

The Impact Of Electronic Learning Package In Mathematics For Secondary Schools In Palestine On Students' Achievement Amidst The COVID-19 Pandemic

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Abstract – The study aimed to design an electronic learning package to be delivered through the Internet and mobile phones to support students' self-learning in mathematics for secondary schools, especially the scientific stream in Palestine. The major objective of this package is to raise their academic achievement in the course of the COVID-19 pandemic. The study also aimed at investigating the impact of the e-learning package on improving the students' academic achievement in math. To achieve these objectives, a constructivist and experimental approach was used as it suits the nature of the study. The sample consisted of 82 male and female students who were randomly divided into an experimental group of 42 male and female students and a control group of 40 male and female students. The study tools included an e-learning package that covered the fifth unit of math in the secondary school/ scientific stream entitled Definite Integration and Its Applications, and an achievement test to measure the students' academic achievement. The findings of the study revealed the following: a statistically significant effect of using the e-learning package on the students' academic achievement during the pandemic with a huge effect, a statistically significant difference between the average achievement scores of the experimental group and the control group due to gender, and an interaction between the method of education and gender.

Keywords – Electronic learning package; mathematics; secondary schools; COVID-19 pandemic.

I. INTRODUCTION

In recent decades, the world has witnessed major advancements in information and communication technology reflected in the field of education and learning through employing and benefiting from this new technology. E-Learning has become one of the most prominent standards that various countries and educational institutions seek to adopt in order to improve and leverage the educational process and address its problems.

E-learning and the digitization of education through the employment of information and communication technology in the educational process and supporting self-learning strategies through it are top concerns of most educational institutions and the orientations of most learners and teachers (Ezeabii & Ohagwu, 2019). E-learning has the potential that qualifies it to play a major role in the continuous development in the field of education. Therefore, educational institutions that wish to adopt successful

strategies in their work mechanisms must ensure that they are fully prepared and equipped from a cultural and technical point of view in order to adopt e-learning systems in their educational strategies, accelerate the development of their educational systems to be in line with the developments of technology and to integrate it into its teaching and learning strategies. Hence, re-designing the teaching and learning process to allow the use of this type of advanced educational technology (Emerald Group, 2006).

Most countries and educational institutions worldwide reached a consensus on the importance of e-learning, despite differing opinions and controversies about its role in the educational and learning process and the need to integrate it prior to the COVID-19 pandemic. However, e-learning as an educational approach is considered an urgent necessity, the sole remedy, and the most appropriate alternative to continuing education in light of the conditions imposed by the pandemic in various countries.

The Coronavirus disease manifests in a new coronavirus strain never previously detected in humans. The disease resulting from this virus is called COVID-19, and the World Health Organization discovered this emerging virus for the first time on December 31, 2019. A group of viral pneumonia cases was reported in Yuhan, the People's Republic of China. Coronaviruses are a widespread family known to cause diseases ranging from the common cold to more severe illnesses such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS; World Health Organization, 2020).

Since the advent of the COVID-19 pandemic at the end of 2019 and the beginning of 2020, most countries were forced to take preventive measures to limit the spread of this pandemic, such as physical distancing between individuals, recurrent lockdowns for long periods, and closures of institutions in various sectors. These preventive measures caused partial and complete paralysis of life and the educational sector.

Such a situation forced all educational institutions worldwide to shift from face-to-face education, a viral stage for the transmission of infection, to e-learning. This shift provided distance education and learning, achieved physical distancing, and solved the problem of education interruption due to the recurrent closures of educational institutions.

The study of al-Ameer (2021) revealed the role of e-learning in facing the academic problems caused by the spread of the pandemic among high school students, a crucial level in the education stages being a critical transitional stage for the student's future. The results of the study revealed that secondary school students believe that e-learning has effectively contributed to overcoming the frequent absence of students from face-to-face education. They also revealed that the educational videos available on YouTube are the most preferred for students in distance learning amid the conditions of the COVID-19 pandemic, with a percentage of 83.2%.

The study of Mulenga and Marban (2020) described the COVID-19 pandemic as the e-learning portal in math teaching and learning. Both authors see that the conditions imposed by the pandemic would have pushed educational institutions in various countries to move towards e-learning, increase their conviction and orientation towards it, and motivate them to employ it to confront those circumstances.

Moreno-Guerrero et al. (2020) also indicated that the use of e-learning has increased in the period of the spread of the pandemic in the world to face the conditions it imposed, especially school closures. Their quasi-experimental study aimed to identify the effectiveness of e-learning in teaching math in secondary school compared to the traditional educational method. The results of the study confirmed that e-learning, compared to the traditional method, is effective in teaching math for the secondary stage and has a positive impact on motivation, independence, learning mathematical concepts, and academic achievement in math amid the conditions of the pandemic.

The study by Hasan (2020) indicated that in order to face the conditions imposed by the COVID-19 pandemic, such as the repeated lockdowns of schools and the irregularity of working hours, it was necessary to employ remote e-learning to ensure the progress of the educational process, and for students to obtain good educational opportunities.

However, this sudden transition from face-to-face education to approaches and systems that students and teachers are not accustomed to has caused a lot of problems, difficulties, and confusion for some students and teachers. This could be seen especially in teaching and learning math, given the nature of math, and the need for those who teach it to write equations and solve problems step by step, drawing geometric shapes, equations, symbols, and exercises.

Accordingly, the authors believe that the success of the application of remote e-learning under the conditions of the pandemic, and employing it for teaching math in the secondary stage of the scientific stream, in particular, needs to adopt a learning strategy that is suitable for the nature of the math on the one hand and supports self-learning to a large extent on the other hand.

E-learning packages are one of the most successful learning strategies that support the principles of self-learning. These packages are a holistic and tightly organized learning system, designed through computer software, containing a set of educational activities and alternatives presented in the manner of e-hyperlinks, which enables the learner to interact with the material according to his abilities, circumstances, and needs. Previous empirical studies have confirmed the impact of e-learning packages on improving the students' achievement in various subjects and different classes, such as the study of al-Khawaldeh & al-Tamimi (2013). This study dealt with the subject of jurisprudence concepts in Islamic education for sixth-grade students in Jordan. In comparison, the study of Safo et al. (2013) dealt with the topic of geometry in the math curriculum for the preparatory stage in Nigeria.

In addition, the study of Elayan & al-Shoura (2014) delved into the subject of physical concepts and the development of scientific thinking skills among secondary school students in the Kingdom of Saudi Arabia. Whereas, the study of Abdel Salam & Shmais (2015) dealt with geography for the first intermediate grade in Iraq, and the study of Abu Mazeed (2015) tackled the subject of the geological structure and topography in the Arab world for the ninth grade in the Gaza Strip in Palestine. Not to forget the study of Helal (2015), which focused on science for the fourth grade in Syria, the study of Khader (2016) on the concepts of nanotechnology for the ninth grade in the Gaza Strip in Palestine, the study of Babale et al. (2018) on chemistry for the upper secondary students in Nigeria, the study of Indira and Dhanalakshmi (2018) in computer learning for 11th graders in India, the study of Rabaa (2019) in science for seventh graders in Jordan, the study of Olajide and Aladejana (2019) on ICT students in the secondary stage in Nigeria, the study of Nurwijaya (2019) in the computerized "geogebra" system for the math curriculum for the eighth grade in Indonesia, and the study of Jasim and Abboud (2020) on the subject of science and scientific curiosity for second grade students in middle school in Iraq.

II. LITERATURE REVIEW

A. Self Learning

Self-learning constitutes the main pillar around which modern learning strategies are centered. Contemporary educational trends have stressed the importance of self-learning, which shifts the focus of the educational process from the subject to the learner himself, taking into account their tendencies, preparations, abilities, and self-skills (Hinnawi, 2012).

Self-learning is a learning method where learners learn independently with self-motivation according to their needs, abilities, tendencies, and interests. Thus, taking advantage of the available educational alternatives and teaching and learning technology, with a minimum of teacher supervision, direction, and guidance (Ahmed et al., 2017)

Self-learning is characterized by a set of features and foundations to realize success and achieve its goals. These features include identifying and formulating the learning approach in a clear and accurate manner, dividing the educational material into meaningful steps to provide the learner with self-evaluation, immediate reinforcement, feedback, and self-direction, achieving its positivity, interaction and excitement, taking into account the individual differences and the learner's self-speed. Self-learning provides alternatives and various learning options, freedom of movement and choice, diversity in learning sources and methods, logical sequence of learning steps and their integration, gradation in performance levels, continuity of evaluation, diversity and comprehensiveness, and striving for the learner to achieve mastery of learning (Othman & Awad, 2008; Maghrawi & Al-Rubaie, 2006).

The study of al-Qasimi (2021) stated that self-learning enables the learner to master the skills necessary to continue learning independently, thus preparing a generation accustomed to bearing responsibility for themselves.

This is consistent with the study of Moller et al. (2009, p.11), which stressed the importance of self-learning as the primary means for building a permanent learning society and achieving the hope of continuous education and life-long learning. This importance, as many see, is the only solution that keeps pace with the individual in the adequacy of the explosion of human knowledge and the amazing acceleration in its technological applications. If the goal of education is to help learners understand

and assimilate lessons and topics, then the goal of self-learning is to help learners develop their abilities and competence not only for understanding and assimilation but also for building their self-reliance personalities and taking responsibility for their learning during different periods of their lives.

The study of al-Qatawneh (2020) indicates that self-learning has become directly linked with electronic methods of obtaining information and its sources. Therefore, e-learning is complementary to self-learning and constitutes a motive for its application.

B. E.Learning

Educational institutions are constantly seeking to develop their educational learning process in order to improve their procedures, tools, methods, strategies, and outputs. There is no doubt that the huge developments in the field of technology, in general, and information and communication technology, in particular, played a major role in these educational developments. The employment of technological innovations and their products has led to the advancement of novel teaching and learning products and the emergence of modern terms and concepts, the most prominent and most popular of which is e-learning.

The e-learning approach provides an educational content through the use of computer-based media and networks to the learner. This is done to allow them to interact actively with this content, with the teacher, and with their peers, whether synchronously (through which teachers and learners communicate directly) or asynchronously (through which learners interact with the educational material independently). The e-Learning approach offers the possibility of completing this in time and within the adequate space at a speed that suits their circumstances and abilities, in addition to managing their learning through these media (Zaki, 2021).

Since distance e-learning has been a critical issue and a source of concern for many educational institutions in the past, during the COVID-19 pandemic, it became a challenge, an urgent need, and an imposed reality not only for the education system and educational institutions but also for the community as a whole (Edelhauser & Lupu-Dima, 2020).

The conditions imposed by the pandemic, such as the repeated closures of various society institutions, including educational institutions, implied taking rapid, sudden, and sometimes random actions. This is due to lack of time, limited capabilities, and lack of experience, such as the transformation from traditional face-to-face education to distance e-learning to ensure the progress of the educational process and it being interrupted (Williamson et al., 2020).

Many studies and research have dealt with e-learning standards and factors for its success during normal times. However, these standards and factors differed during the pandemic for many reasons. During the pandemic, the transition to e-learning for most educational institutions was an emergency, and generally unplanned matter, and not all of them had applied e-learning in the past.

Such institutions did not have the ability to transfer smoothly, unlike organizations that had previously implemented, planned, and invested in e-learning. Moreover, during the pandemic, there was an impact of a number of non-educational factors, such as political and health factors, on the educational process.

For example, during a normal situation, students can visit the library, attend teaching sessions, and even go to places with a good internet connection speed if they don't have a good internet connection at home. Unlike what happened during the pandemic, situations were marked by long periods of closures and curfews. In addition, before the pandemic, the educational materials for the classes that were taught through e-learning were well prepared. However, during the pandemic, there was not enough time to plan and ideally prepare the e-learning materials in general (Alqahtani & Rajkhan, 2020).

Therefore, researchers believe that e-learning after COVID-19 will not be the same as it was before it. Therefore, countries and their educational institutions must seek to employ e-learning by preparing the appropriate infrastructure, electronic programs, systems, tools, and applications, and developing their academic curricula electronically in order to take advantage of the features and benefits that e-learning achieves in normal conditions.

These emergency conditions necessitate that countries should be more prepared to implement successful and effective e-learning, capable of addressing the problems arising from such emergency conditions and facing their challenges.

C. Electronic Learning Package

The traditional learning packages are one of the most effective teaching and learning strategies comprising the principles of self-learning. It is one of the most prominent educational strategies that have been acclaimed globally. Studies have confirmed their effectiveness in responding to the largest number of problems and challenges facing the educational process in various aspects. The e-learning packages are characterized by the most important principles, methods, and strategies such as taking into account the individual differences and the learner's self-paced, self-direction for learning, objectivity, logic, and sequence in the topics of the educational package, the continuity and comprehensiveness of the assessment, the availability of feedback and reinforcement, the diversity of alternatives, learning sources, methods, activities, and means.

The learning packages emerged from integrated educational systems. They are designed in a systematic way that helps learners learn effectively, and include a set of interrelated learning materials with multiple and specific goals that the learner can interact with, on their own and at their own pace (Saifi, 2009).

A learning package is an educational unit that relies on a self-learning system and directs the learner's activity. It contains a variety of knowledge and educational materials related to behavioral objectives and is reinforced by pre and post-self-tests, supported by multiple educational activities, and includes educational manuals (Shazly et al., 2015).

The traditional learning packages consist of a set of basic components. However, one of the main characteristics of the design of learning packages is that they are not subject to static design. Some e-learning packages may exceedingly lack some components but are considered satisfactory for practical reasons or tactics depending on the nature of the objectives, the system of utilization, and the characteristics of the target group in the package. In general, these packages usually include the following components and features:

- The comprehensive view: It gives a comprehensive and a prior idea of the package and its components.
- The general and behavioral objectives: They are the expected outputs for learners during the learning process or after its completion.
- The core content of the package: It comprises the educational materials and activities through the use of various learning materials and aids in their various forms (printed, audio, visual, and audio-visual).
- Evaluation: The evaluation process in the learning package is characterized by comprehensiveness, continuity, and diversity. The process includes pre-tests, structural tests (continuous), and post-tests.
- Guidelines: They include instructions explaining how to use the package and its learning procedures.
- Enrichment activities (in-depth): They are the additional activities that provide students with profound and thorough opportunities that broaden their thinking skills.
- List of sources and references of the package
- The box or container: It includes the components of the learning package (al-Quds Open University, 2013).

Educators specializing in educational technology and e-learning have worked to develop learning packages from the traditional to electronic format using computer software and the Internet. This action increased the effectiveness and flexibility of the learning packages. Computer software improves the performance of the educational package for its role in terms of the learner's ease of use and speed, electronic transmission of hyperlinks between its contents, activities and alternatives, completion of all types of tests, evaluation of results in an easier, faster and more accurate way, and provision of appropriate immediate feedback. However, employing digital devices such as computers, tablets, and smartphones with the learning package through the e-learning bag obviates the use of other learning means that the learner may need to display multimedia educational materials such as television, cassette recorder, slides projector device, and educational cinema, etcetera. The mobile phone or computer are the most comprehensive devices that provide all learning multimedia materials that are provided by other means and other educational devices (Hinnawi, 2011).

The e-learning package is a knowledge container that entails various sources of learning, designed in the form of a multimedia program that includes a set of educational activities and alternatives. It takes into account individual differences between learners and helps them achieve the desired learning goals (Mubarak, 2016). It is one of the forms of asynchronous e-learning pattern where the learner uses it without the need for synchronization in the presence of a teacher. However, an e-learning package is the most representative learning strategy for self-learning (al-Absi, 2017).

In light of the overview in the theoretical literature and previous studies related to e-learning packages, the researchers obtained the traits, advantages, and benefits of e-learning packages they achieve as follows: The mutual interaction between the learner and the e-learning package, realizing the goals of self-learning, and presenting the educational material in a sequential, orderly, and accurate manner. The clarity of educational goals and the existence of instructions that aid learners in their learning. The availability of the element of excitement and suspense, direct and delayed feedback, and flexibility in terms of the place and time of learning. Consideration of the individual differences and their relevance to the different levels and abilities of learners, taking into account the student's learning speed, preparations, abilities, and tendencies.

The authors believe that designing the e-learning package and uploading it to the international information network (Internet), ensuring its accessibility via computers, tablets and smartphones, will make it available all the time for the learner to benefit from its characteristics and features wherever they are and at any time they want. Thus, the e-learning package will represent the best learning strategies to face the conditions imposed by the COVID-19 pandemic.

III. PROBLEM STATEMENT & STUDY QUESTION

Secondary school is one of the main issues for both the Palestinian Ministry of Education and the students, especially the math subject in the scientific stream. Moreover, math is one of the most significant scientific fields; it contributes to developing thinking methods. It inherently depends on extrapolation, deduction, innovation, which is the foundation of scientific progress, technological development, and life interactions (Zahran, 2018). Moreover, math is a fundamental science for university education in many scientific specializations and has the highest grade among the secondary school subjects in the scientific stream.

Secondary school students in the scientific stream face a number of difficulties in studying math under normal circumstances -far from the COVID-19 pandemic- including the difficulty of some topics, limited class time, and crowded classes. Moreover, math teachers need more time to explain and provide examples and exercises to deepen the students' understanding of the topics. Irregular school attendance and frequent closure during the COVID-19 pandemic also had a negative impact on math school students. All these issues required adopting new math teaching strategies, including the e-learning methods to help students of the scientific stream understand its topics, achieve its objectives, and enhance the academic achievement.

The literature review and previous studies indicated that the e-learning packages system was one of the successful strategies that reinforced the students' online learning and raised their academic achievement level. Therefore, this study aimed to design an e-learning package for math secondary school students in the scientific stream in Palestine and study its impacts and potential to help the students understand math topics and improve their academic achievements.

This study aims to answer the following question: What is the effect of the e-learning package on the achievement of math students in the secondary school in the scientific stream in the light of the COVID-19 pandemic?

IV. METHODOLOGY

The study adopted the constructivist and experimental approaches; the constructive approach to designing and producing the e-learning package and the experimental to studying the effect of the package on the students' achievement in math in secondary school (the scientific stream) as well as to compare between the experimental and controlled groups.

A. Participants

Due to the circumstances forced by the COVID-19 pandemic and the adoption of the Palestinian Ministry of Education for special protocols to limit the spread of COVID-19 - which prevent direct communication between the researchers and students at schools- the researchers adopted the available sampling to select the study sample. The researchers selected four secondary school

math teachers in the scientific stream from the Nablus Governorate who had interaction and communication with their students through social media. The researchers clarified the research objectives, tools and procedures, and asked the teachers to select 20-25 students to participate in the study sample. They were divided randomly and equally into an experimental group – which learned unit 5 in the Book of Integration and Applications using the e-learning package- and a controlled group, which learned the same topic by the traditional methods during the COVID-19 pandemic.

The total number of the study sample who participated in the study was 82 students; 42 students participated in the experimental group whereas 40 in the controlled group. Table 1 below shows the study sample distribution according to the group and gender variables:

TABLE 1:STUDY SAMPLE DISTRIBUTION ACCORDING TO THE GROUP AND GENDER VARIABLES

Gender Group	Males	Females	Total
Experimental	23	19	42
Controlled	21	19	40
Total	44	38	82

B. Study Tools

The study entailed two main tools: the experimental tool, an e-learning package for unit 5 in the math book for the secondary school in the scientific stream, and a measurement tool, an achievement test for unit 5 in the math book for the secondary school in the scientific stream.

C. Experimental Design

A two-groups post-test design was applied:

R X1 O

R X2 O

X indicates the treatment and O the test, R the random selection of the study groups. Table 2 below shows the application of experimental and measurement tools to the study groups.

TABLE 2:APPLICATION OF EXPERIMENTAL AND MEASUREMENT TOOLS

Groups	Treatments (methods of learning)	Posttest
Controlled (random)	Traditional methods adopted during the COVID-19 pandemic	Achievement test
Experimental (random)	Application of e-Learning package during the COVID-19 pandemic	Achievement test

D. Study Hypothesis

The study aimed to examine the following null hypothesis to answer the study question. There were no statically significant differences at the level $\alpha \geq 0.05$ between the averages of the experimental group students' achievements degrees and the controlled group in the achievement test due to the teaching methods, gender, and interaction between them during the COVID-19 pandemic.

E. Experimental Procedure

The researchers applied the following procedures to conduct the study:

1. learning Package Production.

The researchers designed and produced an e-learning package following the steps of e-learning package design, adopting the model of Hinnawi's (2012) e-learning package design, which is illustrated in Figure 1.

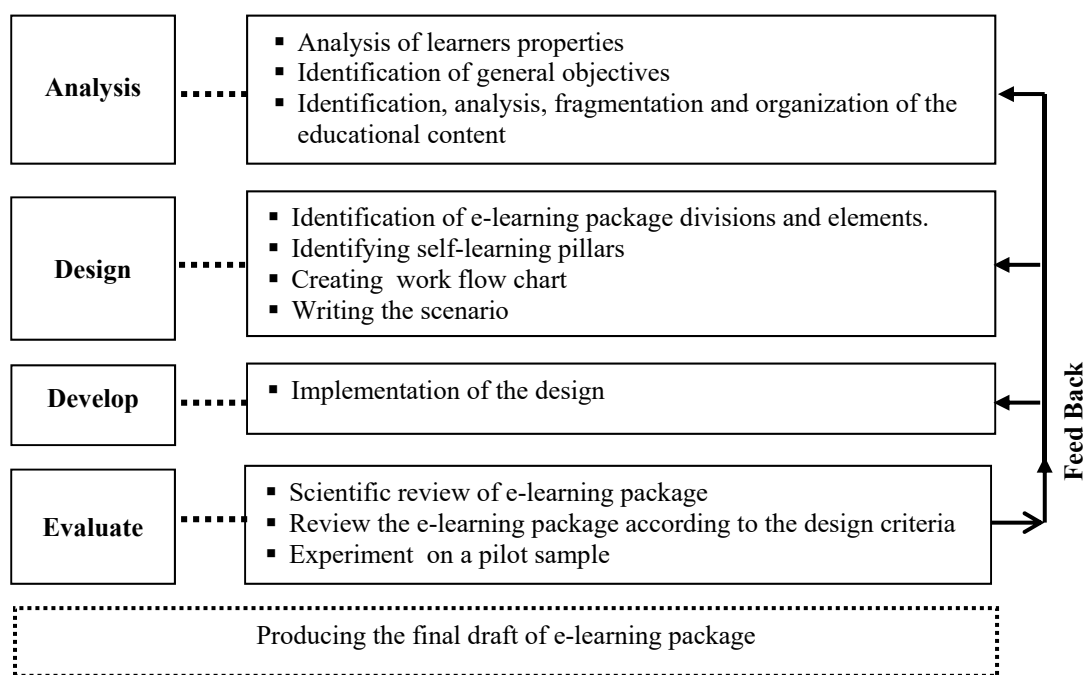


Figure 1: Hinnawi (2012) Model's e-Learning Package Design

2. Achievement Test Preparation.

The achievement test aimed to measure the students' achievement in unit 5 in the math book of secondary school in the scientific stream, entitled *Applications of finite Integration*. This test included 20 multiple-choice questions, and each question had 1 point. Moreover, the test included instructions to guide the students on how to conduct the test. This was the first version of the achievement test.

2.a. Achievement Test Validity.

The researchers presented the initial draft of the achievement test to three reviewers teaching math for secondary school students in the scientific stream and confirmed the test validity and reliability to measure its purposes. However, two questions were omitted as per the Ministry of Education's omission of some relevant unit parts from the secondary school examination. Therefore, the questions were reduced to 18 questions of 18 points. The test was designed electronically using Google educational applications such as Google Documents and Forms to facilitate the student's remote application during the COVID-19 pandemic.

2.b. Achievement Test Analysis.

The researchers applied the test to a pilot sample of 15 students from the secondary school- not included in the study sample- to analyze the test results and determine the effectiveness of the test as an assessment tool. After correcting the test, the researchers calculated the questions' ease and difficulty coefficients and indicated that the questions were medium since the degree of difficulty ranged from 30%-80%.

Moreover, the discrimination factor of the test items was calculated. This factor means the ability of the test items to discriminate between students who scored high or low on the test. The researchers used the Peripheral Comparison method and adopted Kelley Criterion; the results showed that the items' discrimination coefficient ranged from 0.25-0.65, which indicated that the level of discrimination of the test items was good. Moreover, the researchers measured the test reliability using Kyward-Richardson 20 (KR20) method and scored 0.72, which indicated that the reliability value was good and the time calculated to answer the questions was 40 minutes by estimating the time it took 80% of students to answer the test. After that, the final version of the achievement test was produced.

3. Implementation of the Experiment.

The experimental group received the e-learning package link through social media to study unit 5 in their math book entitled *Applications of finite Integration*, whereas the controlled group studied the same unit using the traditional method. This experiment took three weeks duration according to math teachers' recommendations.

4. Applying the Achievement Test.

The researchers announced the fixed exam date for the study sample, including both the experimental and controlled group, clarifying the test questions, accessing the test sheet, and answering the questions. The test was conducted online within the time limit of 40 minutes.

5. Data Collection and Analysis.

The researchers collected the data electronically from the study tool – the electronic achievement test- which was saved in Google documents. They then finished the process of coding and migration to SPSS and treatment using the required statistical methods. The researchers used frequency analysis, the arithmetic mean and standard deviation, and the Two Way ANOVA analysis test and Eta square (η^2) to measure the effect size.

V. RESULTS AND DISCUSSION

To answer the study question, the null hypothesis was examined using a Two-way analysis of the variance test. Tables 3 and 4 below show the results. Table 3 shows the frequency analysis, arithmetic mean, and standard deviation of the study sample results in the achievement test according to the group and gender. In comparison, Table 4 shows the two-way analysis of variance test results of the significant differences between the averages of the study sample results in the achievement test according to the learning method and gender.

TABLE 3:FREQUENCY ANALYSIS, ARITHMETIC MEAN, AND STANDARD DEVIATION OF THE ACHIEVEMENT TEST ACCORDING TO THE GROUP AND GENDER.

Group	Gender	Number	Arithmetic mean	Standard deviation
Experimental	Males	23	14.87	2.53
	Females	19	15.11	2.45
	Total	42	14.98	2.46
Controlled	Males	21	12.05	3.69
	Females	19	13.11	2.73
	Total	40	12.55	3.27

TABLE 4:THE TWO-WAY ANALYSIS OF VARIANCE TEST RESULTS ACCORDING TO THE LEARNING METHOD AND GENDER.

Source of variation	Sum of squares	Degrees of freedom	Mean square	F	Sig.	Eta Square (η^2)
Method	118.411	1	118.411	14.098	0.000	0.153
					*	
Gender	8.519	1	8.519	1.014	0.317	0.013
Method x Gender	3.441	1	3.441	0.410	0.524	0.005
Error	655.140	78	8.399			
Total	16387.000	82				
Corrected Total	787.476	81				

* Statically significance $\alpha \geq 0.05$

Table 3 showed that the average of the experiment group achievement was 14.98, whereas the controlled group was 12.55. Table 4 illustrated that the level of statically significance $\alpha \geq 0.05$ for the difference between the two averages since the calculated

level of significance for the method of learning was 0.000; smaller than 0.05. This meant a statistically significant difference at the level $\alpha \geq 0.05$ between the averages of students' grades in the achievement test attributed to the learning method in favor of the experimental group who were taught using the e-learning package. This result confirmed a statically significant effect of using the e-learning package for teaching math in Secondary school(the scientific stream) in Palestine on the academic students' achievement under COVID-19 circumstances.

Moreover, Table 4 showed the effect size (Eta η^2) to measure the effect of using the e-learning package on the students' grades compared with the traditional method. Eta Square was 0.153, which indicated that using the e-learning package greatly affected the students' achievement in math for secondary school in the scientific stream during the COVID-19 pandemic compared with the traditional method. Furthermore, the majority of studies agree that the effect size is weak if it is 0.01, medium if it is 0.06, and large if it is 0.14.

Table 3 showed that the achievement average of the experimental group of males was 14.87, whereas for females in the same group was 15.11. Table 4 showed no statistically significant differences at the level $\alpha=0.05$ between the scores' average of the experimental group and the controlled group in the achievement test due to the gender variable and interaction between the method of teaching and gender variable.

This result confirmed that the students from both genders who were taught by the e-learning package scored higher grades than the traditional method. Moreover, using the e-learning package showed a great and positive effect on the students' achievement in math subject at the secondary school in the scientific stream during the COVID-19 pandemic.

The researchers attribute this result to two factors: The first one is related to the instability of the controlled group during learning due to circumstances forced by the COVID-19 pandemic, and the second one is related to the features of the e-learning package such as:

- Providing educational videos simulate the lecture and allow the learner to replay, pause and forward the recording. Thus, the e-learning package provides the appropriate time for each learner's need and personal speed to accomplish the learning tasks and educational objectives and allows them to return and repeat the explanations as needed.
- Flexibility in time and place since the learners can determine the time and place according to their special conditions, especially during the COVID-19 pandemic.
- The educational objectives are highlighted clearly; the unit's general objectives and lessons' special objectives can be helpful to show progress in the learning process in clear steps.
- Units are divided into a number of short lessons, which contributes to the progress of learning clearly and steadily.
- Logic in arranging the content of the teaching material, so that the presentation of the teaching material in terms of subjects, explanation, examples, training and questions are phased in a logical sequence from easy to hard, from simple to compound and from active to passive.
- Full of examples, exercises, and tests to increase the students' practice and understanding.
- Variety in the methods of assessments, and the learners are provided with immediate and constant feedback.

VI. LIMITATIONS AND CHALLENGES

The research team faced significant challenges and limitations in the process of application on the study sample due to the COVID-19 pandemic. The research team contacted the Research and Study Department at the Palestinian Ministry of Education to take a formal approval to conduct the study and follow up on its sample at schools face-to-face. However, approval was limited to apply remote study without going to schools as an application of the Palestinian Ministry of Education's COVID-19 Pandemic Response Protocols. As a result, the researchers adopted the available sample method for the study sample selection and randomly distributed the sample to the experimental and controlled groups.

VII. CONCLUSION

All levels of education are important, but the secondary school level in Palestine carries a greater degree of importance since it is critical for the students' future. The math subject in the scientific stream is one of the important subjects since it is a basic science in the university education in all specializations and has the highest-grade percentage of the secondary school subjects (the scientific stream). In addition to the difficulties students face in learning their subjects, teaching math by remote learning for secondary school (the scientific stream) requires adopting e-learning strategies to help students understand its topics, achieve its objectives, and improve their academic achievement.

E-learning is an urgent need and the only replacement for the continuity of education under the circumstances of the COVID-19 pandemic worldwide. Moreover, the emergency conditions imposed by this pandemic require a transition phase which is prominent for the importance of e-learning and its role in the educational process and distance learning. People become aware of the benefits of e-learning, especially in global and local emergencies that can impede face-to-face education or the traditional educational process.

Literature review and previous studies confirmed that the e-learning packages system was one of the most successful strategies to support the students' self-learning remotely and enhance their academic achievement. This study aimed to design a math e-learning package introduced through the internet and mobiles for secondary school students in the scientific stream in Palestine and study its effect and ability to help the students to understand the topics and enhance their achievement in the math subject. Moreover, the researchers aimed to study the students' attitudes towards using the package during the COVID-19 pandemic.

The study results indicate that the use of e-learning packages in teaching the math subject in secondary school (the scientific stream) in Palestine has a great impact on improving the students' academic achievement of both genders compared to the traditional methods during COVID-19 since the size effect of Eta square η^2 is 01.53.

RECOMMENDATIONS

The researchers recommend the following:

- Producing e-learning packages for teaching all the math books units in the secondary school (the scientific stream) and adopting these packages to strengthen the students' self-learning and their ability to face challenges, especially during the COVID-19 pandemic and emergencies that may hinder the educational process.
- Adopting e-learning packages for teaching math in the secondary school (the scientific stream) after the COVID-19 pandemic as a supporting educational system. This will improve the students' learning, overcome the difficulties, and eventually raise their academic achievement.
- Networking between the Ministry of Education and academic and technical experts from Palestinian universities in e-learning and relevant community institutions to raise the level of readiness, competencies, and infrastructure to guarantee the success of e-learning in public schools.
- Raising the educators, mentors, and technicians' awareness at the Ministry of Education on the e-learning package system through conducting seminars and workshops that outline its concepts, components, design, importance, and role in enhancing the students' learning and addressing emergencies.
- Conducting further empirical and descriptive research addressing the production of e-learning packages for the remaining subjects in the secondary school (the scientific stream), other streams, and grades, starting with the important and difficult subjects.

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Declaration of Competing Interest

The authors declare that they have no competing interests

Supplementary Material

Supplementary data to this article can be found online at:

Electronic Achievement Test: https://docs.google.com/forms/d/e/1FAIpQLScdh2P2b2wpQjTOqyMPfXh-7I5IaBlH-nUw3dujItSTqLXArw/viewform?usp=sf_link

Electronic Learning Package: <https://tefl-epal.qou.edu/course/view.php?id=17&lang=ar>

User name: student_

Password: 123321112233

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