



Research Article

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The Attitudes of Teachers Toward Using E-learning in Mathematics Teaching to Intermediate Stage Students

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Abstract

This study sought to identify the significance and employing electronic learning in the teaching process of mathematics at the intermediate stage from the teachers' perspectives. The study adopted the descriptive approach and developed a questionnaire as an instrument, which was distributed to 200 female mathematics teachers at the intermediate level in public and private schools in Jordan. The findings demonstrated that mathematics teachers in the intermediate stage favor the use of e-learning in teaching mathematics and its importance. This agreement among the participants reveals teachers' familiarity with e-learning tools and their availability in public schools in Jordan. The findings also indicated the presence of consensus among the participants in the degree of use and importance of e-learning contained in the tool of this study and that their opinions are not affected by the difference in their educational level.

Keywords: mathematics teaching, e-learning, teachers' attitudes, information technology

1. Introduction

The scientific and technological advancements that the world experienced in the last decade of the 20th century and the first decade of the 21st century have led to rapid advances and changes that define the information age in which we currently live (Nortvig et al., 2018). The growth of computers and information and communications technology was the most notable of these advances, and it was evident in many other areas of advancement, particularly in the field of education. This age is distinguished by advancements in science, culture, and technology, fast communication, and the growing application of contemporary technologies in education to meet effective and efficient learning objectives (Cidral et al., 2018). Without a doubt, educators and administrators, who are responsible for supervising the educational process face challenges due to the information revolution

and the advancement of educational technology in the modern era. As a result, any society that wishes to advance and enhance the educational process must catch up with the information age (Singh, 2021).

The computer has entered all aspects of our lives, and the countries of the civilized world use the computer at various levels in all stages of education according to the student's abilities. Therefore, teaching young male and female students how to obtain information and introduce technology into the educational process became a priority (Alqahtani & Rajkhan, 2020). Educational systems in information societies have paid attention to preparing individuals to use the computer well due to the technologies it features. Computer use has evolved into a crucial component of modern society and a key indicator of advancement (Al-Kahlan & Khasawneh, 2023). With the advent of the Internet as a byproduct of this cutting-edge technology and the information revolution that followed, technology has started to permeate every area of existence (Olefirenko et al., 2019). Because of all of this, being able to utilize a computer and its technologies effectively became essential to keeping up with advancements, transitioning from limited to limitless computer use with all of its contemporary technologies, and keeping up with emerging trends in education.

The computer is an effective mediator when it comes to teaching and studying mathematics. The significant improvement in teachers' and students' attitudes toward studying mathematics, in addition to the inevitable need to confront our schools and curricula for cognitive development, may be the most compelling argument for using computers in mathematics instruction (Almanthari et al., 2020). Students can learn through peer learning, their own experiences, and those of instructors, mentors, and experts in the network over the Internet. One of the main topics of discussion during the World Congress for Mathematics Education in Seville, Spain, in 1996 was the use of technology in mathematics instruction (Sumarwati et al., 2020). The conference came out with recommendations, including the importance of using the Internet to make difficult mathematical courses simpler, by presenting them on CDs that use the media. Multiple learning methods such as sound and movement side by side contribute effectively to reducing the student's dependence on the teacher and increasing the ability to discover and self-learn in the secondary stage and beyond (Vlasenko et al., 2020).

E-learning is a kind of remote education that makes use of networks, computers, and multimedia, including search engines, libraries, Internet portals, and music, pictures, and graphics (Ahn & Edwin, 2018). However, e-learning is broader than distance learning due to the possibility of its use within the classroom. For any e-learning effort to succeed, the ability and competence of the teachers or faculty members entrusted with providing this type of modern education must be ensured. E-learning enhances the teacher's role as a supervisor, guide, and organizer to manage the educational process and thus becomes compatible with developments in the modern era. The teaching-learning process can occur around the clock, year-round, enabling students to receive training while on the go or in a different location than usual, encouraging a shift in the teacher-learner dynamic and learning philosophy—where the student plans their training while the teacher provides guidance—and providing unrestricted access to network resources (Sumarwati et al., 2020). As a result, using e-learning completely alters the viewpoint that we previously had about teaching.

1.1 Problem Statement

Equal educational opportunities through e-learning based on the Internet, which has become an educational reality, add a new dimension to education and contribute to the development of the educational process in its various aspects in terms of foundations, concepts, and goals. E-learning helps create a rich, multi-source learning environment; it also promotes communication amongst stakeholders in the educational system, models education, and presents it in a uniform format; and it helps prepare the next generation of educators and students to work with technology and possess the most up-to-date skills. The Ministry of Education promoted the e-learning project in the implementation of the national plan for information technology by presenting advanced educational

technologies and materials and multi-electronic media in the educational process. The goal of the current study is to determine, from the perspective of instructors, how important and useful e-learning is for teaching mathematics at the intermediate level.

1.2 Questions of the study

1. What is the level of importance and use of e-learning in mathematics curriculum teaching at the intermediate level from the point of view of teachers in Jordan?
2. Is there a difference between the participant's responses to the study instrument regarding the degree of importance and use of e-learning in teaching mathematics at the intermediate level according to the variables of age and educational level?

1.3 Significance of the study

This research might potentially assist secondary mathematics curriculum creators in creating e-learning mathematics courses that are appropriate for the current technological landscape and the needs of the modern world. The results of this study might help determine how much e-learning is used to teach mathematics. This study might help motivate and encourage math teachers who want to employ e-learning in their classrooms. This research might potentially assist the learner and encourage self-reliance.

1.4 Study limitations

Time limitations: The current study was implemented in the second semester of the school year 2022-2023 in the first semester.

Spatial limitation: This study was limited to mathematics teachers.

Objective limitation: This study was limited to identifying the level of significance and use of e-learning in teaching mathematics at the intermediate level from the point of view of teachers.

Human Limit: The sample of the current study was limited to mathematics teachers at the intermediate level in Jordan, for the school year 2022-2023.

2. Literature Review

There has not been a unanimous consensus on what constitutes a comprehensive definition that encompasses all facets of "e-learning." Several definitions of e-learning resulted from the majority of attempts and efforts that concentrated on describing it, each looking at it from a different perspective based on the type of interest, specialty, and goal. (Huda et al., 2019). These ideas may be divided into two primary categories, one of which saw e-learning as a teaching technique and the other as an integrated system, to overcome the excess of these definitions and profit from them. According to the first group, e-learning is a teaching strategy that uses electronic media and multimedia to impart knowledge to students (Bawaneh, 2021). One definition of e-learning that this group employs is the provision of educational content with explanations, exercises, interaction, and follow-up, either partially or fully, in-person or remotely, in the classroom or via sophisticated computer programs stored on the Internet (Wen et al., 2020).

According to the second group, e-learning is a cohesive system that comprises inputs, processes, and outputs. E-learning is defined as "a system for presenting curricula (courses) via the Internet, a local network, satellites, CDs, or interactive television to reach learners," according to one description that reflects the viewpoint of this organization (Ninsiana et al., 2022). E-learning is an educational approach that uses computer networks and information technology to enhance and broaden the breadth of the learning process. It employs a variety of tools, including computers, the Internet, and electronic applications created by businesses or ministry professionals (Çevik & Bakioğlu, 2022).

The most vital objectives of e-learning are to create educational networks to organize the duties entailed by the educational institutions and their departments and to create an interactive educational structure through new electronic technologies and diversity in sources of information and experience (Almanthari et al., 2020). The digital culture that e-learning offers is centered on information processing. This culture is aligned with constructivist education theory in that the student may take control of his learning by creating his world through interactions with other electronically accessible places. All societal sectors can benefit from educational opportunities made possible by e-learning. It offers instruction anywhere, at any time, based on the learner's capacity to succeed (Sumarwati et al., 2020). E-learning lowers educational costs while enhancing the learning process and fostering critical thinking. It encourages the learner to rely on himself and assists him in becoming independent.

Since these technologies make it easier and faster for teachers and students to obtain mathematical information, educational technologies are crucial for creating curricular elements in general and mathematics in particular (Ahn & Edwin, 2018). The computer supports individualized instruction and the growth of students' ability to study mathematics independently. To get a degree of competence in teaching and studying mathematics, e-learning is utilized in the training process to solve difficulties and solve mathematical problems. Instantaneous feedback from the computer motivates pupils to learn math (Vlasenko et al., 2020; Yaser et al., 2022). Additionally, the computer facilitates the study of numerous technical and statistical topics as well as the integration of science, math, and technology with other academic courses. The educational objectives of mathematics are met with the use of e-learning. The computer encourages kids to have a positive attitude while studying mathematics.

2.1 Previous studies

Majeed (2021) examined how a reflective learning technique affects intermediate first-grade students' arithmetic achievement and attitudes toward online learning in Baghdad. The study participants consisted of fifty students who were split into two groups—one experimental and the other control—after being chosen at random. The accomplishment test and a gauge of the e-learning trend were the two instruments that were employed. The findings showed that the experimental performed better than the control group in terms of academic accomplishment and that there was a strong favorable tendency in the experimental group toward the usage of e-learning in the classroom.

Mailizar et al. (2021) sought to identify the variables that affected seasoned math instructors' intentions to include e-learning in their curricula. A questionnaire was used to gather information from 161 math instructors in secondary schools who had finished an online six-month program offered by the Indonesian Ministry of Education. The E-learning experience was added as a concept and served as the framework. This study investigated and presented an expanded TAM model. It was composed of five constructs: experience, perceived utility, perceived ease of use, intention to use, and attitude toward utilizing. The results demonstrated that the two most important factors in predicting the usage of e-learning were attitude toward e-learning and e-learning experience.

Marpa (2021) explored how instructors felt about utilizing technology to teach math to students affected by the COVID-19 epidemic. To solve this issue, the researcher employed a descriptive approach using a Scale, which was given to the participants who were chosen at random. According to the study's findings, math instructors have generally good attitudes toward utilizing technology in terms of behavioral engagement and technological confidence, and they have very positive attitudes regarding affective involvement. The findings also show that opinions regarding the use of technology in math instruction varied considerably across male and female instructors. In keeping with this, it may be concluded that since math instructors have a favorable attitude toward technology, it is relevant and significant to them.

Karasneh et al. (2021) evaluated the pandemic's impact on online learning and identified perceived hurdles to it as reported by Jordanian university teachers. This study is cross-sectional,

descriptive, and questionnaire-based. Jordan's public university lecturers and professors were all given access to an online survey. 508 instructors in all replied to this survey. In comparison to females, men predominated in the study population. During the epidemic, teachers used the internet for instructional reasons for an average of 20.2 ± 15.9 hours per week. Positive sentiments on teaching online were evident, as 65.7% of respondents said they were ready for the format, and 40.8% said they felt at ease interacting with students online. It also seems that institutional support for virtual learning has grown after the coronavirus pandemic.

Moreno-Guerrero et al. (2020) determined whether the e-learning approach, as opposed to the conventional explanatory method, is more successful in teaching adults high school mathematics. The produced study is correlational, descriptive, and quantitative. There is a control group and an experimental group in this quasi-experimental study design. The findings demonstrate the beneficial effects of using the e-learning approach on involvement, motivation, autonomy, and mathematical ideas as well as grades and outcomes. It is clear from a comparison of the expository technique and the e-learning approach that adult learners of mathematics at the high school educational level gain from it.

Zuber and Sulaiman (2019) investigated if using e-learning in mathematics teaching and learning (T&L) could develop the motivation and performance of students in the subject. Forty Year 3 kids were selected as the research sample. Through the use of an evaluation procedure, the efficacy of e-learning was determined. To determine if e-learning has affected the students' incentives for studying mathematics, they were also responding to a questionnaire. The findings showed that there was a noteworthy distinction in students' academic performance between before and after they used e-learning.

3. Methodology

3.1 Research design

The descriptive approach was chosen by the researcher to address the study's problem because it was deemed appropriate given the nature of the problem, which is based on the study of the phenomenon, is interested in accurately and clearly describing reality, and can be expressed either qualitatively or quantitatively. The phenomena is described and its qualities are explained by the qualitative expression. On the other hand, the quantitative expression provides us with a numerical description by elucidating the degree of this phenomenon's link to other phenomena as well as its extent or size.

3.2 Sampling

The participants in this study included 200 female mathematics teachers who were selected in a stratified random manner. They were selected from mathematics teachers at the intermediate level in public and private schools in Jordan. The following table presents the data on the participants.

Table 1. Information on the participants of the study

Variable	Frequency	Percentage
Age		
Less than 30 years	100	50%
From 31-40 years	70	35%
Older than 40 years	30	15%
Academic qualification		
Bachelor	170	85%
Master's	30	15%
Total	200	100%

3.3 Instrument of the study

Since this investigation aims to explore the level of using e-learning in teaching mathematics at the intermediate and its significance according to the teachers in public schools, and for the study to follow the descriptive approach, the researcher had to use the questionnaire as an instrument to gather the data for the study. One questionnaire was used to find out the opinions of the mathematics teachers about the degree of importance and use of e-learning in teaching mathematics. The questionnaire consisted of (34) items, distributed over 5 dimensions.

The researcher presented the study tool to a group of experts from the Department of Curriculum and Teaching Methods at different universities in Jordan. The arbitrators provided their input on the structure and formation of the questionnaire and the researcher prepared the instrument accordingly. After ensuring the validity of the study instrument, the researcher applied it to a pilot sample consisting of 30 members of the study population. The correlation coefficient between each questionnaire statement's score and the dimension was calculated by the researcher using the survey sample responses as a basis for calculating the Pearson correlation coefficient, which assessed the questionnaire's internal validity.

To measure the stability of the questionnaire, the researcher used Cronbach's alpha coefficient, where the equation was applied to the total sample as represented in the following table.

Table 2. Cronbach's alpha reliability coefficient for the dimensions of the instrument

Dimension	Part	No. items	Correlation coefficient
E-learning in mathematics curriculum tasks	Importance	10	0.84
	Use	10	0.88
E-learning in teacher roles	Importance	6	0.91
	Use	6	0.87
E-learning in student roles	Importance	8	0.90
	Use	8	0.71
E-learning in mathematics development tools	Importance	5	0.77
	Use	5	0.92
E-learning concerning analysis	Importance	5	0.75
	Use	5	0.86
Total	Importance	34	0.93
	Use	34	0.91

Table 2 reveals that the coefficient (Cronbach's alpha) for the dimensions of the study tool (as a whole) expresses high degrees of reliability and is equal to 0.93 for the degree of importance and also equal to 0.91 for the degree of use. This suggests that the research tool has a high level of stability and can be trusted when the study is used in the field.

3.4 Data analysis

Frequencies and percentages were utilized by the researcher to explain the sample's characteristics. The dimensions of the research instrument and the expressions' order were determined using the mean scores and standard deviation. The instrument's stability was assessed using the Cronbach's alpha coefficient. The t-test was utilized to identify group differences, and the Pearson correlation coefficient was employed to assess the validity of the internal consistency between the questionnaire statements and their dimensions.

4. Results and Discussion

4.1 The first question

From the perspective of female teachers, frequencies, percentages, mean scores, standard deviations, and ranks were computed for the study items' responses to the statements about the importance and the use of e-learning in secondary mathematics curriculum tasks. Table 3 presents the results.

Table 3. The results of the responses of the sample on the use and importance of e-learning in teaching mathematics

Dimension	Part	Mean score	Standard deviation	Level
E-learning in teacher roles	Importance	3.09	0.87	Medium
	Use	4.32	0.55	High
E-learning in student roles	Importance	4.06	0.42	High
	Use	3.29	0.55	Medium
E-learning in mathematics development tools	Importance	4.02	0.74	High
	Use	3.25	0.56	Medium
E-learning concerning analysis	Importance	4.37	0.61	High
	Use	3.25	0.69	Medium

It is clear from the previous table that the participants agree that the degree of importance is great. The mean score for the second-dimension statements as a whole with the degree of importance was (4.32) with a standard deviation of (0.55), and the degree of importance for this dimension was large. The mean score for the phrases of the third dimension as a whole regarding the degree of use was (3.46) with a standard deviation of (0.72), and the degree of use for this dimension was average. The mean score for the phrases of the fourth dimension as a whole concerning the degree of importance was (4.06) with a standard deviation of (0.42), and the degree of importance was high. The mean score for the expressions of the fifth dimension as a whole concerning the degree of importance was (4.02) with a standard deviation of (0.74), and the degree of importance was high. It is clear from the previous table in general that the mean score for the fifth-dimension statements as a whole concerning the degree of use was (3.25) with a standard deviation of (0.69), and the degree of use for this dimension was average.

The results above show that mathematics teachers in the intermediate stage favor the use of e-learning in teaching mathematics and its importance. This agreement among the participants reveals teachers' familiarity with e-learning tools and their availability in public schools in Jordan. These findings indicate the keenness of the Ministry of Education in Jordan to encourage utilizing e-learning in the teaching process of different school subjects, including mathematics. The findings also show the importance of e-learning according to the teachers' perspectives, which indicates that teachers have good knowledge and practice in implementing e-learning, whether in the classroom or online.

Teachers receive several training courses and seminars on the use of the latest technologies in the teaching of different school subjects, especially mathematics. Their knowledge proves that they are willing to test and try new and different techniques to help their students learn and acquire concepts and ideas, especially complex and difficult concepts found in math books. Using technology is an effective technique to facilitate the learning of these concepts in new trends and methods. Therefore, teachers were inclined to agree with the need to increase using the e-learning tools in their lessons and classes.

4.2 The second question

The One-Way ANOVA analysis was used to answer the second question by finding the differences between the teachers' opinions according to their age variable. The following table shows the results.

Table 4. The One-Way ANOVA analysis for the age variable

Dimension	Part	Sum of squares	Freedom Value	Mean square	F value	Sig.
E-learning in mathematics curriculum tasks	Importance	150.799	199	0.761	0.536	0.586
	Use	40.846	199	0.203	2.223	0.111
E-learning in teacher roles	Importance	63.736	199	318.0	1.571	0.210
	Use	59.932	199	0.303	.0261	0.771
E-learning in student roles	Importance	60.477	199	0.302	1.464	0.234
	Use	34.656	199	0.173	1.594	0.206
E-learning in mathematics development tools	Importance	109.168	199	0.543	2.182	0.166
	Use	63.500	199	0.322	0.183	0.833
E-learning concerning analysis	Importance	95.960	199	0.476	2.197	0.144
	Use	73.449	199	0.372	0.859	0.152

It is noticed from Table 4 that the f value in all dimensions is not significant and indicates that there are no apparent differences between the overall averages of the dimensions of the study instrument from the point of view of the study sample to determine the degree of use and importance of e-learning in teaching mathematics at the intermediate level in public and private schools according to the age variable. This result indicates the consensus among the teachers in the degree of use and importance of e-learning contained in the tool and that their opinions are not affected by the difference in age. Teachers have similar backgrounds and teaching experiences regardless of their age. They receive similar training and instructions, whether from the school principals, supervisors, or the authorities in the education sector. Therefore, the age of the teacher was not an effective factor in their views toward using e-learning.

To find the differences between the teachers' opinions towards the importance and use of e-learning in teaching mathematics according to their academic qualifications, the t-test was used. Table 5 presents the results of this analysis.

Table 5. T-test for independent samples for the participants on the importance and use of e-learning in teaching mathematics according to the educational level

Dimension	Part	Academic level	No.	Mean score	Standard deviation	T value	Sig.
E-learning in mathematics curriculum tasks	Importance	Bachelor	170	3.09	0.8624	0.165	0.869
		Master's	30	3.12	0.9300		
	Use	Bachelor	170	3.94	0.4547	0.194	0.846
		Master's	30	3.93	0.4510		
E-learning in teacher roles	Importance	Bachelor	170	3.45	0.5652	0.594	0.553
		Master's	30	3.52	0.5763		
	Use	Bachelor	170	4.34	0.5174	1.292	0.198
		Master's	30	4.20	0.6995		
E-learning in student roles	Importance	Bachelor	170	3.28	0.5457	0.536	0.593
		Master's	30	3.34	0.5890		
	Use	Bachelor	170	4.07	0.4107	0.432	0.666
		Master's	30	4.03	0.4595		

E-learning in mathematics development tools	Importance	Bachelor	170	3.24	0.5793	0.735	0.463
		Master's	30	3.32	0.4773		
	Use	Bachelor	170	4.04	0.7293	1.116	0.266
		Master's	30	3.88	0.8010		
E-learning concerning analysis	Importance	Bachelor	170	3.22	0.6730	1.236	0.218
		Master's	30	3.39	0.8026		
	Use	Bachelor	170	4.40	0.5968	1.830	0.069
		Master's	30	4.18	0.6440		

Table 5 above reveals that the value of (t) in all dimensions is not significant and indicates the absence of significant differences between the overall averages of the dimensions of the study tool from the point of view of the study sample to determine the degree of use and importance of e-learning in teaching mathematics. This result indicates that there is agreement among the study sample in the degree of use and importance of e-learning contained in the tool of this study and that their opinions are not affected by the difference in their educational level.

The teachers agree on the importance of e-learning in teaching mathematics and its importance in helping them to provide high-quality lessons to students. The findings here indicate the availability of training to all categories of educational levels of teachers, as their academic level did not affect their views on the level of using e-learning. Teachers receive support from their superiors in different areas of skills and competence. They can always find resources provided by the authorities in education that enrich their knowledge and skills on the latest uses of electronic methods in teaching and managing classes and online lessons. Therefore, the academic qualification variable played no effective role in their opinions.

5. Conclusion

This study aimed to determine, from the perspective of instructors, how important and useful e-learning is for teaching mathematics at the intermediate level. The mean scores for the degree of importance of the statements of the first dimension ranged from 3.48 to 4.39. This indicates that the degree of using e-learning in the mathematics curriculum was high. The results also showed that mathematics teachers in the intermediate stage favor the use of e-learning in teaching mathematics and its importance. This agreement among the participants reveals teachers' familiarity with e-learning tools and their availability in public schools in Jordan. The findings also indicated that there was agreement among the study sample in the degree of use and importance of e-learning contained in the tool of this study and that their opinions are not affected by the difference in their educational level. The study concluded that using new technologies and methods to teach math to students is an effective effort. Teachers' willingness to test and try the new methods shows their awareness of the need for novelty and innovation in the classroom.

6. Recommendations

The study recommends raising the level of using e-learning in mathematics teaching at the secondary level in public schools in Jordan and taking more interest in removing the obstacles that limit the effectiveness of using e-learning in teaching mathematics at the intermediate level. It is also recommended to provide appropriate training and qualification opportunities for mathematics teachers, especially in the field of using e-learning, and to create a work environment that is appropriate for the use of e-learning in teaching mathematics. It is necessary to equip laboratories and classrooms with all the requirements for using e-learning in mathematics teaching.

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