Palestinian teachers in K-12 settings. Technostress has significant negative effects on perceived usefulness, which could indirectly influence continuance intentions to use mobile technology.

Discussion

Our study analyzed the relationships among the variables of technostress, perceived usefulness, teacher attitudes toward mobile technology, and continuance intentions to use mobile technology by 367 K-12 teachers in Palestine. Perceived usefulness is important in continuance intentions to use mobile technology as well as in the adoption and acceptance process (Al-Emran et al., 2020; Upadhyaya, 2021). The findings confirm that perceived usefulness has a positive impact on teacher attitudes toward continuance intentions to use mobile technology; we can thus provide

some suggestions for the Ministry of Education to develop professional development programs that show the value and benefits of mobile technology in the teaching process. The effects of the variables have been conceptualized in a model based on the findings of previous studies and models such as TAM (Al-Emran et al., 2020; Upadhyaya, 2021). Technostress was proposed as an external variable that directly affects both teacher attitudes and perceived usefulness of mobile technology, which could influence teachers' continued use of mobile technology for academic purposes (Khlaif, 2018; Kim & Lee, 2021). Perceived usefulness has positive direct and indirect effects on continuance intentions to use mobile technology as proposed in our hypothesis H1 and H2, and it also has a positive direct influence on teacher attitudes toward mobile technology, congruent with previous studies (Davis, 1989, Khlaif, 2018).

All hypotheses related to the direct effects of technostress on continuance intentions to use mobile technology were rejected, which means that technostress did not have direct impact on the continuance intentions to use mobile technology. This was inconsistent with some studies and partially consistent with other studies (Zhao et al., 2020) in terms of indirect impact on continuance intentions to use a given technology. Our study's findings are consistent with the findings of previous studies in terms of the positive influence of perceived usefulness on attitudes toward

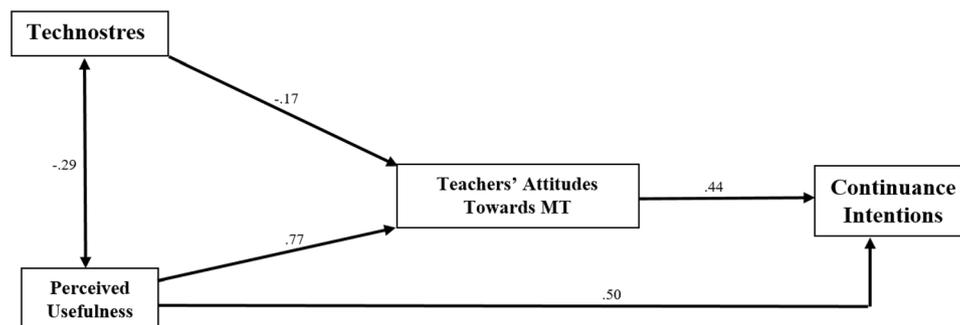


Fig. 2 The final proposed model with standardized coefficients estimations

Table 5 Three-way ANOVA tests between the main constructs

Dependent variable	Source	SS	df	M.S	F	P
Perceived	Gender	0.52	1	0.52	0.57	0.45
	Education level	1.01	2	0.50	0.56	0.57
	Experience with mobile technology	1.08	3	0.36	0.40	0.76
	Error	311.27	343			
	Total	330.97	366			
Attitude	Gender	0.48	1	0.48	0.52	0.47
	Education level	1.76	2	0.88	0.95	0.39
	Experience with mobile technology	3.27	3	1.09	1.18	0.32
	Error	318.03	343			
	Total	345.06	366			
Continue	Gender	0.45	1	0.45	0.46	0.50
	Education level	1.08	2	0.54	0.55	0.57
	Experience with mobile technology	3.30	3	1.10	1.13	0.34
	Error	334.47	343			
	Total	366.92	366			
Technostress	Gender	2.34	1	2.34	2.30	0.13
	Education level	0.82	2	0.41	0.40	0.67
	Experience with mobile technology	7.32	3	2.44	2.40	0.07
	Error	347.95	343			
	Total	381.67	366			

mobile technology integration in teaching and learning, as well as the intentions to use (Davis, 1989; Khlaif, 2018; Joo et al., 2018). However, the findings of other studies reported that there is no significant influence of perceived usefulness on continuance intentions to use mobile technology (Cheng & Yuen, 2018; Yang & Wang, 2019) which is inconsistent with our study's findings. The partial inconsistency of the findings of this study with previous studies could be due to the difference in the context of this study which was the Palestinian teachers in north of Palestine and the timing of the survey during the COVID-19 pandemic.

Moreover, the current study shows that technostress is a factor that influences perceived usefulness on continuance intentions to use mobile technology. It has a negative direct effect on both perceived usefulness (H5) and teacher attitudes toward mobile technology use (H4), which is consistent with previous studies (e.g., Joo et al., 2018; Khlaif, 2018; Verkijika, 2019). Technostress mediated the direct and indirect effect of perceived usefulness of using a given technology (Verkijika, 2019). Moreover, it did not have any direct influence on continuance intentions to use mobile technology (H3), which is inconsistent with Al-Emran et al. (2020) and Goh and Sigala (2020) who mentioned that technostress negatively influenced intentions to continue using technology. However, technostress has a negative indirect effect on continuance intentions to

use mobile technology (H6) through its negative direct impact on perceived usefulness and teachers' attitudes.

Despite the consistencies and inconsistencies between the findings of our study with previous studies, the individual characteristics and their backgrounds could have additional impacts on using technology for academic purposes. Technostress may have increased due to the crisis period of the pandemic which may have influenced attitudes toward using new technology.

Our study's findings can contribute to the literature on multiple levels. For practitioners in research, the study provides evidence about the lack of technostress's influence on continuance intentions to use mobile technology, which requires a refining of adoption and acceptance models of technological integration. Some constructs that have direct influence of technostress on continuance intentions to use and perceived usefulness of a given technology because of the finding in some cases in our study was consistent with previous studies and inconsistent with others. The current study tries to study technostress as a boundary condition that could influence continuance intentions to use technology while knowing the benefits of using that technology.

With advanced technology, especially mobile technology, researchers expected that technostress could continue rising among end-users of a given technology (Huang, 2019). Therefore, to cope with the technostress among

teachers, decisionmakers in the Ministry of Education and other organizations working in the education sector should discuss strategies for coping with and managing technostress. Mobile technology is still a new trend in K-12 settings, and it is important to investigate technostress levels in depth among teachers and how it can influence the use of mobile technology among both teachers and students, as well as design effective programs and strategies to mitigate technostress negative impact.

Limitations of the Study and Future Research

The participants of the current study were teachers from the north of Palestine which is a limitation of the study we cannot generalize the findings of the study. An experimental study of the impact of technostress on perceived usefulness and the continuations intentions to use new technology before generalizing the findings to other new technological initiatives.

Conclusion

The current study seeks to broaden our understanding of the role boundary conditions influencing perceived benefits of technology on the continuance intentions of using mobile technology in K-12 settings in the Palestinian context. Previous studies' findings reported that perceived usefulness on acceptance and continuance intentions to use mobile technology is inconsistent. Moreover, other studies found that technostress has a direct influence on continuance intentions to use mobile technology. Technostress in the current study introduced as a boundary condition which could broaden our understanding of the influences on teachers' attitudes toward usefulness on the continuance intentions to use mobile technology.

Perceived usefulness plays a crucial role and positively directly influences continuance intentions to use mobile technology. Also, it has a positive indirect effect on continuance intentions through teacher's attitudes toward mobile technology. In addition, technostress has a direct negative influence on both teacher's attitudes and perceived usefulness, as proposed in the study's hypothesis. These findings were achieved through building and testing the proposed model by using SPSS and AMOS. The current study's findings provide new insights on the role of technostress on the continuance intentions use of mobile technology, which is considered a boundary condition.

However, we need more experimental studies of the natural impact of technostress on perceived usefulness and the continuance intentions to use new technology before generalizing the findings to other new technological initiatives. Other limitations of the current study were that the

data were collected from teachers in the north of Palestine with different individual characteristics. For future studies, it is important to conduct mixed-methods studies and longitudinal studies through testing the proposed model to better understanding the inter-correlation among the variables. Finally, future studies should be conducted to assess technostress as a moderating factor influencing perceived usefulness and attitudes toward mobile technology to predict their behavioral intentions to use mobile technology.

Appendix I

A Survey

Demographic information

Gender	Male	Female
Experience with mobile technology (years)		

Please choose the best answer that you feel is reflect your answer.

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Perceived usefulness					
I expect that using mobile technology will improve my teaching methods					
Integrating mobile technology can make teaching and learning more efficient					
Mobile technology can help me to achieve the objectives of my classes					
Attitudes					
It would be a grant idea to use mobile technology in teaching					
In general, I have a positive feeling for mobile technology in education					

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It is better for me to use mobile technology in teaching compared to other devices					
<i>Continuance intentions</i>					
I intend to use mobile technology in education in the future					
I am planning to use mobile technology in education in the future					
I predict to use mobile technology in education in the future					
I will do my best to use mobile technology for teaching					
Technostress					
I feel tired from the workload through using mobile technology in teaching					
I feel exhausted from using mobile technology for teaching					
Mobile technology activities make me feel stressed					

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