



Research Article

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The Effectiveness of a Training Program via E-Learning Platforms in Developing the Technological Competencies of Pre-Service Teachers

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Abstract

This study aims to investigate the effectiveness of a training program via e-learning platforms in developing technological teaching competencies in pre-service teachers at Prince Sattam bin Abdulaziz University. The sample comprised 67 male and female Pre-Service Teachers at the College of Education, Wadi Addawasir. In this quasi-experimental research, only one experimental group was involved. For data collection on the technological competencies of pre-service teachers, a questionnaire and an observation card were used. The results demonstrate significant differences between the pre-service teachers' pre- and post-measurement mean scores in the cognitive and performance dimensions of technological teaching competencies when using e-learning platforms in favor of post-measurements. Furthermore, for gender and academic achievement, there were no statistically significant differences among pre-service teachers' mean scores in the cognitive and performance dimensions of technological teaching competencies when using e-learning platforms. The study concludes with recommendations that could contribute to the success of the distance learning experience.

Keywords: cognitive dimensions; distance learning; e-learning platforms; performance dimensions; pre-service teachers

1. Introduction

The present era is characterized by rapid technological prosperity resulting in significant life changes in intellectual, social, and economic fields. The most important is the widespread use of technology in various branches of knowledge that has led to the development of new teaching methodologies and media that can confirm the unity of knowledge (Babair, 2020). As a consequence of the information and technological revolution, the Ministry of Education in Saudi Arabia has been compelled to provide creative and productive methods to employ professionals who are responsible for comprehensively developing educational institutions, especially teachers, who represent the cornerstone of the civilizational, economic, and social construction of a nation. The key to overcoming the many risks faced by modern societies is technology. The COVID-19 pandemic is the most recent disaster to have affected all aspects of life, especially education (Ngwacho, 2020; Schleicher, 2020). Consequently, most educational systems globally have responded rapidly to ensure

the continuity of the education process by relying on e-learning platforms and employing technological innovations in teaching as a strategic choice at all educational stages.

In Saudi Arabia, the COVID-19 pandemic compelled teachers to rely on platforms such as “Madrasati” during the academic years of 2020 and 2021. Madrasati is a Saudi e-learning platform, launched to provide a comfortable and safe means for students to learn. It has achieved great success because it assists students at all levels in completing their educational curriculum. It enables students to contact the teacher, receive information, and complete the curricula, despite the social-distancing and lockdown measures prevalent in the country (Yousef, 2020).

Teachers play a crucial role in employing distance and electronic education. Therefore, teacher preparation programs tend to rehabilitate and develop teachers’ technological competencies in various disciplines by providing diverse training and educational programs that support teachers’ abilities to perform their work accurately, successfully, and proficiently (Hassan, 2020). Teachers’ technological competencies play a significant role in the quality of education. Thus, modern education programs present professional experiences and prepare teachers to integrate technology into their teaching and learning processes (Gülbahar, 2008). Several studies assert that teachers must acquire technical competencies, including various computer and electronic skills, indicating that they have become an essential characteristic of a teacher in the era of information and communication technology (Abdul Hady, 2017; Tondeur et al., 2012).

1.1 The Study Problem

Pre-service teachers require specialized and advanced courses to perform their teaching sessions for the teaching practicum course. Furthermore, the researcher observed the students’ low level of proficiency in employing e-learning platforms, due to their low technological competencies, while supervising field training students. The results of the pilot study conducted on a sample of 30 students by pre-applying the e-learning competency levels test among pre-service teachers during their teaching on the Madrasati platform revealed that 80% of the students obtained a score of 30% and 20% obtained a score less than 50%. These results confirmed the students’ low level of e-learning competencies, despite their necessity in the 21st century. Given the existing theoretical and empirical literature reviewed above, this study highlights the significance of e-learning platforms in resolving the imposed challenges of the current era and the need to prepare pre-service teachers to use such technological tools.

Consequently, various studies have recommended the significance of developing educational policies that support the distance learning process and providing training courses for teachers on using educational platforms (Al Anzi & Al Saeedi, 2021). Furthermore, researchers asserted the necessity of developing college students’ competencies in digital literacy, computer use, and multimedia and computer-based learning, which includes blended learning classes, distance learning, cloud technologies, and virtual and augmented reality tools (Strutynska et al., 2019).

Therefore, this study aims to explore the effectiveness of a training program based on e-learning platforms in developing the technological competencies of pre-service teachers at Prince Sattam bin Abdulaziz University. Specifically, it examines the differences between students’ scores in the cognitive and performance dimensions of the technological teaching competencies when using e-learning platforms for the variables of gender and academic achievement. To fulfill this aim, the following research questions were formulated:

Q1 How effective is the training program on e-learning platforms in developing the cognitive dimension of the technological teaching competencies of pre-service teachers?

Q2- How effective is the training program on e-learning platforms in developing the performance dimension of technological teaching competencies of pre-service teachers regarding the use of electronic platforms?

Q3- Are there significant differences among the experimental group students’ pre- and post-measurements for the cognitive dimension based on gender and academic achievements?

Q4- Are there significant differences among the experimental group students' pre- and post-measurements in the performance dimension based on gender and academic achievements?

1.2 Literature Review

Teachers' technological competencies are reflected in the knowledge, skills, attitudes, and values that they should gain and master in the fields of educational technology, especially in designing, producing, and evaluating educational materials, as well as in the field of operating educational devices in their various forms (Wendawy, 2017). Woldab (2014) confirmed that teacher training institutions provide trainees with the necessary technical skills, which are most effectively acquired through learning with technology. Therefore, many global institutions concerned with teachers, such as the National Council of Accreditation for Teacher Education (NCATE) and the International Society for Technology in Education (ISTE), have defined several standards related to educational technology for teachers, and the indicators for achieving them. Teachers must be familiar with, understand, and employ them effectively in the educational process through their educational preparation programs. These standards include understanding the nature of technology and planning and designing learning environments, assessment, and evaluation (Zhou, 2016).

Teachers must possess the technical and educational competencies, as well as necessary knowledge to interact with educational websites and their tools, communicate with students using synchronous or asynchronous interactions, and interact with the content provided through these websites (Azmi, 2006). Thus, Zain El-Din (2007) identifies the teacher competencies in an e-learning environment as general competencies, including those related to computer literacy, computer skills, dealing with network programs and services, and preparing courses electronically. Zhou's (2016) study shows that the competencies of technological teaching can be classified into the following four axes:

- Computer competencies: The basic skills necessary for teachers to use a computer.
- Internet use competencies: The minimum skills necessary for using the internet during the educational process.
- Competencies of employing learning management system tools: The skills for using management system tools, such as managing direct dialogues and dealing with learners.
- Competencies for designing electronic courses: Analyzing the needs of the course, designing and developing it, using management skills, and internet activation, which summarize the stages of educational design, namely analysis, design, development, implementation, evaluation, and course management.

Online learning has shown rapid growth in the new settings imposed by COVID-19. In this context, e-learning platforms are the bridge between the current educational status and the effective use of technology. Electronic platforms are the foundations for remote training based on web technology and serve as spaces through which content is delivered. The learning process is conducted using a set of communication and outreach tools that enable learners to obtain what they need from courses, programs, and information (Hsu, 2012). Therefore, e-learning platforms are a form of social and interactive e-learning, involving conversations about the presented content and interactions about the educational problems, tasks, and procedures followed to solve such problems (Brown & Alder, 2008). Learning platforms are distinguished by their interactive and participatory techniques and tools, which transform learners from a passive recipient of knowledge to an active participant in knowledge-building as they cooperate, interact, and communicate with their colleagues. Platforms enable users to create, modify, store, manage, and reuse educational content more effectively by creating a repository that contains the general elements of the content (Mansour, 2014). Mansour (2014) and Al Zahrani and Ismail (2019) noted that e-learning platforms are responsible for the following functions:

- Registration: Indicating the ability to access and include data of the teacher and learners.

- Scheduling: Scheduling the course and setting the training and education plan.
- Delivery: Allowing learners to access the content.
- Tracking: Following up on learners' performances and creating reports based on this.
- Communication: Indicating the Communicating with the learners through chats, e-mails, discussion forums, etc.
- Tests: Creating and conducting tests for learners and issuing reports based on the results.

Through e-learning platforms, learners become the focus of the educational process, as they provide an abundance of information sources, allow for synchronous and asynchronous communication between people, and raise the students' levels (Ali, 2016). Various studies have also investigated the effectiveness of using e-learning platforms, stating that they improve professor-student communication, increase student satisfaction for courses, and change students' perceptions regarding homework and its importance in the educational process (Benta et al., 2014). Moreover, Makkawi's (2020) study confirmed that teaching through the e-learning platform "Edmodo" had a positive impact on the experimental group students' skill levels and cognitive achievement levels.

Furthermore, e-learning platforms encourage student cooperation and positive participation. It enables learners to communicate with their peers and engage in effective learning experiences; furthermore, it allows teachers to create and exchange content (Kalpan & Haenlein, 2012). Therefore, educational platforms represent an effective medium for e-learning, which makes learning more impactful, enjoyable, and positive (Al Anzi & Al Saeedi, 2021). This is confirmed by Al Bawi and Ghazi's (2019) study, which demonstrates the positive impact of using the educational platform "Google Classroom" on experimental group's achievement levels and their attitudes toward e-learning, compared to the control group. Moreover, Lutfi (2019) indicated that electronic courses using the Google Classroom platform had a significant impact on developing positive attitudes toward electronic courses.

Pre-service teachers are those who have enrolled in teacher preparation programs at the College of Education, which provides them with appropriate opportunities and experiences to learn and train in accordance with several academic requirements, and thus become teachers (Al Shammari & Al Ajami, 2017). Here, they should be provided with various opportunities to implement technological instructional activities and integrate appropriate technologies in their future classes (Brush et al., 2001). When prospective teachers practice a variety of computer activities, the use of technological-enhanced learning can increase (Wheatly, 2003). Hence, training pre-service teachers to use e-learning platforms is important and effective. This is confirmed by Al Moakely's (2020) study, which examined the effectiveness of training program sessions on smart device applications in enhancing professional and technological competencies in pre-service special education teachers at Jizan University. In addition, Al Ardan's (2017) study presented a program through a training platform, which demonstrated the effectiveness of this training in developing technological competencies for Arabic pre-service teachers.

The current study is significant as it focuses on a topic that has attracted the attention of many competent authorities, especially with the emergence of the COVID-19 and its associated restrictions, namely, the effectiveness of an e-learning platform training program in developing technological teaching competencies in pre-service teachers. Furthermore, it highlights the importance and benefits of e-learning educational programs and demonstrates how it can contribute to the development of future programs, the training of faculty members through workshops, and the development of competencies associated with technological teaching among students.

2. Methodology

2.1 Research Methodology

A quasi-experimental research methodology was utilized to examine the effectiveness of a training

program on e-learning platforms (independent variable) in developing technological teaching competencies (dependent variable).

2.2 Participants

A sample of 30 university students was chosen from the College of Education, Prince Sattam bin Abdulaziz University in Saudi Arabia (mean age = 23.22, SD = 1.43) to test the psychometric properties of the research tools. The basic research sample comprised 67 students (37 males and 30 females), who were enrolled in the field study course during the second semester of the academic years 2020 and 2021. After obtaining the consent of the pre-service teachers to participate in the program, written approval was obtained from the college to implement the program supported by the Deanship of Scientific Research at the university. The researcher controlled the internal and external validity threats through procedures, such as by choosing the sample randomly, which was a representative sample of the original population of the study. The experimental group was not exposed to any similar programs to ensure no overlap between the effects of these treatments. The training program was conducted for eight weeks. There were no dropouts during the training. The research tools had high validity and reliability, and the scale phrases were formulated in a way that made their items difficult to remember.

2.3 Data Collection Tools

2.3.1 Technological Teaching Competencies Questionnaire for the 21st Century

The researcher developed the technological teaching competencies questionnaire to measure the students' usage levels for e-learning platforms for those enrolled in the teaching practicum course, specifically in the cognitive domain of technological teaching competencies, which was conducted after reviewing related studies and measures [Zhou, 2016; Makkawi, 2020; Al Bawi & Ghazi, 2019; Lutfi, 2019; Al Moakely, 2020; Al Ardan, 2017; Zain El-Din, 2007]. According to the research objectives, the questionnaire consisted of two main sections in its initial form. The first section included basic research data, such as gender and cumulative averages, and the second section included questions related to the cognitive dimension of the technological teaching competencies when using e-learning platforms. It consisted of 21 items distributed over three axes: the first axis concentrated on technological planning for teaching through the e-learning platform and included nine items; the second axis was about implementing lessons in the e-learning platform and included seven items; the third axis was about evaluating lessons in e-learning platform and included five items. The questionnaire was validated by seven staff members as arbitrators who ensured the suitability of the statements to measure technological teaching competencies. They agreed on all questionnaire items after modifying the wording of two statements. The questionnaire in its final form consisted of 21 items measured on a five-point Likert scale (ranging from "very high" to "very low").

The questionnaire's internal consistency was examined via Pearson's correlation coefficient to discover the correlation coefficients of each axis with the total questionnaire scores. The correlation coefficient value for technological planning when teaching on an e-learning platform was $^{**}0.909$, implementing lessons on the e-learning platform was $^{**}0.913$, and evaluating lessons on the e-learning platform was $^{**}0.863$. The results revealed significant positive correlation coefficients at the 0.1 level, which indicates high internal consistency of the questionnaire. The internal consistency coefficient (Cronbach's alpha) was calculated to establish the questionnaire's reliability. The values of the reliability coefficients in the total scores of the questionnaire and axes were greater than 0.7, as indicated in Table 1.

Table 1: The Technological Teaching Competencies Questionnaire with Cronbach's Alpha Coefficients

Questionnaire axes	Cronbach's alpha coefficients
Technological planning for teaching on the e-learning platform	0.728
Implementing lessons on the e-learning platform	0.817
Evaluating lessons on the e-learning platform	0.734
Reliability coefficient of entire questionnaire	0.864

2.3.2 Observation Card

An observation card of the trainee's technological teaching competencies when using e-learning platforms was developed after reviewing related theoretical frameworks and previous studies (e.g., Al Ardan, 2017; Al Moakely, 2020; Lutfi, 2019; Makkawi, 2020). It aims to identify the extent to which the pre-service teacher can perform the skills that indicate the competencies of technological teaching on e-learning platforms. The card's statements were distributed into three main technological teaching competencies (i.e., planning, implementation, and evaluation). The final form included 21 behaviors related to technological teaching competencies in learning situations. In formulating the card statements, the following items were considered:

- Using simple sentences that are easy to estimate
- Using short phrases when defining simple sentences
- Using present simple verbs
- Ensuring that each statement describes only one behavioral component

After completing the card's design, it was presented to the faculty member arbitrators in its initial form to ensure that the instructions were clear and phrased accurately, and that behavior descriptions, their observability, and suitability were maintained. The arbitrators' agreement on the observation card's content was high. The reliability of the observation card was estimated using the Pearson correlation coefficient. The score was 0.87 between the first and second observers, 0.89 between the second and third observers, and 0.91 between the first and third observers. These values indicate the reliability of the observers' estimations.

For implementing the observation card, two staff members who are also responsible for supervising the teaching practicum to students at the College of Education, Prince Sattam bin Abdul Aziz University, assisted the researcher. The supervisors were trained on the observation card instructions and how to estimate the students' performance. After the training program was completed, the observation cards and answer sheets were distributed to the observers to evaluate the students' performance. A five-point Likert scale (1–5), with 1 being a "very poor" score to 5 being a "high score", was used in this study. Observers were asked to put a $\sqrt{\quad}$ mark in front of the behavior shown by the student and indicate the technological competencies of the teaching. Accordingly, the total score on the card is 105 points, and the lowest degree obtained by the observer is 21 points, indicating a low level of technological teaching competencies.

2.4 Preparing the Training Program

2.4.1 Premises for Building the Program

- The content of the program is based on the characteristics, attitudes, and general problems that participants face.
- The program has a general objective to achieve; and each session consists of procedural and behavioral objectives that are integrated to achieve the general objective of the program.
- There is a close link between the program sessions, their content and objectives, the activities, and the evaluation tools.

- Enthusiastic participants were recruited to ensure each student actively participates in the program.
- Stimuli, activities, and multiple tasks promote an atmosphere of enthusiasm and activity among participants.
- Multiple training sessions are conducted for each skill to ensure its consolidation and refinement.
- The diversity of techniques used in the sessions, which encourages students to participate actively, prevents boredom, and achieves the aims of each session, and thus the goals of the entire program.
- Formative evaluations were used during the training session to ensure the students' mastery of program activities; a final evaluation was conducted at the end of the program through a form to evaluate the objectives of each session.
- Preparing special sessions for each competency of technological teaching.
- The program includes knowledge, training, and actual practice sessions, providing information on the skills required to use e-learning platforms, as well as training participants in these skills during the sessions.

2.4.2 Procedures for Building the Program

- Determining program objectives: These were determined based on the definition of skills for employing e-learning platforms. The program content, methods, and evaluation methods were selected based on previously identified objectives. The general objective of the program, sub-objectives, and procedural objectives for each session were determined.
- Program content: The program included topics and skills related to the use of e-learning platforms. The program's content was selected based on pre-exploratory research conducted by the researcher. The content includes the following:
 - To employ computer skills when planning daily lessons.
 - To use media and educational materials available online in the planning of instructions.
 - To design educational lessons based on teaching strategies compatible with e-learning (such as the flipped classes, electronic discussions, etc.).
 - To design interactive, digital, and educational activities and experiences.
 - To use forums, blogs, and wikis to support learning objectives.
 - To manage virtual classes with various applications (e.g., Microsoft Teams, Zoom, my school platform, etc.).
 - To use the capabilities of digital learning platforms (e.g., the Madrasati platform) in e-learning.
 - To solve basic technical problems encountered during e-learning.
 - To employ multimedia when preparing students for new lessons.
 - To effectively implement active learning strategies through electronic platforms.
 - To enhance the learning experience of the students who participate in the e-learning environment.”
 - To design electronic assessment tools (e.g., electronic tests, assignments, and discussion rooms).
 - To use electronic records to retain students' assessments during assignments and tests.
- Training methods: Due to COVID-19, the program was conducted remotely through the Blackboard program.
- Program duration and number of sessions: The program was conducted over six weeks with 12 sessions (two sessions per week lasting for about 60 minutes each). The sessions ranged from easy to difficult, with one session each for the pre-tests, dimensional measurements,

- and follow-up measurements.
- Program evaluation: The program was evaluated by considering its foundations and philosophy. Its procedures include the following steps:
 - Pre-measurement: A pre-measurement of skills in using e-learning platforms was conducted on members of the experimental group before implementing the program.
 - Conducting formative evaluation: While implementing the program sessions, the researcher monitored the progress of the program through a form for assessing its session objectives that was prepared by the researcher and distributed at the end of each session. This measured the level of progress in the program, avoided errors during the program, or addressed them.
 - Final evaluation (after completion of the program): The final evaluation of the program sessions was conducted through a post-measurement of the skills of group members in using e-learning platforms, followed by a follow-up measurement after a month of this assessment to verify the extent to which the learning impact remained after the training.
 - Program validity: A group of faculty members were requested to evaluate the validity of the training program procedure, objectives, and content. According to the arbitrators, the program was suitably designed.

2.5 Applying the Post-test

After the completion of the program sessions, the researcher administered the Technological Teaching Competencies Questionnaire for the 21st Century to the classroom and the observation card to the training group as a post-measurement.

3. Results

Q1 - How effective is the training program via e-learning platforms in developing the cognitive dimension of the technological teaching competencies of pre-service teachers? (Table 2)

Table 2: Arithmetic Mean, Standard Deviations, t-values, and the Significance of Differences in Cognitive Dimensions and Domains of Technological Teaching Competencies for Pre- and Post-measurements

Domain	Measurement	N	Mean	Std.	t-value	Significance	Effect size
Planning	Pre	67	2.6252	.45106	22.591	.000	.191
	Post	67	4.5008	.48946			
Implementation	Pre	67	2.6930	.43306	20.786	.000	.093
	Post	67	4.4947	.54332			
Evaluation	Pre	67	2.5463	.59450	16.898	.000	.111
	Post	67	4.4388	.64689			
Total scores	Pre	67	2.6285	.42908	22.589	.000	.348
	Post	67	4.4837	.48471			

According to the results presented in Table 2, there are statistically significant differences in the mean scores of the experimental group members in the cognitive dimension and its technological teaching competency sub-domains between the pre- and post- measurements, favoring the post-measurement. The t-values ranged from 16.989 to 22.591, significant at the 0.01 level. Hence, the differences are due to the effectiveness of the training program in developing the cognitive dimension of the technological teaching competencies when using e-learning platforms for the experimental group members.

Q2 - How effective is the training program via e-learning platforms in developing the performance dimension of technological teaching competencies for the use of electronic platforms for pre-service teachers? (Table 3)

Table 3: Arithmetic Mean, Standard Deviation, t-value, and the Significance of Differences in Performance Dimensions and Domains of Technological Teaching Competencies for Pre- and Post-Measurements

Domain	Measurement	N	Mean	Std.	t-value	Significance	Effect size
Planning	Pre	67	2.2836	.53121	148.360	.000	.984
	Post	67	4.2537	.54564			
Implementation	Pre	67	2.3433	.51571	109.966	.000	.933
	Post	67	4.3177	.56808			
Evaluation	Pre	67	2.4030	.52742	66.082	.000	.895
	Post	67	4.3612	.62303			
Total scores	Pre	67	2.3319	.48567	138.395	.000	.983
	Post	67	4.3006	.52370			

According to the results presented in Table 3, there are statistically significant differences in the mean scores of the experimental group members in the performance dimension and its technological teaching competency domains between the pre- and post- measurements, favoring the post-measurement. The t-values ranged from 66.082 to 148.360, which are significant values at the 0.01 level. Hence, the differences are due to the effectiveness of the training program in developing the performance dimension of the technological teaching competencies when using e-learning platforms for the experimental group members.

Q3 - Are there significant differences among the experimental group students' pre- and post-measurements for the cognitive dimension based on gender and academic achievements?

To answer this question, a two-way ANOVA was used to discover the effect of gender and academic achievements variables on the mean scores of students in the cognitive aspect of competencies for technological teaching using e-learning platforms. The results demonstrate that the relationship between gender and academic achievements is not statistically significant [$F(1.63)=.000$, $p=.991$]. Moreover, there are no statistically significant differences between the mean scores of students in the cognitive aspect based on gender [$F(1.63)=.065$, $p=.800$] and academic achievements [$F(1.63)=2.15$, $p=.147$].

Q4 - Are there significant differences among the experimental group students' pre- and post-measurements in the performance dimension based on gender and academic achievements?

To answer this question, a two-way ANOVA was performed to discover the effect of gender and academic achievements on the mean scores of students in the performance dimension of technological teaching competencies when using e-learning platforms. The results demonstrate that the relationship between gender and academic achievements is not statistically significant [$F(1.63)=.030$, $p=.863$]. Moreover, there are no statistically significant differences between the mean scores of students in the performance dimension based on gender [$F(1.63)=.185$, $p=.669$] and academic achievements [$F(1.63)=.098$, $p=.756$].

4. Discussion

This study investigates the effectiveness of a training program via e-learning platforms in developing the technological teaching competencies of pre-service teachers at Prince Sattam bin Abdulaziz University. The results indicate that the training program contributed to enhancing the skills of

teaching practicum students in the cognitive and performance dimensions of technological competencies when using e-learning platforms for teaching middle and high school students in the aspects of planning, implementation, and evaluation. This result was confirmed by the statistically significant differences between the mean scores of the pre- and post-measurements in the cognitive and performance dimensions of the technological teaching competencies when using electronic platforms, in favor of the post-measurement. It is consistent with several studies, indicating the necessity of developing teachers' performance in using teaching methods and technologies (Babair, 2020). Teaching through electronic educational platforms has been found to have a positive effect on the skill level of university students and their cognitive achievement (Al Ardan, 2017; Al Enezi, 2017; Al Moakely, 2020; Makkawi, 2020). The students' cognitive and performance levels may be attributed to the content of the training program and positive effect of using e-learning platforms. It enables learners to communicate with their colleagues, exchange experiences and content with their peers, and enhance positive attitudes toward education (Al Bawi & Ghazi, 2019; Al Enezi, 2017; Kalpan & Haenlein, 2010; Lutfi, 2019). Therefore, the Ministry of Education must endeavor to develop the technical ability of in-service teachers so that they can teach on educational platforms, such as Madrasati, by establishing training programs actively. Moreover, faculties of education must raise students' electronic skills when teaching through educational platforms by offering courses and training programs. This was confirmed by Abdul Hady (2017), who stated that teachers should acquire computer skills and competencies, which have become one of the most important teaching competencies in the era of communications and technology. The teacher preparation programs must reflect these standards, as confirmed by Al Enezi's (2017) study on the importance of holding courses for teachers to develop their skills when using educational platforms. Therefore, there is a need to reconsider teacher preparation programs in the faculties of education to keep pace with the changes in the field of educational technology, since IT skills and dealing with technological innovations have become a prerequisite among teachers. This is confirmed by Strutyńska et al. (2019) and Woldab (2014), who demonstrated an increased interest in developing university students' use of educational platforms and cloud-based technologies.

The sub-group analysis for gender and academic achievements also confirmed that there were no statistically significant differences among the mean scores of students in the cognitive and performance dimensions of the technological teaching competencies when using electronic platforms. This may be because all the students of various academic levels were actively involved in the program and eager to benefit from it.

5. Conclusion

This study confirmed the effectiveness of a training program in raising the skill level of pre-service teachers in the technological aspect of optimally using electronic learning platforms. Mastering technological skills has become inevitable for teachers, as the success of countries in terms of education, in light of the COVID-19 pandemic, depends on their ability to use educational platforms to avoid interrupting the students' learning process. The Ministry of Education must continue training in-service teachers on technological skills and practices in distance education, whether synchronously or asynchronously, owing to its positive effects on students. It is also necessary for faculties of education to reformulate the objectives of their courses to align with the requirements of the technological era, and work on training university students on the optimal use of educational platforms. This can help the Ministry of Education in transitioning seamlessly from traditional education to distance learning.

Therefore, it is the duty of education ministries in all countries to implement blended learning (in attendance and distance learning) at all academic levels, even if a minimum of 10% is offered via remote electronic platforms, to preserve the technical gains for both teachers and students. Furthermore, distance learning can be used in remote areas that are difficult for teachers to access, especially in rare specialties, and when students are unable to reach school due to weather conditions

or sickness. In-service and pre-service teachers from Saudi Arabia and other countries can also benefit from the application of this program to improve their e-learning platforms. Future studies can explore the challenges that teachers face while using distance education and its effectiveness on student achievement.

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