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RESEARCH ARTICLE

THE IMPACT OF USING SMART PHONES TO GAIN ALGEBRAIC EQUATIONS SOLUTIONS AND THE LITERARY STUDENT-TEACHERS' ATTITUDES TOWARDS MATHEMATICS AT AL AQSA UNIVERSITY

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ABSTRACT

The purpose of this study is to investigate the impact of using smart phones to acquire some algebraic equations solving skills and attitudes towards mathematics for teacher-students with literary majors at Al-Aqsa University. The study used the quasi-experimental method to achieve this goal.

The study sample consisted of an experimental group and a control group. The experimental group was taught with the smart phones and they were (32 students), while the control group was taught through the traditional way and they were (32 students),

An achievement test and an attitude scale were applied on both groups. The study results showed that the literary teacher-student in Al Aqsa University have 21 skills for solving algebraic equations. Additionally, the study results found that there were weaknesses among the students in solving algebraic equations. Also, they showed that there were significant statistical differences between the experimental and control groups in the post achievement test in favor of the experimental group, as well as there were significant differences between the experimental and control group in the post attitude scale in favor of the experimental group.

INTRODUCTION

Promoting university education requires the university lecturer to go beyond the role of the transcriber and the deliverer of knowledge to hiring modern strategies and techniques compatible with the technological development, which imposed itself on all sectors of life, including universities, and thus calling for the urgent need to improve and develop ways, means, tools and strategies used in the classroom to meet the requirements of the educational changes and renovations.

Recently, we have witnessed the emergence of several modern innovative methods and techniques that have contributed to the development and evolution of educational institutions, including distance learning, computerized learning, e-learning and other rapid and successive learning systems reaching the wireless revolution, introducing a new model of education---Mobile Learning, which relies on the use of the wireless technology, and has impelled itself firmly on all sectors, including the educational sector.

Education via Smartphone, a new educational environment and a form of distance e-learning, relies mainly on modern mobile devices, transmitting the educational process outside the classroom to a context of temporal and spatial freedom (Bader, 2012: 169); it is a form of distance learning characterized by the separation of the lecturer and the students spatially and temporally, thus is considered to be a new linguistic term that refers to the use of smart phone devices in the teaching and learning process (Sanusi 0.2013: 128), providing easy exchange of information among students on one hand and between students and lecturer on the other hand, where the learner is fully interactive; so it is quite different from the traditional classroom, lecture room, or computer lab, in which the learner learns in a subjective and interactive way. (Winters, 2007: 5)

The term Mobile Learning refers to the use of portable devices in the learning process, with emphasis on the use of technology available with wireless communication systems to deliver information outside the classroom, using portable and mobile devices such as cellular phones, digital assistants, smart phones and laptops, all to be equipped with different communication

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technologies; which ensures the smoothness of the process of exchanging information and communication between the different parties of the educational process (Attiya, 2013: 38)

The most important characteristics of learning via smart phones and Mobile Learning is related to the specifications of mobile devices, known to be characterized by their light weight, small size, and flexibility of use at all times, during day and night, and in all places inside the classrooms and outside the educational institution. In addition to that, it's characterized by its ability to be easily linked to the Internet, easy exchange of digital multimedia such as text, sound, images and others, and its support of individual learning, consideration of individual differences, and activation of various educational activities. Nowadays, smart phones contain many of the functions that can be used to connect between teaching and learning, and which can include texts documentation, voice recording, video players, listening to the radio, taking notes, taking pictures and videos, and providing access to the Internet.

Smart phones make the learner be the center of educational process, to able to achieve his own objectives. Its value also appears in continuous learning, and where a great deal of information can be delivered through daily life activities (Al-Barbary and Abdul Salam , 2011: 168), for which learning can happen anywhere and at any time the learner wants, outside study halls or the usual learning environment.

Statement of problem

Despite the proliferation of smart phones and their uses, the multiplicity of types and denominations, their cheap prices, and the fact that all university students have at least one mobile device, smart phones are still not widely used for educational purposes, but only for traditional uses such as: personal calls, messaging, and Internet browsing.

It's worth noting that members of the educational faculties in universities are not directing their students, at all levels and departments, towards the use of smart phones as a tool of gaining information, for which students do not have the full knowledge and awareness of how to take advantage of mobiles' multiple capacities in the field of education, despite its high capacity that can be used as a source of information, and a tool to overcome the obstacles that hinder the learning process.

Several studies have emphasized on the importance and effectiveness of using mobile learning via smart phones in the educational process for the improvement and enrichment of education and development of various educational outcomes; among those studies are Fergon (2010), Al and Abdul Salam (2011), Abdul Rafe' and Alsamdoni (2011), Abdul Aziz (2011), al-Sanusi (2013), Al-Saeed and Kabli (2013), Al-Otaibi and Zidan (2013), and Attia (2014), all of which have resulted that both the faculty and students at universities have positive attitudes toward the use of smart phones in the educational process, and that there is a decline in the extent of the students use of smart phones in educational fields, thus based on the foregoing, there is an urgent need to carry out such a study, to answer the following main question:

What is the impact the employment of smart phones to acquire some algebraic equations solving skills and attitudes towards mathematics on teacher-students of literary majors at Al-Aqsa University?

To answer this question, the following sub-questions have to be answered

1. What algebraic equations solving skills necessary to teacher-students of literary majors at Al-Aqsa University?
2. What is the level of achievement of teachers-students of literary majors at Al-Aqsa University in algebraic equations solving skills?
3. What is the impact of the employment of smart phones to acquire some algebraic equations solving skills on teacher-students of literary majors at Al-Aqsa University?
4. What is the impact of the employment of smart phones on the development of attitudes towards mathematics on students of literary majors at Al-Aqsa University?

Study Hypothesis

The study aims to verify the validity of the following hypothesis

1. There is no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of teacher-students of literary majors at Al-Aqsa University in test of algebraic equations solving skills and the expected/default mean.
2. There is no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of students of the experimental group and their peers in the control group in the post test of algebraic equations solving skills.
3. There is no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of students of the experimental group and their peers in the control group in the post test of attitudes toward mathematics.

Objectives of the study

This study aims to achieve the following objectives

1. Preparing a list of algebraic equations solving skills necessary for teacher-students of literary majors at Al-Aqsa University
2. Knowing the levels of students of the faculty of education in Al-Aqsa University in algebraic equations solving skills.
3. Revealing the impact of the employment of smart phones in acquiring some algebraic equations solving skills and attitudes towards mathematics on teacher-students of literary majors at Al-Aqsa University

Significance of the study

The study is expected to contribute to the following

1. This study comes in response to modern attitudes, which calls for the need to employ technology in teaching, so as to overcome the shortcomings and disadvantages of the traditional way in the various courses of study generally, and in the course of basic Mathematics particularly.
2. The importance of education and learning using smart phone in the current era, and to attract attention on the capabilities and services it offers in the development of the educational process in the Palestinian universities.
3. Permanent and constant emphasis by educational organizations that learning via phone devices is no longer just a theoretical possibility, but is rather a reality on the ground, in which students and teachers are using mobile devices for educational implications, chatting with other students, exchange information, and get support from peers and coaches.
4. May help to modify teachers' and students viewpoints to the nature of the use of mobile wireless technologies such as smart phones, personal digital assistants, and tablets only as a mean of phone calls to make use of them in teaching and learning processes, thus converting it from consumption to investment, which comes back with benefit and interest.
5. May help those responsible for the universities to benefit from the proposed strategy to activate the mobile learning with the already based e-learning model to take advantage of the personal wireless technology of students to learn the different courses.
6. Is considered to be a contribution to the scientific development of research on education technology and e-learning and the use of modern technology in the development of the educational process.

Operational definitions of the study

1. ***Smart phones:*** phones that combine the advantages of mobile phones, multimedia player devices, PDAs and additional memories, in which it contains a video and photography camera and allows access to the Internet. Its software is designed to connect to networks in a single system, as well as exchange of files between other devices carrying Bluetooth connectivity and connecting between many similar devices that share the same properties.
2. ***Attitudes towards mathematics****:* is an acquired mental state that results as a result of the experiences that the learner go through when hiring smart phones; it expresses students' response in terms of positive or negative response, measured by the degree to which the learner gets for his responses to the paragraphs of attitudes towards mathematics.

Limitations of the study

1. ***Objective limit:*** the study was confined to hire smart phones to acquiring some algebraic equations solving skills and attitudes towards mathematics on teacher-students of literary majors at Al-Aqsa University.
2. ***Spatial limit:*** Al-Aqsa University.
3. *Time Limit-* the first semester of the academic year 2015-2016
4. *Human limit:* a random sample of teacher-students of literary majors at Al-Aqsa University enrolled in the course of "basic mathematics".
5. Several smart phone applications have been used, including: (PhotoMath ;Mathematics; and WhatsApp).

The theoretical framework

The concept of learning via smart phone

Learning via smartphones is considered to be new form of distance education, which is characterized by the separation of lecturer for students spatially and temporally. Learning via smart phones is a new linguistic term that refers to the use of portable devices in the education process, a method that is related to a large extent to e-learning and distance education; this term focuses on the use of available wireless communications technology to deliver information outside the classroom. As a term, Mobile learning has been defined by many researchers, in which (Salem 2006: 187) defines it as the use of small, hand, portable wireless devices (such as mobile phones, personal digital assistants, small and personal computers), to achieve the flexibility and interaction in the teaching and learning processes at any time and in any place; while (Fergon 2010: 112) defines it as a learning model based on the use of mobile devices, which can take place anywhere, anytime, and that is characterized by freedom, independence and interaction, and is often accompanied by traditional education in an integrated systemic context.

Al Barbary and Abdul Salam (2011: 175) defines learning via smartphones as a form of e-learning that can be either applied independently, or integrated into traditional education, where it can be used to publish and track educational material using portable devices; it also helps achieves flexibility in learning and fits learners' circumstances and needs, where learning can happen at any time and any place.

Going through the previous concepts of learning via smart phones, it is clear that there is an agreement on 1) the use of smart phones, digital assistants, and small computers when applied, 2)and that it can be done at any time and in any place, 3) is used in teaching and learning processes as well as in training, 4) is related to a large extent to e-learning, and distance education, in which it enables the use of different techniques outside the classroom, and deals with the both types of networks (wireless and wired) when used.

Educational importance of learning via smart phones

Learning via smartphone is characterized of its large importance in the educational field, which clearly appeared through its educational services and applications, in which "a student have a direct access to the educational content, anywhere and at anytime, with the possibility of retaining it, freedom of movement outside educational institution, and viewing the content anywhere (Al-Saeed and Kabli 2013: 100); not to forget the direct communication between the parties of the educational process, participation in the implementation of

tasks in a cooperative image (Sanusi 2013: 133), and the direct transmit of lectures and discussions to students, regardless of their location, through internet access, with the interaction of students with each other and with the teacher.

Learning via smartphones provides access to students for a variety of educational materials useful for the completion and achievement of their duties and exams, which is an important aspect of the learning process (Abdul Rafe' and Asamdoni 2011: 541). It's worth noting that some smartphones are characterized by the possibility of handwriting, and using a pen for writing, which makes their use more convenient than using the keyboard (Al Barbary and Abdul Salam 2011: 177), as well as the use of multimedia programs for displaying sound, photographs, drawings, and videos, and helping teachers to easily distribute work on the students. (Salem 2006: 195)

Thus, learning via smart phone is the ideal way to provide immediate assistance to students, enable individual learning, allowing university students to receive administrative declarations and urgent decisions, such as the postponement of the date of an exam and a teacher's apology to attend a lecture, and helps to bring more activities to traditional lessons, bringing vitality and attraction to the scientific material and the learning environment.

Justifications Calling for the use of the smart phone in the educational process

Trends that support the use of the smart phone in the educational process highlighted the arguments, justifications and positive goals that emphasize its importance; these justifications are summarized in the following points (Al Dahshan and Sharaf, 2013: 151-160) (Abdul Rafe' and Asamdoni 2011: 520), (Ardito, 2012: 22), and (Loiseau, 2013: 339)

1. Smartphones are a modern educational method that enables student to access to the Internet during lectures, seminars and to get access to information once needed.
2. Learning via Smartphone allows teachers, lecturers and supervisors to provide their training and educational material on various mobile devices easily, using the publisher program.
3. "Education for All" or "continuous learning" will become easier in the light of smartphone learning; in which smartphone education system can reach to a larger number of students in different places, especially with the possession of everyone's of mobile phones, and thus offers an excellent way to increase educational opportunities.
4. A lot of people, from all age groups, started searching for online educational courses via the Internet on a variety of areas including complex topics.
5. Overcoming the problem of computers' shortage in educational institutions, in which modern phones became equivalent to small computers, and are able to perform searches on the Internet.
6. Recording of educational lectures and reviewing it any time the student wants.
7. The smartphone is considered a quick and easy way to study literary material, in the so-called vessels of information, which is available in the case of the use of computer labs, requiring much more time.
8. Learning via smartphone would address the many aspects of traditional learning methods deficiencies, in which it is a real joy that can be invested with learners who have lost their desire to learn.
9. Prevalence of the use of the smartphones, in which many university students have mobiles with distinctive technological specifications and use them skillfully.

The use of smartphones in the educational process is considered a step to keep pace with modern trends to take advantage of communications technology in the educational process, in which it helps to provide direct communication between parties of the educational process, the student, the educational institution and parents. It also works to facilitate teachers' tasks, because it is a form of distance education systems, which has become widespread throughout the world, serving tens of millions of students, due to its important role in access to individuals in any place and at any time.

Applications of smart phones in the educational process

Smartphone provides many applications which can be used in the educational process, including (El-Hussein, 2010: 16), (Salem 2006: 214), (Al Barbary and Abdul Salam 2011: 193-185):

1. ***SMS text message:*** Short Message Service (SMS) is a message written by Smartphone buttons panel and is sent via networks, allowing users to exchange short text messages with each other.
2. ***WAP service:*** Wireless Application Protocol (WAP) is a communications protocol that is used for wireless data access through most mobile wireless networks. WAP enhances wireless specification interoperability and facilitates instant connectivity between interactive wireless devices (such as mobile phones) and the Internet.
3. ***Whats App:*** an application used to communicate via short messages or pictures and video clips. WhatsApp relies basically on internet services in phones, where the phone must have an internet connection for the program to work, and thus its use does not constitute e any additional cost to the user.
4. ***Chat ON:*** a comprehensive communication service that enables the user to communicate better with friends, either individually or in groups, combining all features of communication and sharing in one application.
5. ***Viber:*** an application that allows users to send instant messaging, make free phone calls and send messages (text, images, video, voice) ; it is free to anyone who installed the application and has access to a WiFi Network.
6. ***Wireless Bluetooth Technology:*** a technique to communicate via radio waves and communication

protocol, designed to connect different devices in a new style and method that relies on wireless connectivity.

7. ***Visual communication service:*** This method is designed to allow the possibility of audio and visual communication in two directions between several locations.
8. ***Photo Math program:*** It is a Smartphone application that works by capturing an image of a mathematical equation, then shows the solution of the equation, allowing the student to review the complete steps that lead to the solution.
9. ***Mathematics program:*** It is a Smartphone application that works on solving and representing graphically represented equations, drawing relationships using engineering transfers, and dealing with other mathematical equations.

Wireless technologies in mobile learning

Mobile learning relies on a number of technological devices that can transmit and receive wireless connections, which rely on Android applications, such as: (Al-Saeed and Kabli 2013: 95-97), (Salem, 2006: 187-190), (Al Barbary and Abdul Salam 2011: 181-183)

1. Smart phones, a phone that combines the capabilities of the normal phone and tablets, for which it is, just like the personal digital assistant, equipped with a camera, has a touch-sensitive screen, and provides the advantages of surfing the Internet and e-sync.
2. Digital assistant devices which are small size, hand-held screen devices ,equipped with a pen, can be placed in the pocket, and through which can be connected to the Internet, download and operate e-books, audio files, and video.
3. Laptops, hand-held personal computers, characterized by their light weight, and operates on advanced operating systems that allow the use of the Internet Android related softwares.
4. iPad Tablet computers are touch sensitive screen , with varied sizes and often comes without a keyboard , as it is equipped with a virtual QWERTY keys from within the operating system; it operates by Android system.

METHODOLOGY

Study Methodology

The researcher used the quasi-experimental approach that is based on the design of two random groups (experimental and control group), using the experimental design of the pre and post test to two equivalent groups.

Study population

The study population consisted of all Al-Aqsa University students registered for the course of "basics mathematics" for the first semester of the academic year 2015/2016, numbering (673) students, according to the statistics of the Department of Admissions and Registration at the Al-Aqsa University.

Study sample

The study sample consisted of two classes, selected randomly from the classes in-Aqsa University, in which one class was selected as the experimental group consisting of (32) students and the other group was the control groups, also consisting of (32) students.

Tools of the study

Test of algebraic equations solving skills: to determine algebraic equations solving skills necessary for teacher-students of literary majors in Al-Aqsa University, a test of algebraic equations solving skills has been prepared to achieve this purpose; the test consisted of (21) multiple choice question. The test went through a series of steps before finalizing it; these steps are as follows:

A. Determining the purpose of the test: the test is designed to identify the algebraic equations solving skills necessary for teachers students of literary majors at Al-Aqsa University.

B. Formulating the test questions: the paragraphs of the test has been formulated based on a list of algebraic equations solving skills that is prepared, and by which the steps of its preparation has been clarified in answering the first question of the study; then the test questions has been formulated as multiple choice questions, made up of four alternative choices (answers) for each question, in which only one alternative is the correct answer, while the other three alternatives are wrong answers.

C. Setting the test instructions: The instructions included:

- ***Examinee data;*** student name, and class name.
- ***Instructions regarding the test;*** such as the number of paragraphs, alternatives and pages.
- Instructions regarding answering all the questions by circling the correct answer code.

D. The initial form of the test: in the light of the previous steps, an initial test of algebraic equations solving skills has been prepared, consisting (22) multiple choice questions. After writing the paragraphs of the test, it was presented to a committee of arbitrators.

E. Exploratory experimentation of the test: After the preparation of the initial test, it was applied on an exploratory sample of (36) students of teacher-students of literary majors at Al Aqsa University, outside the study sample. Exploratory experiment to test the skills of solving algebraic equations have been conducted in order to:

- õ measure the items' easiness and discrimination indexes.
- õ Measure the validity and reliability of the test.
- õ Determine how long it takes to answer the test when applied to the basic study sample.

F. Correcting the test: The test was corrected after testing the exploratory sample students, in which one mark has been assigned for each multiple-choice question, and thus the students' grades are limited between (zero and 22)

G. Determining the test time: It has been found that the appropriate time for the application of the test is (40 minutes), because the average length of time it takes for

the exploratory sample is equal to 40 minutes; the required time has been calculated based on the following equation: Test time = (time the first student takes + time the last student takes) ÷ 2

H. Analyzing the test Paragraphs: the students' answers has been analyzed in order to find out: the degree of easiness and discrimination index of each paragraph of the test, as was illustrated by the following table:

students from outside the study sample, and then used Kuder–Richardson Formula 21 and found that the reliability coefficient is (0.868), which is highly reliable and statistically significant coefficient.

And thus, the validity and reliability of the diagnostic test of algebraic equations solving skills is tested, putting the test in its final form valid for the application of the basic study sample.

Table 1 Shows the easiness and discrimination indexes of each paragraph of the algebraic equations solving skills test

Paragraph No.	Easiness Index	Discrimination Index	Paragraph No.	Easiness Index	Discrimination Index	Paragraph No.	Easiness Index	Discrimination Index
1	%63.9	%33.3	9	%66.7	%29.2	17	%44.4	%25.0
2	%55.6	%29.2	10	%44.4	%33.3	18	%47.2	%37.5
3	%41.7	%25.0	11	%38.9	%37.5	19	%55.6	%29.2
4	%44.4	%29.2	12	%50.0	%29.2	20	%52.8	%41.7
5	%50.0	%37.5	13	%61.1	%41.7	21	%38.9	%33.3
6	%55.6	%33.3	14	%58.3	%50.0	22	%66.7	%37.5
7	%52.8	%45.8	15	*%16.7	**%12.5			
8	%58.3	%33.3	16	%58.3	%33.3			

*Difficult Question **Non-discriminative question

Validity and Reliability of the test

Test Validity: The reliability of the algebraic equations solving skills test has been tested though:

A. ***the Validity of the arbitrators:*** The algebraic equations solving skills test was presented to a group of arbitrators from specialists in education, curriculum and teaching methods of the Palestinian universities, to be guided from their views on the appropriateness of the paragraphs of the test, as well as to ensure the validity and clarity of the language, in which some paragraphs have been added, deleted and modified based on the suggestions of arbitrators.

B. ***Internal consistency:*** internal consistency was ascertained using Pearson correlation between the scores of each paragraph of the test and the total score, as shown in Table (2)

Preparing a measure of attitudes towards mathematics*:* The measure of attitudes toward mathematics has been prepared in order to use it to identify the attitude of Al- Aqsa University students of literary majors towards mathematics, before and after the application of the second unit, entitled "solving algebraic equations" from the book of basic mathematics scheduled on students teaching basic stage; the test included (32) paragraphs in its final form, testing attitudes towards four dimensions: the nature of mathematics, and the value of math, and learning of mathematics, and enjoying mathematics.

1. Determine the goal of the measure: the attitudes of Aqsa University students of literary majors towards mathematics, before and after the application of the second unit, entitled "solving algebraic equations" from the book of basic of mathematics scheduled on students teaching basic stage

Table 2 Shows Correlation Coefficient of each paragraph and the total of the test

Paragraph No.	Pearson correlation Coefficient	p-value (sig.)	Paragraph No.	Pearson correlation Coefficient	p-value (sig.)	Paragraph No.	Pearson correlation Coefficient	p-value (sig.)
1	.597**	.000	9	.560**	.000	17	.442**	.007
2	.522**	.001	10	.564**	.000	18	.638**	.000
3	.430**	.009	11	.695**	.000	19	.557**	.000
4	.582**	.000	12	.566**	.000	20	.713**	.000
5	.662**	.000	13	.715**	.000	21	.597**	.000
6	.618**	.000	14	.806**	.000	22	.671**	.000
7	.722**	.000	15	.276	.103			
8	.559**	.000	16	.541**	.001			

** correlation is significant at the 0.01 level

The previous table shows that the paragraphs of the algebraic equations solving skills test used to measure the skills needed for teacher-students of literary majors in Al-Aqsa University, are consistent and valid, expect for paragraph (15); this assures the consistency of the paragraphs with the total score of the test.

Test Reliability

To test the reliability of the test of algebraic equations solving skills, this test was applied on an exploratory sample of (36)

2. Determine the areas of the measure: the measure dimensions are represented in four dimensions: (the nature of mathematics, and the value of math, and learning of mathematics, and enjoying mathematics)
3. Formulating measure phrases: the measure phrases has been formulated in a procedural image, in which the number of phrases in the initial image reached (35), distributed on the four areas.
4. The scaling and correction of the measure: student responses are formulated according to the Quintet Likert scale (strongly agree "five points", Agree "four points",

neutral "three points", Disagree "two points", and strongly disagree and has "one point") for positive phrases, and vice versa for negative phrases.

The validity of the instrument: the validity of the instrument was tested through

1. ***the Validity of the arbitrators:*** The algebraic equations solving skills test was presented to a group of arbitrators from specialists in education, curriculum and teaching methods of the Palestinian universities, to be guided from their views on the appropriateness of the paragraphs of the test, as well as to ensure the validity and clarity of the language.
2. ***Internal consistency:*** internal consistency was ascertained using Pearson correlation between the scores of each paragraph of the test and the total score, and also by applying the instrument on an exploratory sample of (36) students outside the study sample, as shown in Table (3)

Table 3 shows Correlation Coefficient of each dimensions and the total of the test

No.	Pearson correlation Coefficient	Significance	p-value
1	.954	.000	Sig. at 0.01
2	.943	.000	Sig. at 0.01
3	.909	.000	Sig. at 0.01
4	.970	.000	Sig. at 0.01

The above table shows that that the correlation coefficients between each dimensions and the total score of the questionnaire have been high, which indicates that the measure is strongly valid.

The reliability of the questionnaire*:* the reliability of the instrument was calculated using Cronbach's alpha coefficient to measure the reliability of each dimensions and the paragraphs of the measure as a whole; the reliability coefficients are indicated in Table (4).

Table 4 Cronbach's alpha for each dimension of the questionnaire

No.	Dimension	No. of paragraphs	Cronbach's alpha
1	nature of mathematics	6	.897
2	value of math	8	.930
3	learning of mathematics	10	.887
4	enjoying mathematics	8	.915
	All paragraphs of the questionnaire	32	.967

It's clear from the previous table that reliability coefficient for all dimensions are acceptable and appropriate.

Fifth- The consistency of the study groups: the consistency of the experimental and control groups was ascertained in terms of: (applying the pre-test of attitudes, achievement pre-test, and the cumulative average for students, and chronological age), as illustrated in Table (5).

It is clear from the above table that the calculated T-value equal to (0.354, 0.596, 0.815, 1.229), respectively, which is smaller than the index T- which is equal to (1.98), when the degree of freedom (62) and the average statistically significant ($\alpha = 0.05$), and this indicates that there is no statistically significant differences between the experimental group and the control group, and this means that the two groups are consistent.

Sixth: steps of the study: The present study included the following steps:

1. Reviewing the educational literature related to the study, in order to learn how to prepare the study tools.
2. Preparing a test of algebraic equations solving skills to measure the level of achievement for teacher-students with literary majors at Al- Aqsa University, as well as measuring the impact of the employment of smart phones to acquire some algebraic equations solving skills and attitudes towards mathematics.
3. Applying the test on a small sample in order to determine the time of the test, and to find the index of ease and difficulty, index of discrimination, and to test validity and reliability.
4. Preparing a measure of attitudes toward mathematics.
5. Applying the measure of attitudes toward mathematics on a small sample in order to determine its validity and reliability.
6. Choosing two divisions (classes) randomly from the Al-Aqsa University, so that one is chosen as the control group and the other as the experimental group.
7. Ensure consistency of the two groups of the study (experimental and control) regarding the impact of some variables on the dependent variable, which is the achievement of literary majors student at Al-Aqsa University in terms of (applying the pre-test of attitudes, achievement pre-test, and the cumulative average for students, and chronological age).
8. Applying the test and measure of the attitudes before applying the experiment (pre-test) on the study sample, in order to ensure consistency of the two study groups; and to study the impact of the employment of smart phone applications.

Variable	Group	Number	Mean	Standard deviation	Test Value	Sig
applying the pre-test of attitudes	Control	32	3.04	.59	.354	.725
	Experimental	32	2.99	.60		
achievement pre-test	Control	32	3.53	2.55	.596	.553
	Experimental	32	3.16	2.48		
chronological age	Control	32	19.33	.50	-.815	.418
	Experimental	32	19.47	.79		
the cumulative average for students	Control	32	79.79	7.02	1.229	.224
	Experimental	32	77.51	7.82		

Limits of statistical significance begin at the level ($\alpha = 0.05$) when the tabulated value is (1.98)
Limits of statistical significance begin at the level ($\alpha = 0.01$) when the tabulated value is (2.617)

9. Teaching the unit to the control and experimental groups according to the experimental design, in which the experimental group is taught using smart phones, and the control group is taught using the traditional way in a total of (4) lectures, starting on Sunday, 10/4/2015 , for the academic year 2015/2016.
10. At the end of the application of the experiment, the test of algebraic equations solving skills and the measure of attitudes towards mathematics is applied once again to reveal the impact of the employment of smart phones to acquire some algebraic equations solving skills and attitudes towards mathematics for teacher-students of literary majors at the University.
11. Correcting the test and measure of attitudes, do the grading work, data collection, and analysis and discussion of study results.
12. Make the study's recommendations in the light of the results, and then provide a set of proposals.

Seventh / statistical methods used

The statistical Package for Social Sciences (SPSS) was used to perform the required analysis, in which the (T-test) for two independent samples was used to study the differences between the variables of the study, in addition to calculating the size of the impact of the employment of smart phones to acquire algebraic equations solving skills and the attitudes towards mathematics through ETA square (η^2).

RESULTS OF THE STUDY (DISCUSSION AND INTERPRETATION)

Based on the study questions and hypotheses, the following results were obtained:

Presenting and discussing the results of the first question: What algebraic equations solving skills necessary to teacher-students with literary majors at Al-Aqsa University?

To answer this question, the following stepshas been followed

1. Determine the goal of preparing the list of algebraic equations solving skills necessary to teacher-students with literary majors at Al-Aqsa University.
2. Going through some previous researches and related studies.
3. Surveying the opinion of a sample of curricula and methods of teaching mathematics specialists, through personal interviews (Delphi method)

In light of the above mentioned steps, a list of the most important algebraic equations solving skills necessary for teacher-students of literary majors at Al-Aqsa University was prepared and presented to a group of specialists in the field of curricula and teaching methods, in order to verify: (the accuracy of the linguistic and scientific phrasing, comprehensiveness of the list of algebraic equations solving skills necessary for teachers students with literary majors at Al-Aqsa University, and the importance of these skills to teachers students with literary majors in Al-Aqsa University).

Some skills has been deleted, replaced, added and modified; in addition to that, the approval rate for the paragraphs of the list of algebraic equations solving skills necessary for teachers students of literary majors at Al-Aqsa University was calculated based on the following equation: Approval rate = [n1 ÷ (n 1 + n 2) × 100%]. (Attia, 1994).

Where: n1 = number of approvers 1, n = 2 is the number of disapprovers.

With the calculation of the frequencies, application of the previous equation, and deleting paragraphs with approval rate less than (80%); the list of algebraic equations solving skills necessary for teachers students of literary majors at Al-Aqsa University was obtained, where the list, in its final form, consisted of (21) algebraic skill, as illustrated in the table following table (6):

Presenting, discussing and interpreting the result of the second question: what is the level of achievement of teacher-students with literary majors at Al-Aqsa University in the algebraic equations solving skills?

To answer this question, the first hypothesis of the study was formulated, stating that: There is no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of teacher-students of literary majors at Al-Aqsa University in test of algebraic equations solving skills and the expected/default mean. To test this hypothesis, the expected mean was pre-identified as (75%), which is a level of proficiency; it was identified based on the views of the curricula and teaching methods specialists and the researcher review of previous studies. After that, the T-Test was applied for one sample to compare the average grades of teachers students with literary majors at Al-Aqsa University to the test of algebraic equations solving skills and the expected/default mean, in addition to the application of the study on a sample of (84) students who have completed the course of basic mathematics in the semester

No.	Skill	No.	Skill
1	Discriminate linear equations for other equations.	12	Solve quadratic equations in the method of completing the square.
2	Writes linear equation in terms of x or y.	13	Solve quadratic equations by public law.
3	Assigns correlation values of a, b, c in the linear equation.	14	Finds the total radical of the quadratic equation.
4	Solve linear equations with one variable.	15	Find the total product of the quadratic equation.
5	Solve system consisting of two linear equations.	16	Find the solution of the quadratic equation in the form $x \pm \sqrt{y}$.
6	Solve system consisting of two linear equations using elimination method.	17	Forms a quadratic equation with known radicals.
7	Forms a system of two linear equations from a verbal equation	18	Use Graphical representation in solving the quadratic equation.
8	Distinguishes quadratic equations for other equations.	19	Writes a graphical quadratic equation base
9	Assigns transaction values of a, b, c in the quadratic equation.	20	Identifies the type of radicals of quadratic equations.
10	Solve quadratic equations in the form of the product of two factors	21	Solve problems on quadratic equations
11	Solve non-written quadratic equations as the sum of the product of factors.		

Table (7) shows the results of the (T) test for one sample for comparison between the mean scores of teacher-students with literary majors at Al-Aqsa University in the test of algebraic equations solving skills and the expected/default mean (75%)

Dimensions	Number	Mean	Std. deviation	Percentile	Calculated T-Value	Sig	p-value
The whole test	84	13.67	2.84	%65	-3.33	0.00	Sig at 0.01

Limits of statistical significance begin at the level (α = 0.05) when the tabulated T-value is (1.98)
Limits of statistical significance begin at the level (α = 0.01) when the tabulated T-value is (2.617)

prior to the one of the application of the study ; the results are illustrated by the following table. It is clear from the above table that the calculated T-value equal to (3.33), which is greater than the tabulated T-value (2.617), at the degree of freedom (82) and the level of statistical significance (α = 0.01); this indicates to the existence of significant statistical differences between the mean scores of teacher-students with literary majors at Al-Aqsa University in the test of algebraic equations solving skills and the expected/default mean (75%), in favor of the default mean, which means that there is a clear weakness in the students' levels in the algebraic equations solving skills. This weakness can be due to several reasons including:

1. Lecturers adoption of the traditional methods in teaching algebraic equations solving skills.
2. Concentration of students on the educational requirements at the expense of specialty requirements, including the basics of mathematics.
3. Students' pre-assumption that the mathematics is a difficult subject.
4. Lecturer neglect of individual differences among students.

Presenting, discussing and interpreting the result of the third question: What is the impact of the employment of Smartphones to acquire some skills to solve algebraic equations on teacher-students of literary majors at the Al-Aqsa University?

To answer this question, the second hypothesis of the study was formulated, stating that: There is no significant statistical differences (α ≤ 0.05) between the mean scores of students of the experimental group and their peers in the control group in the post test of algebraic equations solving skills; to test this hypothesis, T- test was used for two independent samples. The results were as illustrated in table (8)

Table 8 shows the results of the T- test comparing the mean scores of the experimental group students and their peers in the control group in the post test of algebraic equations solving skills

Group	Number	Mean	Standard deviation	Calculated T-Value	Sig
Control	32	7.50	4.33	-15.76	0.00
Experimental	32	20.03	1.23		

Limits of statistical significance at mean (α = 0.05) ,d.f. (62) and tabulated T-value is (2.00)
Limits of statistical significance at mean (α = 0.01) ,d.f. (62) and tabulated T-value is (2.66)

It is clear from the above table that the calculated T-value equal to (15.76), which is greater than the tabulated T-value (2.66), at the degree of freedom (62) and the level of statistical significance (α = 0.01); this indicates to the existence of significant statistical differences between the mean scores of students in the experimental group and their peers in the control group in the post test of algebraic equations solving skills, in favor of students in the experimental group. Regarding the size of the impact of the employment of smart phones to acquire algebraic equations solving skills to teacher-students with literary majors at Al-Aqsa University teachers students, ETA square (η2) was calculated to make sure that the size of the T-test resulting differences are real differences caused due to the study variables, and are not coincidental. The following table illustrates this:

It is clear from the above table that the value of ETA square equal to (0.80), which indicates a large impact, where (Afana, 2000: 42) indicates that the size of impact is considered large if the value of ETA square is greater than or equal to (0.14), as is the size of the impact is considered supplementary to the statistical significance, and does not replace it, which is an agreed upon issue by the results of all the studies that have been previously presented. Although they presented the same content, the success of employing smart phones in acquiring algebraic equations solving skills to teacher-students with literary majors at Al-Aqsa University over the traditional way, is due to the following reasons:

a. Its modern way of presenting the educational content through smart phone, which enhances the chances of students' response and their interaction and motivation to learn and benefit.
b. The Smartphone messages display fits the students' desire to deal with the electronic media on an ongoing basis; making them more likely to read the content, increasing the collection of knowledge, building skill and practicing it with their peers all the time.
c. educational messages and other announcements addressed to students are automatically saved on the students' phones; so they can be restored at any time to review and re-read them and send them to colleagues easily and with low cost.
d. Smartphone addresses many aspects of traditional learning deficiencies, in which Smartphone Learning is a real pleasure, especially for students who have lost the desire to learn.

Table 9 shows the size of the impact of the t-test of the differences between students of the experimental and control groups

Group	Number	Mean	Standard deviation	Calculated T-Value	Value of ETA square (¦2)	d value	Size of impact
Control	32	7.50	4.33	-15.76	0.80	3.97	Large
Experimental	32	20.03	1.23				

e. The fast and rapid exchange of information and ideas among students and faculty members, due to the ease of passing information, files and cooperation in learning through e-mail and others, in addition to the possibility of connecting devices via Bluetooth..
f. Learning using smart mobile devices allows some kind of interaction between the learner and the educational material in an entertaining way; where multiple sources of access to information is provided, as well as the positive cooperation of the learner in the learning process.
g. Providing the opportunity to get information on educational content via the wireless devices, instead of searching for information, which requires time and effort.
h. The fact is mobile learning is based on the need to make learning interesting and effective, and convert tutorial of indoctrination and inertia to interaction and vitality, which can develop various skills.
i. Flexibility of smartphones, which absorb a wide and effective range of methods, tools and educational activities in an interesting context, combined together to achieve the desired goals of teaching.

Presenting, discussing and interpreting the result of the fourth question: What is the impact of the employment of smart phones on the development of attitudes of students of literary majors at the Al-Aqsa University towards mathematics?

To answer this question, the third hypothesis of the study was formulated, stating that: There is no significant statistical differences ($\alpha \leq 0.05$) between the mean scores of students of the experimental group and their peers in the control group in the post test of attitudes toward mathematics; to test this hypothesis, T- test was used for two independent samples. The results were as illustrated in table (10)

Table 10 shows the results of the T- test comparing the mean scores of the experimental group students and their peers in the control group in the post test of attitudes toward mathematics

Group	Number	Mean	Standard deviation	Calculated T-Value	Sig	p-value
Control	32	3.60	.27	-16.19	0.00	Sig at 0.01
Experimental	32	4.67	.26			

Limits of statistical significance at mean ($\alpha = 0.05$) ,d.f. (62) and tabulated T-value is (2.00)
Limits of statistical significance at mean ($\alpha = 0.01$) ,d.f. (62) and tabulated T-value is (2.66)

Table 11 shows the size of the impact of the t-test of the differences between students of the experimental and control groups

Group	Number	Mean	Standard deviation	Calculated T-Value	Value of ETA square (¦2)	d value	Size of impact
Control	32	3.60	.27	-16.19	0.81	4.13	Large
Experimental	32	4.67	.26				

It is clear from the above table that the calculated T-value equal to (19.92), which is greater than the tabulated T-value (2.66), at the degree of freedom (62) and the level of statistical significance ($\alpha = 0.01$); this indicates to the existence of significant statistical differences between the mean scores of students in the experimental group and their peers in the control group in the post test of attitudes toward mathematics, in favor of students in the experimental group. Regarding the size of the impact of the employment of smart phones to positive attitudes towards mathematics for students with literary majors at Al-Aqsa University teachers students, ETA square ($\eta 2$) was calculated to make sure that the size of the T-test resulting differences are real differences caused due to the study variables, and are not coincidental. The following table illustrates this:

It is clear from the above table that the value of ETA square equal to (0.81), which indicates a large impact, where (Afana, 2000: 42) indicates that the size of impact is considered large if the value of ETA square is greater than or equal to (0.14), as is the size of the impact is considered supplementary to the statistical significance , and does not replace it, which is an agreed upon issue by the results of all the studies that have been previously presented. This result is due to the following reasons:

a. Team work, group work, individual learning and other learning methods, as well as the variety of display techniques enhanced with multimedia while learning via smartphone has had a positive impact on the development of the attitudes towards the use of the smart phone in the educational process.
b. The use of the smart phone in teaching different educational topics leads to increasing students' motivation towards learning, and the formation of a positive attitudes towards studying using a smart phone.
c. teaching via smart phone achieves students' freedom from all forms of fear and repression; leading to the reveal of internal positive feelings toward education.
d. The fact that teaching via smart phone contain many stimuli, forms of activities, interesting dialogue, attractive and entertaining ways of presenting information, experiences and concepts, entertaining, and mindful leading of the lecturer to the students has all created an internal love and seek of students' towards education, and a desire to repeat exercises of this kind of teaching, so it is working to attract students to scientific material, and help to provide them with positive attitudes.
e. Educational activities via smart phone are distinguished in the presentation of educational material, such as the use of effects in their various forms, such as audio, image, movement, and color, all of which attract students, and increase their motivation to learn.
f. Modern way of presenting the educational content through smart phone enhances the chances of students' response and their interaction and motivation to learn and benefit; which will reflect positively towards mobile learning.

Recommendations of the study

In the light of the study outcomes, the following recommendations can be made:

1. Expanding the use of smart phones in learning in various academic and educational majors, for it is a distinguished educational model of clear advantages.
2. The need for faculty members of the Palestinian universities in the education sector to take advantage of smart phone capabilities in education.
3. Increasing the awareness among university students about what is offered by smart phone technology to take advantage of the educational aspects and the denial bad ones.
4. Holding educational workshops for students and university professors, to clarify the educational services that can be provided by smart phones to support the teaching of university courses.
5. Holding a number of conferences, seminars and study days by universities and research institutions to address and discuss the implications for mobile learning and the development of solutions to benefit the most of it to achieve the desired educational goals.
6. The need to introduce the use of mobile and modern means of communication within the curriculum and student activities to develop students' perception and awareness in the possibility of exploiting the phenomenon of the presence of cellular devices with university students and turn it into a strength to enhance the educational process and improve the quality of education.
7. Building training programs for teachers to acquire the necessary technical skills for the use of mobile wireless devices in teaching.
8. Conducting a similar study on recording lectures with mobile and its impact on the achievement and attitudes towards the employment of the smartphone in the educational process.

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