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Acceptance of Mobile Learning Technology by Teachers: Influencing Mobile Self-Efficacy and 21st-Century Skills-Based Training

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Abstract: This study aimed to investigate the factors influencing the acceptance of mobile learning technology for 21st-century skills-based training among teachers in Saudi Arabia and Pakistan. This study adopted the Unified Theory of Acceptance and Use of Technology (UTAUT) model, which included constructs such as performance expectancy, effort expectancy, facilitating conditions, social influence, mobile self-efficacy, student self-efficacy, behavioural intention, 21st-century skills-based training, and creative thinking skills. A survey was conducted with 619 teachers from Saudi Arabia and Pakistan who participated in a two-week mobile learning-based training session. The data were analysed using structural equation modeling (SEM). The results show that all hypotheses were supported, indicating a positive relationship between the constructs and the acceptance and use of mobile learning technology for 21st-century skills-based training. This study's findings suggest that by emphasising factors such as performance expectancy, effort expectancy, facilitating conditions, social influence, mobile self-efficacy, and student self-efficacy when designing mobile learning interventions, teachers will be more likely to accept and use mobile learning technology for 21st-century skills-based training and contributed to sustainability by providing increased access to quality education.

Keywords: 21st-century skills; mobile learning acceptance; lifelong learning; creative thinking skills; teacher professional development; UTAUT

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1. Introduction

The rapidly evolving job market and changing demands of the modern workplace require individuals to possess a new set of skills, such as 21st-century skills. These skills include critical thinking, creativity, collaboration, communication, digital literacy, and adaptability, among others [1,2]. In response to this demand, educational institutions have begun incorporating 21st-century skills-based training into their curricula to prepare students and teachers for the future workforce. Additionally, the emergence of mobile learning (M-learning) has provided a convenient and flexible means of delivering 21st-century skills-based training to learners [1–3]. M-learning allows learners to access educational resources and materials anytime and anywhere through mobile tools such as smartphones and tablets [4,5]. With the rising use of mobile phones, M-learning has become an attractive option for learners who wish to acquire new skills or update their existing ones. The convenience and flexibility of M-learning have made it an effective tool for delivering 21st-century skills-based training to learners.

Globally, the COVID-19 epidemic has disrupted education systems, causing schools to close and to switch to online or distant learning. This sudden shift has posed significant challenges for teachers unprepared for this new teaching mode [6,7]. In the context of Pakistan and Saudi Arabia, like many other countries, teachers faced numerous challenges in adapting to online or distance learning, such as a lack of technical skills, limited access to technology and internet connectivity, and inadequate training and support [5,8–10].

Teacher training programs have traditionally relied on face-to-face interactions between trainers and trainees. In Pakistan, workshops and seminars conducted by government and non-governmental organisations have been the primary approach to teacher training [9–11]. However, this approach has several limitations, including limited access to training opportunities for teachers in remote areas and limited opportunities for ongoing professional development [8,12,13]. To address these challenges, there has been a shift towards mobile-based training for teachers in Sindh, Pakistan, offering greater flexibility and access to training opportunities, regardless of their location [14–16]. In line with this, the government launched the mobile application "Sindh Taaleem" to provide training opportunities for teachers [6,11,17].

Similarly, in Saudi Arabia, there is a need to improve the quality of education, as highlighted in the TIMSS 2019 report, which showed that Saudi Arabian students in grades 4 and 8 performed below the international average in math and science subjects [18]. The Ministry of Education in Saudi Arabia has introduced initiatives for teachers' professional development to enhance education quality and improve student learning outcomes. Leading programs such as the Teachers' Professional Growth Program (TPGP) and the National Center for Professional Development (NCPD) aim to enhance teaching practices and offer courses in areas such as instructional design, assessment, evaluation, classroom management, leadership, and educational technology [19–22]. The Ministry has also implemented the E-learning Program, providing online training courses for teachers in educational technology and instructional design [19,20].

In both Saudi Arabia and Pakistan, mobile-based training programs for teachers have gained less attention as effective approaches to enhance their knowledge and skills, Motivated by the importance of teacher training and the growing interest in mobile-based training programs [23,24], this study aims to investigate the factors influencing the adoption of mobile-based training among teachers in Pakistan and Saudi Arabia. By examining the empirical significance of these factors, we seek to understand their impact on teachers' acceptance and intention to use mobile-based training programs.

In the context of developing countries, the use of mobile-based learning can contribute to sustainability by providing increased access to quality education, particularly for marginalized populations such as rural and low-income communities. Mobile-based learning can also help develop 21st-century skills that are crucial for promoting sustainable development and improving the employability of graduates. However, the adoption of mobile-based learning among teachers in developing countries is often hindered by various factors, including a lack of technical skills, inadequate infrastructure, and negative attitudes toward the use of technology in education.

By examining the factors that influence teachers' behavioural intention to adopt mobile-based learning for 21st-century skills-based training, this study has the potential to contribute to the promotion of sustainable development in education. By incorporating 21st-century skills-based training into education, learners can develop the skills necessary to address environmental, social, and economic issues and promote sustainable development [25]. Therefore, understanding the factors that influence the adoption of mobile-based learning for 21st-century skills-based training can contribute to the development of more sustainable educational practices.

We have studied various technology acceptance models to understand the factors influencing technology adoption by teachers. Various studies [26–30] have focused on examining the acceptance of technology in education, particularly in response to the COVID-19 pandemic. Each study used different models and variables to investigate various aspects of technology adoption, including students' actual use of e-learning platforms [26,30], the impact of mobile learning on art education, the use of personal learning environments for self-regulated learning, and the intention of art teachers and lecturers to continue using blackboards.

In recent years, despite the many benefits of M-learning, the technology has not been widely accepted by teachers, who play a decisive role in implementing and finding success with M-learning programs [31]. Almogren and Aljammaz examined the effect of mobile learning (M-learning) on art education at King Saud University, using the technology acceptance model (TAM) and social cognitive theory (SCT). This study collected data from 124 students and analysed the relationship between students' attitudes, perceived ease of use, usefulness, self-efficacy, and behavioural intentions toward M-learning. The results show that integrating SCT and TAM improves the prediction of students' attitudes and intentions toward M-learning. Additionally, self-efficacy significantly predicted students' attitudes and intentions toward M-learning. Almogren also explored the intention of art education lecturers to continue to use the blackboard during and after the COVID-19 pandemic using the Unified Theory of Acceptance and Use of Technology (UTAUT) and the technology acceptance model (TAM). This study collected data from 130 art education lecturers through a survey to measure behavioural intention, perceived usefulness, ease of use, social influence, and other variables.

Among these models, the Unified Theory of Acceptance and Use of Technology (UTAUT) has gained popularity due to its comprehensive nature and ability to predict technology adoption in different contexts [32]. investigate the readiness and acceptance of mobile learning technology among pre-service teachers in Pakistan through the COVID-19 pandemic. This study aims to identify the factors affecting pre-service teachers' readiness and acceptance of mobile learning technology. This study collected data from 306 pre-service teachers using a survey instrument based on the UTAUT model. The results proved that performance expectancy, effort expectancy, social influence, and facilitating conditions were significant predictors of pre-service teachers' intention to use mobile learning technology. Moreover, this study learned that pre-service teachers' technology readiness and self-efficacy influenced their acceptance of mobile learning technology. Through various studies on technology acceptance in Pakistan and Saudi Arabia have focused on exploring the factors that influence the adoption and acceptance of various types of technology, including mobile learning, e-learning, and online learning platforms [33–36]. These studies have used various models and variables such as UTAUT, TAM, and social cognitive theory to understand the complex nature of technology adoption and acceptance in different contexts. The studies have identified several factors influencing technology adoption, including performance expectancy, effort expectancy, facilitating conditions, perceived usefulness, ease of use, self-efficacy, social influence, and infrastructure. Additionally, cultural and socio-economic factors have also been found to play a role in technology adoption and acceptance in Pakistan and Saudi Arabia.

Moreover, UTAUT includes four fundamental constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions, which have been identified as important in technology adoption. However, this study intends to examine the elements that affect teachers' acceptance of M-learning technology, focusing on mobile self-efficacy and acceptance of 21st-century skills-based training. There is still a significant gap between the potential of the technology and its actual implementation in educational settings [8,37]. In addition to these constructs, other factors such as mobile self-efficacy, students' self-efficacy, creative thinking skills, 21st-century skills-based training, and behavioural intention to use have also been identified as important in technology adoption. In this paper, we propose a model based on UTAUT to examine the factors influencing the behavioural intention of teachers towards using mobile-based learning for 21st-century skills-based training in a developing country context.

2. Proposed Research Model and Hypothesis

UTAUT has gained popularity due to its comprehensive nature and ability to predict technology adoption in different contexts [30,31]. Several studies have validated the effectiveness of UTAUT in predicting the adoption of various technologies, such as mobile banking, social media [7,27,38], and online shopping [39]. Additionally, UTAUT has been used to compare technology adoption between different cultures and countries. The model's ability to incorporate multiple factors influencing technology adoption has made it a valuable tool for understanding user behaviour [40–42]. These models have been widely used in various contexts and validated by several studies. Organisations can use these models to design and implement technology that is more likely to be accepted and used by users [4,42–46].

The UTAUT model has been widely adopted in research due to its high success rate, accounting for up to 70% of the variance in behavioural intention to use IT or information systems. It surpasses other comparable models in explaining technology acceptance and offers a comprehensive framework derived from eight theories in social psychology and sociology [44]. Its effectiveness in predicting user acceptance of IT in diverse contexts and its relatively recent emergence further contribute to its relevance and applicability [4,42]. The UTAUT model's four primary constructs—performance expectancy, effort expectancy, social influence, and facilitating conditions—along with its moderators, such as gender, age, experience, and voluntariness of use, play a crucial role in understanding behavioural intention and use behaviour [47]. Its widespread adoption and customization by researchers highlight its value in comprehending technology acceptance. The proposed model is based on the UTAUT model, providing a comprehensive framework for understanding the factors influencing technology acceptance. UTAUT includes four fundamental constructs: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). In addition to these constructs, other factors such as Mobile Self-efficacy (MSE), Students' Self-efficacy (SSE), Creative Thinking Skills (CreT), 21st-Century skills-based Training (TRG), and Behavioural Intention (BI) to Use have also been identified as important in technology adoption. The model aims to examine the factors influencing the behavioural intention of teachers towards using mobile-based learning for 21st-century skills-based training. The proposed model can be depicted as follows; see Figure 1.

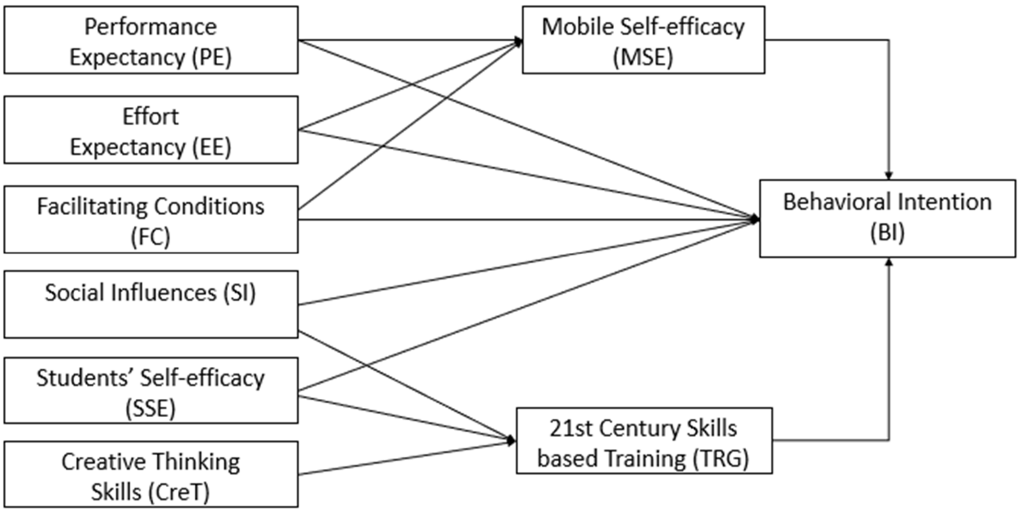

Figure 1. Proposed research model.

Definitions of constructs and proposed hypothesis.

2.1. Performance Expectancy (PE)

PE refers to a teacher's belief that utilising a specific technology will improve their performance. In the context of mobile learning and training acceptance, studies have shown that PE significantly influences individuals' acceptance of mobile learning and training [24,42]. For instance, research by Hossain et al. (2021) found that PE positively affected the intention to use mobile learning among university students [48]. PE allows the teachers to carry out the CPD activities to enhance their performance in terms of knowledge and skills and bring positive change in their behaviour [42,45,49–52].

2.2. Effort Expectancy (EE)

EE is an individual's perception of the ease of use of a particular technology. In mobile learning and training acceptance, EE has significantly affected individuals' intention to use mobile learning. Studies have shown that when individuals perceive mobile learning as easy to use, they are more likely to adopt it. For instance, a study by Amin et al. (2019) found that EE significantly impacted the intention to use mobile learning among higher education students [24]. Moreover, effort expectancy is deemed to have a more influence on behavioural intention [42,45,49–52].

2.3. Facilitating Conditions (FC)

FC refers to the resources and support individuals can use a particular technology. FC has significantly affected individuals' intention to use mobile learning in mobile learning and training acceptance. Studies have shown that when individuals have access to resources and support, they are more likely to adopt mobile learning. For instance, a study by Aijaz et al. (2019) found that FC significantly impacted university students' intention to use mobile learning [45]. FC is considered a significant predictor of assessing how people utilise information systems. Examples of supporting facilities include individual assistance, training, resources to enhance skills and knowledge, and access to a system [42,45,49–52].

2.4. Social Influence (SI)

SI refers to the impact social factors, such as peers and family, have on an individual's decision to use a particular technology. In mobile learning and training acceptance, SI has significantly affected individuals' intention to use mobile learning. Studies have shown that when individuals perceive social support for mobile learning, they are more likely to adopt it. For instance, Alismaiel et al. (2022) found that SI significantly impacted undergraduate students' intention to use mobile learning [7].

2.5. Students' Self-Efficacy (SSE)

SSE refers to an individual's belief in their ability to learn and achieve academic success. SSE has significantly affected individuals' intention to use mobile learning in mobile learning and training acceptance. Studies have shown that individuals with high levels of SSE are more likely to adopt mobile learning. For instance, a study by Wang et al. (2018) found that SSE significantly impacted undergraduate students' intention to use mobile learning [52].

2.6. 21st-Century Skills-Based Training (TRG)

Next, 21st-Century Skills-based Training (TRG) refers to training programs that aim to develop skills such as communication, collaboration, critical thinking, and creativity, essential for success in the 21st century. In mobile learning and training acceptance, TRG has been found to significantly affect individuals' intention to use mobile learning [53]. Studies have shown that when individuals perceive mobile learning as a means to develop 21st-century skills, they are more likely to adopt it. For instance, a study by Tohani et al. (2018) found that TRG significantly impacted the intention to use mobile learning among students [54].

2.7. Creative Thinking Skills (CreT)

CreT refers to an individual's ability to think creatively and develop innovative solutions to problems. In mobile learning and training acceptance, CreT has been found to significantly affect individuals' intention to use mobile learning [55]. Studies have shown that when individuals perceive mobile learning as a means to develop creative thinking skills, they are more likely to adopt it. For instance, a study by Alzahrani et al. (2020) found that CreT had a significant impact on the intention to use mobile learning among gifted students [56].

2.8. Mobile Self-Efficacy (MSE)

MSE refers to an individual's belief in using mobile technology effectively. MSE has been found to significantly affect individuals' intention to use mobile learning in mobile learning and training acceptance. Studies have shown that individuals with high levels of MSE are more likely to adopt mobile learning. A study by Chao found that MSE had a significant impact on the intention to use mobile learning among university students [57]. Therefore, this study proposed the following hypothesis.

2.9. Behavioural Intention (BI)

BI refers to an individual's intention to use a particular technology. BI has been found to affect individuals' actual use of mobile learning in mobile learning and training acceptance. Studies have shown that when individuals have a solid intention to use mobile learning, they are more likely to actually adopt it [4,45,58]. It refers to the participants' intention towards the use of mobile-based CPD for an improved professional career [42,45,49–51,59–62]. The UTAUT model and its constructs provide a useful framework for understanding the factors that influence technology adoption in the context of teacher training during the pandemic, as shown in Figure 2. Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions are essential factors to consider, as well as other factors such as Mobile Self-efficacy, Students' Self-efficacy, Creative Thinking Skills, 21st-Century Skills-based Training, and Behavioural Intention to Use. By addressing these factors, teacher training programs can increase the adoption and effective use of technology in the classroom.

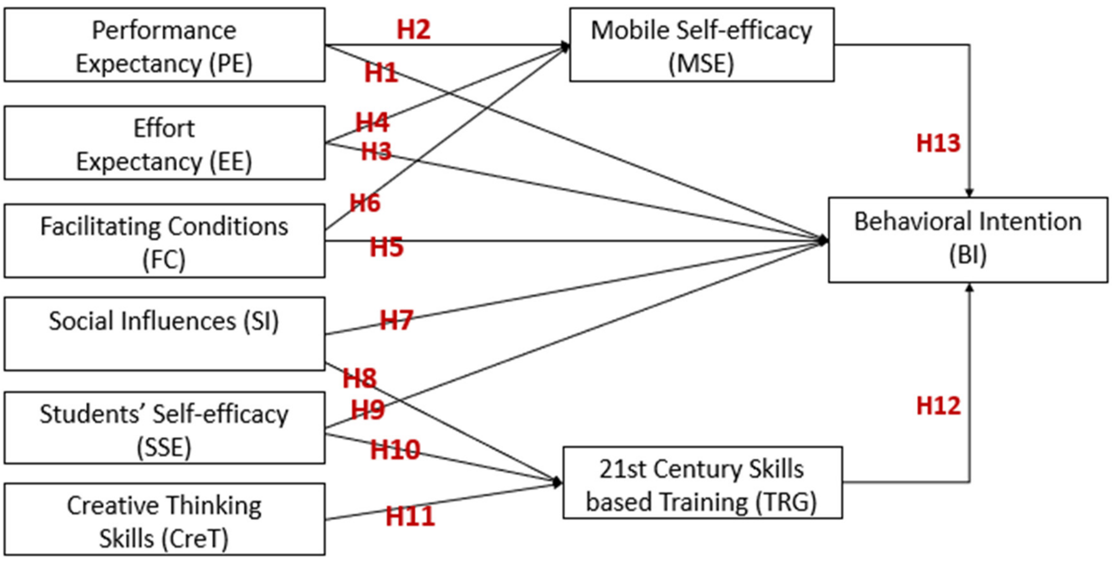

Figure 2. Proposed research hypothesis.

The proposed research model of this is illustrated in Figure 2.

H1 = PE → BI: Performance Expectancy (PE) will positively affect Behavioural Intention (BI) towards using mobile-based learning for 21st-century skills-based training.

H2 = PE → MSE: Performance Expectancy (PE) will positively affect Mobile Self-efficacy (MSE) towards using mobile-based learning for 21st-century skills-based training.

H3 = EE → BI: Effort Expectancy (EE) will positively affect Behavioural Intention (BI) toward using mobile-based learning for 21st-century skills-based training.

H4 = EE → MSE: Effort Expectancy (EE) will positively affect Mobile Self-efficacy (MSE) toward using mobile-based learning for 21st-century skills-based training.

H5 = FC → BI: Facilitating Conditions (FC) will positively affect Behavioural Intention (BI) toward using mobile-based learning for 21st-century skills-based training.

H6 = FC → MSE: Facilitating Conditions (FC) will have a positive effect on Mobile Self-efficacy (MSE) toward using mobile-based learning for 21st-century skills-based training.

H7 = SI → BI: Social Influence (SI) will positively affect Behavioural Intention (BI) toward using mobile-based learning for 21st-century skills-based training.

H8 = SI → TRG: Social Influence (SI) will positively affect 21st-Century Skills-based Training (TRG) for using mobile-based learning.

H9 = SSE → BI: Students' Self-efficacy (SSE) will positively affect Behavioural Intention (BI) toward using mobile-based learning for 21st-century skills-based training.

H10 = SSE → TRG: Students' Self-efficacy (SSE) will positively affect 21st-Century Skills-based Training (TRG) for using mobile-based learning.

H11 = CreT → TRG: Creative Thinking Skills (CreT) will have a positive effect on 21st-Century Skills-based Training (TRG) for mobile-based learning.

H12 = TRG → BI: 21st-Century Skills-based Training (TRG) will have a positive effect on Behavioural Intention (BI) toward using mobile-based learning for 21st-century skills-based training.

3. Research Methods

3.1. Study Sample and Data Collection

The study sample of this research study comprised teachers working in Saudi Arabia and Pakistan. The sample involved 700 in-service schoolteachers from both countries selected using a random sampling technique. According to [63,64], an appropriate sample size for structural equation model analysis (SEM) is a minimum of 150 participants. According to another study, a straightforward SEM model requires at least 200 participants or 5 occurrences per item. [42,43], while some studies suggested the lowest possible sample size of 351 participants. As this study is based on 36 observed indicators, the minimum sample size required is 36 × 5 = 180 participants. The teachers underwent a 12-day mobile learning training program. The MS Teams application was used as a valuable platform for teachers and teacher educators to engage in discussions about teaching and learning. It offers real-time communication through text, audio, and video functionalities. Various key features were used for the two-week training program such as polls, quizzes, and more. Its continuous assistance feature enables teachers and experts to actively participate and exchange ideas. Additionally, also used a wide range of useful resources, including textbooks, curriculum materials, training manuals, lesson plans, worksheets, videos, and audio files. It also offers tools for classroom observation, assessment, online assignment submission, help and FAQ support, rewards, and the option to export reports.

During the two-week training program, we leveraged the capabilities of MS Teams extensively. We utilised its online classroom feature, discussion rooms, chat rooms, and dedicated spaces for group work. These features facilitated collaborative learning and engagement among participants. The 4Cs (Communication, Collaboration, Critical Thinking, and Creativity) aspects of MS Teams played a crucial role in enhancing the training experience. The application encouraged effective communication and interaction, supported collaborative work among participants, fostered critical thinking through discussions and activities, and provided opportunities for creative exploration and problem-solving. Overall, MS Teams proved to be a valuable tool in delivering the training and creating an engaging learning environment, and subsequently, a survey was shared with them via WhatsApp groups after the completion of training. The survey's purpose and guidelines were explained to the participants, and they were requested to fill it out honestly and provide accurate information. After reviewing the responses, 619 questionnaires were considered for analysis, while some others were excluded because of incomplete or missing information.

3.2. Instrument Development Methodology

A survey was developed using an extensive review of the pertinent literature to assess the variables determined in this research. The questionnaire was divided into two sections. The initial part included demographic inquiries that gathered the participants' personal information, such as age, gender, educational level, and teaching experience. The second section contained queries related to the variables recognised in this study. The variables were rated using a 5-point Likert scale that ranged from strongly disagree to strongly agree. The questionnaire contained 36 items, with each variable consisting of 3–5 items, as specified in Table 1 and Appendix A. The questionnaire items were evaluated and revised based on feedback from domain experts (see Appendix A). A preliminary test was conducted with 50 teachers to evaluate the items' clarity and comprehensibility and identify potential issues with the research tool. The data consistency was checked using Cronbach's alpha method, and the outcomes indicated that Cronbach's alpha values for all variables were over 0.7, demonstrating acceptable levels of internal consistency [63,65]. Consequently, the survey was determined to be valid and reliable for use in the research. Table 1 displays the variables, the number of items in each variable, and the associated Cronbach's alpha values obtained from the preliminary examination.

Table 1. Constructs, Cronbach's alpha values, and references.

Construct	Number of Items	Cronbach's Alpha	References
Performance Expectancy (PE)	4	0.85	[42,45,49–52]
Effort Expectancy (EE)	4	0.83	[42,45,49–52]
Facilitating Conditions (FC)	4	0.81	[42,45,49–52]
Social Influences (SI)	4	0.79	
Mobile Self-efficacy (MSE)	4	0.87	[24,57]
Students' Self-efficacy (SSE)	5	0.89	[66,67]
Creative Thinking Skills (CreT)	4	0.84	
21st-Century Skills-based Training (TRG)	4	0.82	[66,68]
Behavioural Intention to Use (BI)	3	0.78	[4,45,58]

The tool is composed of 36 items grouped into several constructs, as follows:

Performance Expectancy (PE)—this construct assesses users' perceptions of how mobile learning can improve their learning results, motivation, and performance. It consists of four items (PE1–PE4).

Effort Expectancy (EE)—this construct assesses users' perceptions of how easy it is to use and become skillful at using mobile learning. It consists of four items (EE1–EE4).

Facilitating Conditions (FC)—This construct assesses users' perceptions of the resources, knowledge, and compatibility of mobile learning with their learning style. It consists of four items (FC1–FC4).

Social Influences (SI)—This construct assesses users' perceptions of the influence of others on their use of mobile learning. It consists of four items (SI1–SI4).

Mobile Self-efficacy (MSE)—This construct assesses users' confidence in their ability to use mobile learning. It consists of four items (MSE1–MSE4).

Creative Thinking Skills (CreT)—This construct assesses users' ability to generate and develop new ideas. It consists of four items (CreT1–CreT4).

Students' Self-efficacy (SSE)—This construct assesses users' confidence in using the mobile learning system. It consists of five items (SSE1–SSE5).

Twenty-first-century Skills-based Training (TRG)—This construct assesses users' perceptions of the training program's effectiveness in improving their understanding and confidence in developing 21st-century skills. It consists of four items (TRG1–TRG4).

Behavioural Intention to Use (BI)—This construct assesses users' intention to use mobile learning for future training activities and professional development. It consists of three items (BI1–BI3). This tool provides a comprehensive assessment of users' beliefs and perceptions about mobile learning. It covers various constructs. The results of this assessment can be useful in designing and improving mobile learning programs that meet users' needs and expectations.

3.3. Data Analysis

The data were analysed using statistical software such as SPSS and AMOS. The data were summarised using descriptive statistics. Analysing the relationships between variables and testing hypotheses required the use of inferential statistics such as correlation, regression, and path analysis [25,42,51,63,65].

3.4. Ethical Considerations

The research was carried out following ethical principles and standards, and all the participants were given informed consent before participating. The confidentiality and anonymity of the participants' responses were guaranteed, and the data collected was exclusively utilised for research purposes.

3.5. Model Analysis

This study aims to test the structural relationship between nine variables and the actual use and acceptance of mobile learning technology based on 21st-Century Skills-based Training. Structural equation modeling (SEM) was employed to examine the research model to accomplish this aim. The process of assessing the research model is elaborated below.

3.5.1. Reliability Analysis

First, a reliability analysis using Cronbach's alpha was conducted to evaluate the internal consistency of the questionnaire items. The pilot study results showed that Cronbach's alpha values for all the constructs were higher than 0.7, indicating acceptable levels of internal consistency [63,65].

3.5.2. Validity Analysis

Next, the measurement model [65] was used to evaluate the convergent and discriminant validity of the constructs. To assess convergent validity, three criteria recommended by Fornell and Larcker [69] were considered: factor loading, average variance extracted (AVE), and composite reliability (CR). As indicated in Table 3, all factor loadings must exceed 0.5, which is considered suitable for further analysis according to recommendations by Hair et al. [65], Churchill [70], and Pallant and Manual [71]. Additionally, the AVE values obtained should be greater than 0.5, which is deemed acceptable for further analysis as suggested by Hair et al [65]. Likewise, the CR values for all constructs should also be above 0.8. Cronbach's alpha was used to assess the internal consistency of the data, and the reliability coefficients must meet the recommended level of >0.7. These findings demonstrate good reliability and satisfactory internal consistency of the instruments [65,72], confirming the convergent validity of the constructs based on the fulfilled criteria.

To examine discriminant validity, the correlation among items and the difference in variance or covariance among factors were considered [65,73]. The square root of the AVE (diagonal values) and correlation coefficients of all factors (off-diagonal values) were considered. It is evident that all diagonal values (square root of the AVE) exceed the off-diagonal values (correlation coefficients) of other factors. This confirms the discriminant validity at the construct level [65,69,72].

Discriminant validity measures how well a set of variables can be distinguished. In other words, it assesses whether each variable measures a unique and distinct construct. To assess discriminant validity, compare the correlation between each variable and its construct (i.e., the diagonal element) to the correlations between the variable and all other constructs (i.e., the off-diagonal elements). If the diagonal element is higher than the off-diagonal elements, there is evidence for discriminant validity [38,43,51,74,75].

3.5.3. Confirmatory Factor Analysis (CFA)

CFA was used to evaluate the model fit indices of the research model. The model fit indices used to assess the goodness of fit of the research model included Chi-square (χ^2), normed Chi-square (χ^2/df), comparative fit index (CFI), Tucker–Lewis's index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). A good model fit is indicated by χ^2/df values less than 3, CFI and TLI values greater than 0.90, and RMSEA and SRMR values less than 0.08.

3.5.4. Path Analysis

Finally, path analysis was used to examine the proposed hypotheses and analyse the path coefficients between the variables included in the structural model. We tested the hypothesised relationships between the constructs by estimating the direct and indirect effects of the exogenous and endogenous variables in the research model.

4. Results and Data Analysis

4.1. Demographic Data Analysis

The demographic data table provides information about the distribution of participants based on specific variables such as gender, age, education, occupation, daily time spent on social media, and favourite time to use social media. Table 2 shows some potential analyses. Gender: the sample population is predominantly male, with 404 (65.3%) participants, with females comprising the remaining 215 (35.6%). Age: Most educators fall under the age bracket of 31–40 (62.6%), while 29.1% are between the ages of 20–30. The remaining 8.1% are aged between 41–50, and there are no participants aged between 51–60. Education: The majority of the sample population holds a Master's/M.Phil. Degree (62.6%), while 35.1% have a bachelor's degree. Only 0.8% of the participants have a Ph.D., and the remaining 1.6% have other academic qualifications. Professional: most educators have an M.Ed. degree (58.3%), followed by a B.Ed. (31.5%). ADE and other qualifications are held by 9.5% and 0.8% of the sample population, respectively. Teaching Experience: Nearly half of the educators have 1–5 years of experience (51.8%), while 34.5% have 6–10 years of experience. Only 13.9% of the participants have 11–20 years of experience. No. Of CPD training received: Most educators have received 1–5 CPD (Continuous Professional Development) training sessions (93.9%), while only 6.3% have attended 6–10 sessions. No participant has attended more than ten sessions. Daily time spent on social media: Most participants (60%) spent 1–2 hours per day on social media and their favourite time to use social media (40%) is in the evening.

Table 2. Demographic information of participants.

Items	Description	Sample	%
Gender	Male	404	65.3
	Female	215	34.7
Age	20–30	180	29.1
	31–40	389	62.9
	41–50	50	8.1
	51–60	0	0.0
Education (Academic)	Bachelor's degree	217	35.1
	Master's/M.Phil.	387	62.6
	Ph.D.	05	0.8
	Other	10	1.6
Professional	B.Ed.	195	31.5
	M.Ed.	360	58.3
	ADE	59	9.5
	Other	5	0.8
Teaching experience	1–5	320	51.8
	6–10	213	34.5
	11–20	86	13.9
No. of CPD training received	1–5	580	93.9
	6–10	39	6.3
	11–20	0	0.0
Daily time spent on social media	1–2	371	60.0
	3–4	152	24.6
	>4	96	15.5
Favourite time to use social media	Morning	147	24.0
	Noon/Evening	247	40.0
	Night	225	36.4

4.2. Assessment of Measurement Model

4.2.1. Reliability and Validity of Model

Table 3 presents the measurement models of factor loadings, AVE, CR, and Cronbach's alpha for each of the nine constructs. All constructs are reliable and Cronbach's alpha measures internal consistency or reliability. When interpreting the results of convergent validity measures, Cronbach's alpha values range from 0.782 to 0.944, exceeding the recommended minimum value of 0.7. High values of Cronbach's alpha indicate that the items are highly correlated, indicating a high degree of reliability.

Additionally, all constructs' CR values are above 0.7, indicating that the constructs' measurement model has an excellent internal consistency, as highlighted in Table 3. All constructs exhibit adequate convergent validity regarding the AVE values, with values ranging from 0.554 to 0.720, exceeding the recommended minimum value of 0.5. Thus, more than 50% of the variance in each construct is accounted for by its measures, indicating adequate convergent validity. As a result, all factor loadings are above the recommended minimum value of 0.7, indicating good discriminant validity for each construct. The performance expectancy (PE) construct has the highest factor loadings, ranging from 0.816 to 0.900, followed by students' self-efficacy (SSE) and behavioural intention to use (BI) constructs, with factor loadings ranging from 0.812 to 0.823 and 0.813 to 0.822, respectively.

The facilitating conditions (FC) construct has the lowest factor loadings, ranging from 0.721 to 0.792. Overall, the measurement model's results indicate that the constructs exhibit good reliability, convergent validity, and discriminant validity, suggesting that the model is adequate for further analysis.

Table 3. Standardized items loading, AVE, CR, and alpha values.

Construct	Item	Factor Loading	AVE	CR	Cronbach's Alpha
PE	PE1	0.816	0.720	0.881	0.897
	PE2	0.862			
	PE3	0.900			
	PE4	0.814			
EE	EE1	0.761	0.627	0.808	0.856
	EE2	0.790			
	EE3	0.795			
	EE4	0.819			
FC	FC1	0.774	0.582	0.765	0.845
	FC2	0.792			
	FC3	0.764			
	FC4	0.721			
SI	SI1	0.705	0.659	0.836	0.903
	SI2	0.836			
	SI3	0.860			
	SI4	0.838			
MSE	MSE1	0.786	0.686	0.857	0.944
	MSE2	0.868			
	MSE3	0.862			
	MSE4	0.794			
SSE	SSE1	0.823	0.693	0.887	0.822
	SSE2	0.845			
	SSE3	0.863			
	SSE4	0.819			
	SSE5	0.812			
TRG	TRG1	0.700	0.554	0.733	0.919
	TRG2	0.721			
	TRG3	0.793			
	TRG4	0.760			
CreT	CreT1	0.815	0.623	0.805	0.872
	CreT2	0.854			
	CreT3	0.775			
	CreT4	0.707			
BI	BI1	0.822	0.668	0.802	0.933
	BI2	0.813			
	BI3	0.817			

4.2.2. Discriminant Validity

Looking at Table 4, we can see that the variables have generally good discriminant validity. The diagonal elements (in bold) are higher than the off-diagonal elements, indicating that each variable measures a unique construct. For example, the correlation between PE and its construct is 0.849, while the correlations between PE and all other constructs range from 0.079 to 0.25.

Table 4. Discriminated validity measures.

	PE	EE	FC	SI	MSE	SSE	TRG	CreT	BI
PE	**0.849**								
EE	0.203	**0.792**							
FC	0.25	0.337	**0.763**						
SI	0.209	0.267	0.34	**0.812**					
MSE	0.167	0.343	0.371	0.424	**0.828**				
SSE	0.235	0.193	0.357	0.347	0.365	**0.832**			
TRG	0.148	0.305	0.31	0.328	0.403	0.367	**0.744**		
CreT	0.079	0.226	0.153	0.325	0.251	0.157	0.259	**0.789**	
BI	0.18	0.443	0.406	0.172	0.404	0.342	0.443	0.281	**0.817**

Similarly, the correlation between EE and its construct is 0.792, while the correlations between EE and all other constructs range from 0.203 to 0.443. It is also worth noting that some constructs are more strongly related to each other than others. For example, FC and SI correlate by 0.34, while TRG and CreT correlate by 0.259. This suggests that these constructs may be measuring similar underlying factors. Overall, the results suggest that the variables in this analysis have good discriminant validity, meaning they measure unique and distinct constructs.

4.2.3. Goodness of Fit Measures

Table 5 shows the goodness of fit measures for the model, which assesses how well the model fits the data. The absolute fit measures include χ^2, the Chi-square test statistic, degrees of freedom (df), and χ^2/df, ideally between 1 and 3. In this case, the obtained value of χ^2 is 1323, and the degrees of freedom are 554, resulting in an χ^2/df of 2.389, indicating an acceptable fit. The goodness of fit index (GFI) obtained value of 0.889 is slightly below the recommended criteria of 0.90, while the root mean square error of approximation (RMSEA) value of 0.047 is below the recommended criteria of 0.05, indicating a good fit for the model. The incremental fit measures include the normed fit index (NFI) and comparative fit index (CFI), ideally above 0.90. In this case, the obtained values of NFI and CFI are 0.900 and 0.939, respectively, indicating an acceptable fit for the model. The parsimony fit measure is the adjusted goodness of fit index (AGFI), which should ideally be above 0.90. In this case, the obtained value of AGFI is 0.867, slightly below the recommended criteria but still acceptable.

Table 5. Summary of model fit indices.

Measures	Fit Indices	Obtained Value	Recommended Criteria
Absolute fit measures	χ^2	1323	-
	df	554	-
	χ^2/df	2.389	$1 < \chi^2/\text{df} < 3$
	GFI	0.889	≥ 0.90
	RMSEA	0.047	< 0.05
Incremental fit measures	NFI	0.900	≥ 0.90
	CFI	0.939	≥ 0.90
Parsimony fit measures	AGFI	0.867	≥ 0.90

Overall, the goodness of fit measures indicate that the model has an acceptable to good fit to the data.

4.2.4. Hypothesis Testing

The path analysis and hypothesis testing show the relationships between different factors in this study and whether these relationships are significant or not. The results suggest that all hypotheses are supported with a *p*-value less than 0.05, as shown in Table 6. The accepted hypothesis, H1, indicates that the relationship between performance expectancy (PE) and behavioural intention to use (BI) is positive but not significant. On the other hand, the relationships between PE and mobile self-efficacy (MSE), effort expectancy (EE) and BI, EE, and MSE, facilitating conditions (FC) and BI, FC, and MSE, social influence (SI) and 21st-Century Skills-based Training (TRG), students' self-efficacy (SSE) and BI, SSE and TRG, creative thinking skills (CreT) and TRG, and TRG and BI are all positive and significant. These results show the importance of considering factors such as performance expectancy, mobile self-efficacy, effort expectancy, facilitating conditions, social influence, students' self-efficacy, creative thinking skills, and training when studying technology adoption among teachers at universities, which includes the visual arts.

Table 6. Hypothesis testing (path relationships) of structural model.

Hypothesis	**Relationship**			**Estimates (β, Value)**	**S.E.**	**C.R. or (T Value)**	***p*** **($p < 0.001$)**	**Result**
H1	PE	→	BI	0.056	0.054	1.041	0.000	Accepted
H2	PE	→	MSE	0.073	0.055	1.322	0.000	Accepted
H3	EE	→	BI	0.279	0.047	5.95	0.000	Accepted
H4	EE	→	MSE	0.247	0.048	5.16	0.000	Accepted
H4	FC	→	BI	0.271	0.056	4.871	0.000	Accepted
H6	FC	→	MSE	0.317	0.052	6.087	0.000	Accepted
H7	SI	→	BI	−0.128	0.04	−3.203	0.001	Accepted
H8	SI	→	TRG	0.106	0.032	3.307	0.000	Accepted
H9	SSE	→	BI	0.106	0.047	2.236	0.025	Accepted
H10	SSE	→	TRG	0.209	0.037	5.705	0.000	Accepted
H11	CreT	→	TRG	0.125	0.034	3.665	0.000	Accepted
H12	TRG	→	BI	0.403	0.069	5.872	0.000	Accepted
H13	MSE	→	BI	0.211	0.043	4.898	0.000	Accepted

Note: SE: standard error; C.R: critical ratio or T-value; and *p*: *p*-Value.

Additionally, this study highlights the significance of behavioural intention to use as a predictor of actual technology usage among teachers. The path analysis and hypothesis testing Table 6 of the structural model indicate the relationship between different variables and the estimates, standard errors, t-values, and critical ratio (C.R.) values. The results show that all hypotheses are supported, as the *p*-values are less than 0.05.

The coefficients of the predictor variable (PE) and the regression model's intercept were both statistically significant ($p < 0.001$), and the overall model was significant ($F = 1.041$, $p < 0.001$). These results indicate a statistically significant positive relationship between the predictor variable (PE) and the outcome variable (BI). The effect size of the relationship was small (β = 0.056), suggesting that while there is a significant relationship, the impact of PE on BI is relatively modest. Overall, this hypothesis was accepted. H2: the relationship between PE and MSE is positive and significant, as the estimate is 0.073 with a standard error of 0.055, resulting in a t-value of 1.322 and a *p*-value of less than 0.001. H3: the relationship between EE and BI is positive and significant, as the estimate is 0.211 with a standard error of 0.043, resulting in a t-value of 4.898 and a *p*-value of less than

0.001. H4: the relationship between EE and MSE is positive and significant, as the estimate is 0.247 with a standard error of 0.048, resulting in a t-value of 5.16 and a *p*-value of less than 0.001.

H5: the relationship between FC and BI is positive and significant, as the estimate is 0.271 with a standard error of 0.056, resulting in a t-value of 4.871 and a *p*-value of less than 0.001. H6: the relationship between FC and MSE is positive and significant, as the estimate is 0.317 with a standard error of 0.052, resulting in a t-value of 6.087 and a *p*-value of less than 0.001. H7: the relationship between SI and BI is negative and significant, as the estimate is −0.128 with a standard error of 0.04, resulting in a t-value of −3.203 and a *p*-value of 0.001.H8: the relationship between SI and TRG is positive and significant, as the estimate is 0.106 with a standard error of 0.032, resulting in a t-value of 3.307 and a *p*-value of less than 0.001.H9: the relationship between SSE and BI is positive and significant, as the estimate is 0.106 with a standard error of 0.047, resulting in a t-value of 2.236 and a *p*-value of 0.025. H10: the relationship between SSE and TRG is positive and significant, as the estimate is 0.209 with a standard error of 0.037, resulting in a t-value of 5.705 and a *p*-value of less than 0. 001.H11: the relationship between CreT and TRG is positive and significant, as the estimate is 0.125 with a standard error of 0.034, resulting in a t-value of 3.665 and a *p*-value of less than 0.001. H12: the relationship between TRG and BI is positive and significant, as the estimate is 0.403 with a standard error of 0.069, resulting in a t-value of 5.872 and a *p*-value of less than 0.001.

H13: MSE → BI: The coefficients of the predictor variable (MSE) and the regression model's intercept were both statistically significant ($p < 0.001$), and the overall model was highly significant ($F = 4.898$, $p < 0.001$). These results indicate a statistically significant positive relationship between the predictor variable (MSE) and the outcome variable (BI). The effect size of the relationship was moderate ($\beta = 0.211$), suggesting that the impact of MSE on BI is relatively stronger than that of PE on BI. Overall, this hypothesis was also accepted. However, these results suggest that all of the predictor variables tested have a statistically significant impact on either BI, MSE, or TRG and that these relationships are generally positive. The results of this study reveal compelling insights into the adoption of mobile learning technology among teachers.

The proposed model accounted for 27.0% of the variance in behavioural intention. However, when the identified factors related to M-learning were removed from the model, the variance explained by the model decreased to 19.0%. The higher variance explained by the model, along with the statistically significant results, particularly in relation to the factors associated with mobile technology.

These findings underscore the critical role of self-efficacy in teachers' confidence and competence in utilising mobile devices for teaching, as well as the importance of equipping them with 21st-century skills through targeted training programs. By addressing these factors, educational institutions can empower teachers to effectively integrate mobile learning technology into their instructional practices, ultimately enhancing the quality of education and preparing students for the challenges of the 21st century.

5. Discussion

The results of this study indicated that Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Conditions (FC), and Mobile Self-Efficacy (MSE) were significant predictors of BI to use mobile-based learning. Specifically, EE and FC had the highest impact on BI, followed by MSE and PE. These findings are consistent with previous studies, emphasising the importance of these constructs in technology adoption.

Furthermore, this study found that Social Influence (SI), Students' Self-efficacy (SSE), Creative Thinking Skills (CreT), and 21st-Century Skills-based Training (TRG) were significant predictors of BI and MSE. Notably, TRG had the highest impact on BI and MSE, SSE, CreT, and SI. These findings highlight the importance of providing adequate training and support to teachers to enhance their skills and self-efficacy in mobile-based learning.

Regarding Performance Expectancy (PE), this study found a substantial positive impact on teachers' BI toward mobile-based learning, supporting H1 and H2, which assesses respondents' perceptions of how training through mobile learning can improve their learning results, enhance their learning motivation, increase their performance in learning activities, and be useful in their professional development, which is consistent to the findings of previous studies [4,42,76]. However, this finding could be because this study's participants were motivated to utilise technology in their teaching practices. Effort Expectancy (EE) had a significant positive impact on teachers' behavioural intention toward mobile-based learning. Effort Expectancy (EE) also had a significant positive impact on teachers' BI toward mobile-based learning. This study confirmed H3, which proposed that EE positively affects BI, with a large effect size. This finding aligns with previous research and H4 suggested that EE positively affects the MSE. This finding is consistent with previous research [42,45,77], which has shown that perceived ease of use is a crucial factor in technology adoption.

Facilitating Conditions (FC) were found to have a significant positive effect on teachers' BI toward mobile-based learning, supporting H5. The availability of resources and support from the school administration and colleagues can facilitate the adoption of mobile-based learning among teachers. This result is consistent with previous studies emphasising the importance of facilitating conditions in technology adoption [42,45,77].

In contrast, Social Influence (SI) was found to have a significant negative influence on teachers' BI toward mobile-based learning, contradicting H7 and H8. This suggests that the pressure from colleagues and peers to adopt new technology may not always be effective and can even hinder the adoption process, which is consistent with the findings of previous studies [4,7,45].

Students' Self-efficacy (SSE) was found to have a significant positive impact on teachers' BI toward mobile-based learning, supporting H9 and H10. This finding highlights the importance of teachers' belief in their students' ability to learn and benefit from mobile-based learning. This finding also highlights the importance of teachers' belief in their students' ability to learn and benefit from mobile-based learning, which is consistent with the findings of previous studies [66,67].

Creative Thinking Skills (CreT) and 21st-Century Skills-based Training (TRG) were found to have a significant positive impact on teachers' BI toward mobile-based learning. This finding supports H11, emphasising the importance of providing teachers with training and resources to enhance their creative thinking skills and develop 21st-century skills-based training, which is consistent with the findings of the previous study.

The strongest predictor of BI was 21st-Century Skills-based Training (TRG), with a significant direct effect. This finding supports H12, indicating that providing teachers with training on effectively integrating mobile-based learning into their teaching practices can significantly impact their intention to use this technology and results are consistent with previous studies [66,68].

Mobile Self-efficacy (MSE) was also found to have a significant positive impact on teachers' BI toward mobile-based learning. This finding supports H13, indicating that teachers who feel confident and capable of using mobile-based learning technologies are more likely to have a positive intention to adopt and utilise them in their teaching practices.

This finding highlights the importance of teachers' confidence in using mobile technology in their teaching practices. Finally, Behavioural Intention to Use (BI) is measured by three items (BI1–BI3), which assess respondents' intentions to attend training through mobile learning in their future training activities, to use mobile learning to improve their 21st-century learning skills and to use mobile learning in the next two months for their professional development. The result was also consistent with other studies [4,45,58]

This study's findings have significant implications for teachers' professional development policymakers, teacher educators, and teachers or practitioners. By recognizing the factors that influence teachers' behavioural intention to use mobile-based learning, policymakers can design effective strategies and policies to promote its adoption. It is crucial to provide adequate training and support to teachers to enhance their skills and self-efficacy in mobile-based learning. This could include workshops, professional development programs, and resources specifically designed to help teachers integrate technology effectively into their classrooms.

Moreover, this study's findings suggest that mobile-based learning can be advantageous in improving 21st-century skills among teachers. This study revealed that Performance Expectancy (PE), Effort Expectancy (EE), Facilitating Conditions (FC), and Mobile Self-efficacy (MSE) significantly influence teachers' behavioural intention to use mobile-based learning. Additionally, Social Influence (SI), Students' Self-efficacy (SSE), Creative Thinking Skills (CreT), and 21st-Century Skills-based Training (TRG) were identified as important predictors of behavioural intention.

It is important to acknowledge that this study did not specifically focus on the distinction between 21st-century skills and training for those skills. This study aimed to explore the factors influencing teachers' intention to use mobile-based learning and their impact on 21st-century skills-based training. Future research could delve deeper into examining the relationship between training characteristics and the development of 21st-century skills among teachers.

Overall, this study contributes to the existing literature by providing insights into the factors that influence teachers' intention to adopt mobile-based learning and their implications for enhancing 21st-century skills. It is recommended that future research further investigates the actual skill gains resulting from the adoption of mobile-based learning and explores additional factors that may influence teachers' acceptance and usage of these technologies.

6. Conclusions

This study aimed to investigate the factors influencing the adoption of mobile learning technology among teachers in Saudi Arabia and Pakistan. The UTAUT model, known for its high success rate of up to 70% in explaining behavioural intention to use IT, was adopted as the theoretical framework. The findings of this study underscore the significance of various factors in technology adoption, including performance expectancy, effort expectancy, social influence, and facilitating conditions. Additionally, mobile self-efficacy, students' self-efficacy, creative thinking skills, 21st-century skills-based training, and behavioural intention to use were identified as essential contributors to technology adoption. The results indicate that performance expectancy positively affects behavioural intention to use and mobile self-efficacy, while effort expectancy and facilitating conditions also positively influence behavioural intention to use. Moreover, mobile self-efficacy, students' self-efficacy, creative thinking skills, and 21st-century skills-based training were found to significantly enhance technology readiness. These findings emphasise the role of mobile-based learning in fostering 21st-century skills among teachers and highlight the importance of providing adequate training and support to facilitate technology adoption. Education policymakers, educators, and practitioners should consider these factors and insights when implementing mobile learning technology in educational institutions. By improving teachers' self-efficacy, and creativity, and providing the necessary infrastructure and support, the challenges associated with technology adoption can be effectively addressed. Overall, this study contributes valuable insights into the field of technology adoption and provides practical implications for enhancing teachers' adoption of mobile learning technology.

Limitations and Future Work

This study did not specifically focus on the distinction between 21st-century skills and training for those skills. Rather, it explored the factors influencing teachers' intention to use mobile-based learning and its impact on 21st-century skills-based training. Future research should consider examining the relationship between training characteristics and the development of 21st-century skills among teachers.

This study employed cross-sectional survey data, which limited the ability to establish cause–effect relationships. Variables were measured at a specific point in time, preventing an understanding of their pre-training values. To gain deeper insights, future research should incorporate longitudinal designs to capture changes over time and explore the impact of variables measured before and after training.

Future Work: Skill gains from mobile-based learning: It is recommended that future research investigates the actual skill gains resulting from the adoption of mobile-based learning. By assessing the impact on specific 21st-century skills, such as problem-solving or digital literacy, a clearer understanding of the benefits and effectiveness of these technologies can be obtained.

Additional factors influencing acceptance and usage: To further enhance the understanding of teachers' acceptance and usage of mobile-based learning, future research should explore additional factors beyond those examined in this study. For example, the influence of individual characteristics (e.g., age, gender, experience, qualifications) and contextual factors (e.g., cultural differences, institutional support) could be investigated to gain a more comprehensive understanding of the adoption process.

Overall, this study contributes to the existing literature by shedding light on the factors influencing teachers' intention to adopt mobile-based learning and their implications for 21st-century skills. However, future research should address the mentioned limitations and pursue the suggested avenues to advance the understanding of mobile-based learning for 21st-century skills-based training adoption.

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Appendix A. Instrument Measurements (Questionnaire)

S.No	Items
Performance Expectancy	
1	PE1: Training through mobile learning improves my learning results.
2	PE2: Training through mobile learning enhances my learning motivation.
3	PE3: Training through mobile learning increases my performance in my learning activities.
4	PE4: I would find training through mobile learning useful in my professional development.
Effort Expectancy	
5	EE1: I would find training through mobile learning is easy for me to use.
6	EE2: I would find it easy for me to become skillful at attaining training through mobile learning.
7	EE3: I would become proficient at using training through mobile learning applications.
8	EE4: My learning activities with mobile learning are clear and understandable.

Facilitating Conditions	
9	FC1: I have the resources necessary to attend training through mobile learning.
10	FC2: I have the knowledge necessary to use training through mobile learning.
11	FC3: I think that using training through l learning fits well with the way I like to learn.
12	FC4: If I have problems using mobile learning, I could solve them very quickly.
Social Influences	
13	SI1: People who are important to me think that I should use mobile learning for 21st-century skills-based trainings.
14	SI2: People who affect my learning behavior think that I should use mobile learning.
15	SI3: My peers and teachers think that I should use mobile learning.
16	SI4: I think that using mobile learning is fashionable and enjoyable.
Mobile Self-efficacy	
17	MSE1: I have qualification to use and operate mobile learning application.
18	MSE2: I have qualification to use and operate mobile learning application via internet.
19	MSE3: I have skills in using mobile learning application.
20	MSE4: I am confident of using mobile learning application.
Creative Thinking Skills	
21	CreT1: I am able to discover new ways of doing things.
22	Cret2: use idea-generating techniques such as brainstorming to develop several original design ideas.
23	Cret3: I contribute ideas that could be helpful in this class.
24	Cret4: I develop innovative ideas.
Students' Self-efficacy	
25	SSE1: I feel confident in the utilization of mobile learning system even when no one is there for assistance.
26	SSE2: I have sufficient skills to use the mobile learning system.
27	SSE3: I feel confident when using the mobile learning system even if I have only the online instructions.
28	SSE4: I feel confident when using the mobile learning system features.
29	SSE5: I feel confident when using the online learning content in the mobile learning.
21st Century Skills-based Training	
30	TRG1: My level of understanding was substantially improved after going through the training program.
31	TRG2: The training through mobile learning gave me confidence in developing 21st-century skills.
32	TRG3: The training was of adequate length and detail.
33	TRG4: The trainers were knowledgeable and aided me in my understanding of 21st-century skills.
Behavioural Intention to Use	
34	BI1: I intend to attend training through mobile learning in my future training activities.
35	BI2: I would use mobile learning to improve my 21st-century learning skills.
36	BI3: I plan to use mobile learning in the next 2 months for my professional development.

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