

Attitudes of Basic School Students Towards using Smartphones in Math Classes in Jordan: A Survey-Based Study

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Abstract

This study explored the attitudes of basic school students towards using smartphones in math classes in Jordan. It also explored the challenges hindering such use. The descriptive analytical approach was adopted. The population is represented in all the public and private basic school students (including males and females) in all the Jordanian cities. The basic school stage in Jordan is represented in the stage that starts from first grade and ends at tenth grade. A questionnaire was designed to collect the required data. It was uploaded to Google Form. The questionnaire link was uploaded to several Facebook Groups. 304 basic school female and male students filled in the questionnaire. They are considered the members of the random sample. The data was processed in a statistical manner through a special software called (SPSS). It was found that the attitudes of basic school students towards using smartphones in math classes in Jordan are positive. It was found that the use of smartphones in math classes improves students' achievement in this course and raises their engagement in such classes. Such use also raise their motivation to learn math. The challenges that may hinder the use of smartphones include: the absence of good internet connection in some schools and the poor skills of some students in using smartphones.

Keywords: Attitudes, basic school, smartphones, math, Jordan, challenges, survey-based study.

1. Introduction

During the contemporary age, people have been witnessing an information explosion and constant developments in all the social, economic and technological areas. In the light of such developments, people start using modern technologies for carrying out daily life activities of people. Such use became a basic requirement for achieving advancement and human development. The daily activities that people use modern technologies for carrying them out include: the daily educational activities in the educational sector (schools and

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universities). That is done to enable students to keep up with the developments and make them acquainted with the latest knowledge in the scientific fields (Ale'wainaty, 2022).

Today, modern technologies are used in classrooms in the aim of enabling students to access the academic material uploaded on email, class blogs, and social media. Such access shall eliminate the need to distribute academic papers to each student and have much time wasted in doing that. In addition, modern technologies are used today in classrooms for enabling teachers to track the progress achieved by each student through letting him/her do quizzes -that are automatically corrected – in class.

The use of modern technologies in classrooms aims to improve the learning environment. Through such use, the learning environment shall become similar to the learning environments in the developed countries. Such use aims to enable students to access electronic libraries, and databases. That shall enable students to gain new knowledge and information that weren't provided to them during in class. It shall enable students to retain the information for a longer period, because they acquired the information in a distinguished visual manner through relying on themselves rather than having it delivered to them through the conventional lecturing method.

In addition, the use of modern technologies in classroom develops students' self-learning skills. That's because the students shall rely on themselves for collecting information and searching for it. That shall enable students to rely on themselves in the future for learning and developing their skills. In addition, the use of modern technologies in classroom shall enable students to solve the problem they face instead of seeking the help of the teacher for addressing each problem they face. That shall contribute to developing the students' problem solving skills (Ale'layan, 2019).

Example on modern technologies that can be used in classroom include: smartphones. The use of such technologies in classroom falls under the term (m-learning). The term (m-learning) can be defined as the process of running, designing, and producing knowledge and sharing it. It involves exchanging the sources of knowledge between students and teachers and having them communicating with each other through the use of the applications and features of mobile phones (Ghanam and Ale'baikan, 2016, 69). It can be defined as the use of mobile or portable devices in the teaching-learning process. Such devices include: mobiles, and laptops (Almubarak, 2017, 33)

Smartphones can be used in math classes due to offering several merits. For instance, smartphones are portable due to their small size and light weight. The cost of smartphones is little. Smartphones allow students to exchange electronic books and files in class. They allow students to retrieve and store information easily. That shall enable students to access the information that the teacher illustrated in previous lessons without dedicating much time to search for it in the curriculum. In addition, the use of smartphones allow students to search for information on the web fast. To add more, it allows teachers to carry out a variety of educational activities that are considered entertaining and interesting for students (Ale'taiby, and Ale'taiby, 2023)

Furthermore, the use of smartphones in math classes allows students to improve their achievement in the math course. That is because such use allows students to access knowledge, examples, and models that include math problems and solution via the web. It is because such use allows students to access numerous applications and videos specialized in math. In addition, the use of smartphones in math classes allows teachers to present the academic material in a good and

interesting manner through using the multimedia. It allows students to assess themselves accurately through getting immediate feedback. Such feedback can be obtained when doing math exercises that are automatically corrected. It should be noted also that such use improves students' attitudes towards learning math. In fact, such use shall make students perceive the process of learning math as an easy and enjoyable process that involves carrying out educational games and activities (Alegh'wairy, 2021).

The use of smartphones in math classes shall enable students to explore mathematical rules and gain interesting mathematical knowledge, such as: the mathematical knowledge related to human bodies and natural phenomena. It shall increase students' engagement in the teaching-learning process due to becoming more acquainted with more knowledge shall enable to participate in classroom activities (Baya'a and Daher, 2009). It shall improve students' understanding for the academic material and enable students to acquire complex and abstract math concepts. That's because accessing the search engines shall enable students to access detailed information and visual and practical examples on such concepts. Such use shall enable students to solve more mathematical problems due to using electronic calculator. The use of the paper-pencil method requires more time than the use of the electronic calculator on smartphones. In addition, it facilitates the cooperation between students and their colleagues in solving mathematical problems. That's because the communication applications on such phones -e.g. WhatsApp application- allows students to share the knowledge needed for solving the concerned mathematical problems with their colleagues (Peteros et al., 2022)

2. Statement of the problem

The use of smartphones and their applications in classroom has several merits. For instance, it allows students to save the time and effort they dedicate for searching for information in the curricula and notebooks. That shall positively affect the quality of the education delivered to students. It shall positively affect the way through which students utilize their time. Such use shall contribute to attracting students' attention due to the use of multimedia (e.g. academic videos, and images, visual and auditory effects and etc.).

Such merits include: making the teaching-learning process enjoyable and fun due to the use of modern teaching and learning strategies that are based on the use of smartphones. Such strategies include: the team-based learning strategy via the use of smartphones, and the problem solving-based learning strategy via the use of smartphones. That shall make students curious to obtain knowledge. Such merits include: having the students engaged in the process of playing electronic games that have academic goals. In other words, such use shall enable teachers to use a variety of teaching strategies and methods for illustrating information (Ale'layan, 2019).

There are several merits for using smartphones and their applications in the educational field. Despite that, such use has negative psychological impacts. Such impacts include: experiencing the feelings of jealousy by the smartphone users due to seeing others' possessions while using social media platforms. They include: experiencing the feelings of depression and frustration due to seeing others' successful achievements. That shall negatively affect the self-confidence of the smartphone users. Such impacts include: the rise of the anxiety levels among the users of smartphone and its applications due to phone addiction and having a drop in the extent of having social communication with others. There are negative psychological impacts for the use of smartphones, such as: suffering

from bullying. As for the negative social impacts of using smartphones, they include: suffering from isolation, and having a drop in the level of academic achievement due to the excessive use of such phones (Nassar, 2022).

Several researchers shed a light on the merits of using smartphones in the educational field. Other researchers addressed the negative impacts of using smartphones in the educational field. Hence, the researcher of the present study believes that it's necessary to conduct a study that sheds a light on the effectiveness of using smartphones in classroom, especially in the classes of the courses perceived as difficult by students. Such courses include: the math course. Therefore, the present study sheds a light on the following problem

(What are the attitudes of basic school students towards using smartphones in math classes in Jordan?)

3. Objectives

This study aimed at

-Identifying the attitudes of basic school students towards using smartphones in math classes in Jordan

Identifying the challenges that may hinder the use of smartphones in the math classes in the basic schools in Jordan

4. Questions

This study offered answers for those questions:

Q.1. What are the attitudes of basic school students towards using smartphones in math classes in Jordan?

Q.2. What are the challenges that may hinder the use of smartphones in the math classes in the basic schools in Jordan?

5. Significance of the study

This study is significant due to the reasons below:

5.1. Theoretical significance:

-This study is important, because it sheds a light on an important topic that hasn't been addressed by any researcher. This topic is represented in (the attitudes of basic school students towards using smartphones in math classes in Jordan). Hence, this study enrich the relevant literature.

-This study sheds a light on an important educational technology (i.e. smartphones). Smartphones are considered important, because include many features and applications that are beneficial in the math classes. Such features and applications include: specialized math applications, electronic calculator, search engines, electronic libraries, Word Program, and multimedia

5.2. Practical significance

-This study is important because it provides the employees at the Jordanian Ministry of Education with information about the effectiveness of using smartphones in math classes. Reaching positive results in this study encourages employees to design an electronic system and electronic curricula that allow students to use smartphones effectively in math classes

-This study enriches the knowledge of employees at the Ministry of Education about the challenges that might be faced when using smartphones in math classes at schools.

-This study contributes to promoting awareness among teachers and students about the significance of using smartphones in learning math

6. Limits and Limitations

-Temporal limits: This study was carried out during the first year of the academic year 2023-2024

-Spatial limits: This study targets the public and private basic schools in Jordan

-Human limits: This study targets all the students enrolled at the public and private basic schools in Jordan

-Thematic limits: The topic of this study is represented in the attitudes of basic school students towards using smartphones in math classes in Jordan

-Limitations: The results of this study can't be generalized, because the results shall differ when using a different type of instrument, or changing the items of the questionnaire, or the size of the sample.

7. Definitions:

7.1. Theoretical definitions

-Attitude: This term refers to the degree to which one accepts or rejects a specific practice or behaviour (Almubarak, 2017,33)

-Smartphones: They refer to portable devices that shall one to use electronic applications and features, such as: camera, GPS, and Wi Fi. They operate through using one of the following operation systems: iPhone, Ozdalga, BlackBerry, Windows Mobile (Ozdalga et al., 2012)

-M-learning: It can be defined as the use of mobile or portable devices in the teaching-learning process. Such devices include: mobiles, and laptops (Almubarak, 2017, 33)

-Basic school stage in Jordan: It starts in first grade and ends when finishing the tenth grade

7.2. Operational definitions:

-Attitude: This term refers to the degree to which basic school students in Jordan accepts or rejects the use of smartphones in math classes

-M-learning: It refers to the use of smartphone in the math classes at basic schools in Jordan

8. Theoretical framework

8.1. The advantages of using smartphones in the learning process

The use of smartphones in the educational field shall break the routine of the teaching-learning process due to being a new learning method. It leads to raising the students' autonomy in learning. That's because such phones allows students to solve math problems through searching by themselves. The use smartphones in the learning process promotes a cooperative learning approach through

allowing students to share the knowledge needed for solving problems with their colleagues. It makes the learning process enjoyable due to allowing students to use multimedia and educational electronic games (Baya'a and Daher, 2009).

The use of smartphones in the educational field allows students to use many features. For instance, it allows students to make voice recordings for the lesson to be reviewed at home while studying. It allows students to use some useful scientific applications that enrich their knowledge and develop their skills. It enables students to use an electronic calculator at home or classroom to solve math problems fast. In addition, students can use the calendar in their smartphones to remind them about the dates of quizzes and monthly exams and submission of homework. In addition, the prices of smartphones are low. Such phones can be easily used and portable. Hence, students are willing to use such phones and their use became popular among students. In addition, such phones allow students to use search engines to search for information (Alsaif, 2018).

The use of smartphones in the educational field changed the teacher from a transmitter of knowledge into a facilitator for the acquisition of knowledge. That's because the teacher shall shift from using the lecturing method into engaging students into smartphone-based activities that make their role in the learning process active. Furthermore, using smartphone shall provide students with knowledge and skills due to granting them access to academic websites and journals. Using smartphones in the educational field increases the degree to which students engage in the learning process. That's attributed to providing them with access to information that enable them to participate in activities and do exercises provided by the teacher. Using smartphones increase the degree to which students interact with their colleagues in class. That's because such use allows students to share files and knowledge with each other. In addition, such use allows teachers to take the individual differences between students into consideration. That is because teachers shall be capable to send special academic materials to each student or group of students based on his/her/their achievement and skills. Teachers can use a variety of teaching strategies when using smartphones, because they can use a variety of academic videos, images and programs (Salaman and Amin, 2019).

The use of smartphones in the educational sector positively affects the achievement of students, because it allows students to send files, presentations, and summaries to their colleagues. It enables students to learn through using visual, auditory, and motion effects. That shall make the students retain the information for a longer period of time. In addition, it enables teachers to attract the attention of students to the academic content due to the use of various colours and multimedia which can't be used when using the lecturing methods. The use of smartphones in giving lessons shall raise the students' motivation to learn. That is because such use allows teachers to employ modern programs that students love. The use of modern programs shall make the teaching-learning process a process that keeps up with the latest technologies instead of being a boring routines process that's based on the lecturing method (Aledwan, 2021).

The use of smartphones in the educational sector allows students to retrieve information easily and fast due to offering students a variety of electronic features. It enables students to access studies and books easily. It promotes a self-learning approach among students, because it enables students to acquire knowledge by themselves through accessing academic applications and videos that include simple illustrations for difficult lessons and information. It provides students with feedback when using websites and applications that include questions with an automatic-correct feature. It reduces the effort and time dedicated by students for learning. That's because smartphones allows students

to access a variety of information sources and illustrations for lessons (Arafah, 2022).

8.2. The challenges that hinder the use of smartphones in classroom

There are various challenges that hinder the use of smartphones in classrooms. Such challenges include: the need to provide students with training about the way of using search engines and educational games on such phones. There is also a need to train students on the way of using email list and exchanging files. There is also a need to train students on the way of using social media on smartphones (Ateyah, 2004).

In addition, there is a need to train students and teachers about the meaning, and merits of m-learning and the type of the devices used in the light of employing the m-learning approach. Such training must provide students with knowledge about the strategies used in the light of employing the m-learning approach. It must inform students about the educational standards that must be met in the m-learning environment. It must inform students about the requirements of employing the m-learning approach. It must inform students and teachers about the global experiences that involve employing this approach (Ateyah, 2004).

The challenges that hinder the use of smartphones in classroom include: poor internet in schools which hinder students from accessing the material that the teacher sent to them. They include: the limited battery life of smartphones. Such limitedness requires having students sitting next to a charger (Alsaif, 2018). Such challenges include: an increase in the cost incurred by the owners of educational institutions. Such costs are need for designing an electronic system for smartphones to manage the educational process. In addition, using smartphones in classroom may cause a chaos and hinder teachers from managing classroom effectively. That may be attributed to having some students using smartphones in classroom for entertaining and chatting with their colleagues (Salaman, and Amin, 2019).

In addition, using smartphones in classroom requires dedicating much time and effort by teachers to prepare and plan electronic activities and design an electronic academic material. It isn't appropriate to use smartphones for teaching all courses. That's because teaching some courses requires using manual skills, such as: drawing, and art of sculpture. Using smartphones in classroom may distract students' attention due to offering them access to entertaining websites while learning. It weakens students' relationships with their teachers due to having students relying on smartphones as a main source of knowledge instead of considering their teachers the main sources of knowledge (Salaman, and Amin, 2019)

Nikpeyma et al. (2021) add that such challenges include: ones related to the (smartphone itself, access to internet, and information literacy). The ones related to the smartphones itself, they include: limited smartphone memory. Such limitedness hinder students from storing many educational videos and much information. The latter challenges include: the small size of the smartphone screen. That shall hinder students from reading the academic material. It shall cause eye fatigue and problems and neck problems for students.

The challenges related to internet access include: low internet speed and the absence of internet connection in some schools. The low internet speed shall negatively affect students' motivation to learn through using smartphones. Addressing the latter challenges requires dedicating a greater budget for internet services and concluding a contract with companies that deliver internet services of high quality in terms of speed and coverage. The challenges related to

information literacy include: having students with low English language competency. That shall hinder those students from understanding the academic material written in English language (Nikpeyma et al., 2021)

9. Previous studies:

The following studies were reviewed by the researcher

Ghanam and Ale'baikan (2016) explored the reality of adopting the m-learning approach in the faculty of education at King Saud University. They explored the challenges hindering the adoption of this approach. They adopted a descriptive approach. They used a survey to obtain data from the sample. The data was collected from 91 female and male students in the MA program in the latter faculty. It was also collected from 47 female and male instructors working in this faculty. It was found that 83.2% of the respondents use the mobile features to obtain Google services. They use the electronic notebook to take and save notes fast during the lecture. 78.2% of the respondents use the electronic calendar on their mobiles to remind themselves of the dates of exams. 67.6% of the respondents use electronic alarm on their mobiles to remind themselves of the dates of submitting homework. 51.6% of the respondents use mobiles to remind themselves of quizzes and 93.2% of the respondents use mobiles to check the educational email messages. 88.2% of the respondents use mobiles to read electronic books. 93.2% of the respondents use mobiles to access the educational videos on social media. Regarding the challenges that hinder the adoption of m-learning approach, they include: the lack of the required training courses, the poor technical skills needed for using mobiles phones, and poor internet network. They include: the poor technical support and having a high load of administrative tasks assigned to instructors. They include: the negative impacts of using mobiles much on health, such as: a decline in the visual acuity. They include: the lack of knowledge of many instructors about the mobile applications related to their course.

Bani Younis (2017) explored the impact of using smartphones in the math course on second grade students' achievement in Alkura district in Jordan. She adopted the experimental approach. She chose a sample through the convenience sampling method. She chose the sample from Alkura district. The sample consists from two sections. Each section includes 30 female and male second graders. The first grade was taught through using smartphones. It represents the experimental group. The second group was taught through the conventional method. It represents the control group. Pre-test and post-test were administered. It was found that using smartphones in the math course has a significant positive impact on second grade students' achievement in Alkura district in Jordan and the amount of concepts they acquire.

Almubarak (2017) examined the attitudes of instructors in Al-Hasaheisa faculty of education in Jazeerah University in Sudan towards using mobile applications in the teaching process. A descriptive analytical approach was adopted. The population consists from 59 instructors. Survey forms were passed to the purposive sample that consists from 50 instructors chosen from the population. 48 forms were retrieved. The data was processed statistically through SPSS software. It was found that the attitudes of the instructors in this faculty are positive towards such use are positive. Using such applications in the teaching process shall increase the students' interaction with each other in the lecture hall. It shall raise students' motivation to learn. It shall promote a sense of creativity among students and develop their self-learning skills. That's because using such applications shall enable students to collect information by themselves. Such

use develops students' problem solving skills, because it allows students to gain knowledge on models of problems facing them and their solutions. It makes the learning process enjoyable. It provides students with access to the academic material and allows presenting the material in an interesting manner that attracts students' attention. Furthermore, it allows students to apply the theoretical knowledge in a practical manner, because it allows students to access models of questions that require applying theoretical knowledge. It allows instructors to save effort. That's because it allows students to access information that deepen their understanding for the material instead of considering the instructor their main source of knowledge.

Alalwneh (2020) examined the attitudes of Jordanian school students towards learning math through using mobile. He adopted the descriptive analytical approach and used a survey. The sample consists from 52 9th grade students who were chosen purposively. It was found that adopting the m-learning approach for learning math positively affects students' achievement and raise their motivation to learn. Such adoption make the learning process suitable for all students, regardless of the learning approach that suits each one of them. It develops students' mathematical problem solving skill and high thinking skills. It raises students' engagement in the learning process and promotes creativity among them. However, it negatively affects students' communication skills. The use of electronic games on mobiles doesn't improve students' understanding for the math course.

Albayer (2021) examined the impacts of using smartphones on the achievement of basic school students in Al-Muwaqqar, Jordan from the perspective of their teachers. She examined that through the descriptive approach. The population consists from all the basic school teachers in Al-Muwaqqar, Jordan. It consists from 88 female and male teachers chosen randomly. The sample consists from 73 female and male teachers. The survey consists from 22 items. It was found that using smartphones significantly affects the achievement of the targeted students. Such use allows the students with learning difficulties to address the problems facing them. It increases the participation of students in the teaching-learning process, because it provides them with access to knowledge. It presents the material in an interesting manner and allows students to get feedback. It allows shy students to get knowledge without asking the teacher. However, it has some disadvantages. For instance, it may have negative effects on wellbeing, such as: (cause a curve in neck and back, decline in the visual acuity, and headache). Such disadvantages include: increasing the students' tendencies towards violence and aggressive behaviours. They include: the negative impacts on students' morality.

Jarah (2021) examined the effectiveness of using mathematical mobile applications on the acquisition of mathematical concepts by fourth grades who suffer from mathematical learning difficulties in Jordan. She adopted the quasi experimental approach. The sample consists from 50 female and male 4th grades who were chosen from five schools. Those students were divided into experimental and control groups. Pre-test and post-test were administered. It was found that using mathematical mobile applications positively affects the acquisition of mathematical concepts by fourth grades who suffer from mathematical learning difficulties in Jordan.

Aleghwairy (2021) explored the degree to which the use of mobiles is effective in improving the achievement of students in the math course in Hashemite University. He examined the attitudes of those students towards using mobiles in this course. Descriptive and quasi experimental approaches were adopted. A purposive sample was chosen from the students registered in this course in

Hashemite University. It consists from 56 female and male students who were divided into control and experimental groups. Pre-test, post-test and survey were used. It was found that using mobiles has a positive and significant effect on the achievement of students in the math course in Hashemite University. Such a use contributes to presenting the material in a good manner and promotes positive attitudes among students towards learning math. It allows students to acquire new mathematical concepts and enables students to assess themselves more accurately and receive feedback instead of waiting for the teachers to assess them. In addition, it provides students with more learning opportunities, and allows students to overcome their shyness when asking questions. It develops students' mathematical skills and makes students' role active in the learning process. It facilitates the process of doing homework. The positive respondents' attitudes towards using mobiles may be attributed to the fact that mobiles allow connecting theoretical knowledge with daily life and offer access to exercises, and activities and offer opportunities to review the things that were taught. They may be attributed to the fact that mobiles offer access to new knowledge via search engines, social media and libraries and enable students to access educational websites. In addition, such use enables students to acquire knowledge with less time and effort.

Peteros et al. (2022) examined the preparatory school students' attitudes in Philippines towards using smartphones in learning math. They adopted a descriptive approach and used a survey. The sample consists from 195 female and male students chosen from preparatory school in سيبو Philippines. It was found that students often use smartphones for improving their understanding for the math material and complex and abstract mathematical terms. Students often use smartphones for cooperating with their colleagues in doing math problems. Using smartphones allow students to do a greater number of math problems that require using calculator.

Ale'taiby, and Ale'taiby (2023) shed a light on the reality of using smartphone applications in the teaching-learning process by the female and male math primary school teachers in Dawadmi, Saudi Arabia. They adopted a descriptive survey-based approach. They used a survey consisting from 35 items. The random sample consists from 220 female and male math teachers chosen from primary schools in Dawadmi, Saudi Arabia. It was found that the extent of using such applications in the teaching-learning process by those teachers is very high. Such use allows students to learn the way of doing math operations and identify numbers. It enables teachers to use a variety of teaching strategies. It allows students to use a mini electronic library that includes books and lessons that can be used in class. It allows students to store and retrieve knowledge easily and fast. It allows students to access a variety of information sources (e.g. search engines and digital libraries). It allows students and teachers to access educational websites

10. Comments on the previous studies:

Similar to the present study, some previous studies target the math course, such as the ones conducted by Ale'taiby, and Ale'taiby (2023), Peteros et al. (2021), Alegh'wairy (2021) and Ale Bani Younis (2017). Similar to the present study, some previous studies use a survey to collect data, like the one carried out by Alalwneh (2020).

Contrary to this study, Ale'baikan (2016) targeted a population that's represented in all the students in the faculty of education at King Saud University. Contrary to this study, Almubarak (2017) targeted a population that's represented in the

instructors in Al-Hasaheisa faculty of education in Jazeerah University in Sudan. As for this study, it targets a population that consists from all the basic school students in Jordan. Contrary to this study, Bani Younis (2017) used a pre-test and a post-test. As for this study, it used a survey to obtain data.

11. Methodology

11.1. Approach

In this study, the researcher adopted a descriptive analytical approach. He adopted a quantitative approach.

11.2. Population and sample

The population of this study in all the public and private basic school students (including males and females) in all the Jordanian cities. The basic school stage in Jordan is represented in the stage that starts from first grade and ends at tenth grade. A survey was designed to collect the required data. It was uploaded to Google Form. The survey link was uploaded to several Fb groups. 304 basic school students in Jordan filled in the survey. Those students are considered the members of the random sample. The researcher displayed the distribution of the sampled basic school students in accordance with gender, school type, Province and school stage in the table below:

Table (1): The distribution of the sampled basic school students in accordance with gender, school type, Province and school stage

Variable	Category	Frequency	Percentage
Gender	Male	119	39.14474
	Female	185	60.85526
School type	Private	113	37.17105
	Public	191	62.82895
Province	Northern Province	83	27.30263
	Central Province	123	40.46053
	Southern Province	98	32.23684
School stage	The senior basic school stage (seventh grade or less)	128	42.10526
	The top basic school stage (8 th , 9 th , and 10 th grades)	176	57.89474

11.3. Instrument

The researcher designed a survey after reviewing several studies published in Arabic and studies published in English language. This survey is based on five

point Likert scale and includes three parts and an introductory paragraph. The latter paragraph presents the study's title, goal, and extent of maintaining data confidentiality. Part one collects data about (gender, school type, province and school stage). Part two collects data about the female and male respondents' attitudes towards using smartphones in the math classes. The third part collects data about the challenges that may hinder the use of smartphones in the math classes in the basic schools in Jordan from the perspective of the female and male respondents.

The second part was designed based on the references of: Alegh'wairy (2021), Bani Younis (2017), Albayer (2021), Baya'a and Daher (2019), Almubarak (2017), Alalwneh (2020), Ale'layan (2019), Ale'taiby, and Ale'taiby (2023), Salaman and Amin (2019). The third part was designed based on the references of: Albayer (2021), Salaman and Amin (2019), Ghanam and Ale'baikan (2016), Al-Saif (2018), Nikpeyma et al. (2021), Ale'taiby, and Ale'taiby (2023).

11.4. Validity of the Instrument

The researcher measured the validity of the initial version of the questionnaire through sending it to four faculty members holding PhD degree in teaching methods. He asked them to assess the questionnaire in terms of language, clarity, relevancy to the goals. However, two faculty members recommended making modification the way of drafting some items. Changes were made to the questionnaire in the light of the faculty members' views.

11.5. Reliability of the Instrument

The reliability of the instrument was measured through calculating Cronbach Alpha coefficient values. The Cronbach Alpha coefficient value of the second part of the survey is 0.735 and the counterpart value of the third part of the survey is 0.842. The overall value is 0.788. It is high and indicates that the results are very accurate due to being greater than 0.70 as added by the study of Salehi & Farhang (2019)

11.6. Data sources

-Secondary sources of data: They include: books, theses, and studies related to the goals of this study

-Primary source of data: It's represented in the survey designed by the researcher

11.7. Data analysis

The data was analysed through the use of SPSS software that is used mainly for analysing data statistically. Several descriptive statistical methods were used. They include: standard deviations, means, frequencies, percentages and Cronbach Alpha coefficient values

To have the means classified into categories, the following statistical criteria were used (Ale'thamat, 2022): 2.33 or less: Low / 2.34 – 3.66: Moderate / 3.67 or more: High

The five point Likert scale was used. It consists from several rating categories. Those categories are listed below (Ale'thamat, 2022):

Table (2): The five point Likert scale (scores and categories):

Score	Category
5 scores	Strongly agree
4 scores	Agree

3 scores	Neutral
2 scores	Disagree
One score	Strongly disagree

12. Discussion and results

12.1. First question

Q.1. What are the attitudes of basic school students towards using smartphones in math classes in Jordan?

Table (3): The attitudes of basic school students towards using smartphones in math classes in Jordan

No.	Statement	Mean	Std.	Attitude
	Using smartphones in math classes			
1.	Improves my attitudes towards the math course	4.86	0.44	Positive
2.	Improves my academic achievement in the math course	4.88	0.26	Positive
3.	Allows me to acquire more mathematical concepts	4.75	0.40	Positive
4.	Increase my engagement in the teaching-learning process in such classes	4.60	0.63	Positive
5.	Increase my motivation to learn math	4.48	0.49	Positive
6.	Promote a sense of creativity within me when solving math problems	4.51	0.75	Positive
7.	Maintains my concentration and attention during such classes	2.29	0.58	Negative
8.	Develops my skills in solving math problems	4.35	0.66	Positive
9.	Allows the math teacher to use a variety of teaching strategies	4.72	0.24	Positive
10.	Enables the math teacher to take the individual differences between students into consideration in class	4.42	0.55	Positive
11.	Enables me to connect the theoretical knowledge with daily life	4.85	0.37	Positive
12.	Develops my communication skills	2.14	0.89	Negative
13.	Promotes a sense of autonomy within me in the learning process	4.63	0.59	Positive
14.	Presents the academic material of the math course in an interesting manner	4.56	0.97	Positive
15.	Overall	4.28	0.55	Positive

Based on the aforementioned table, the attitudes of basic school students towards using smartphones in math classes are positive. That is because the overall mean (4.28) is deemed high. This result is attributed to the fact that students love learning through using modern educational technologies, like: iPad, laptops, and smartphones. It was found that using smartphones in math classes improves students' attitudes towards the math course because the mean of item No. 1 (4.86) is high. This result is consistent to the one found by Aleghwairy (2021). It may be attributed to the fact that smartphones allows students to access a simplified illustration for mathematical information and more examples for the things illustrated by the teacher in class. That shall make students perceive the math course as a course that can be easily understood. It was found that using smartphones in math classes improves students' achievement in the math course, because the mean of the second item (4.88) is high. This result is consistent to the one found by Bani Younis (2017) and Albayer (2021). It may be attributed to the fact that smartphones enriches students' information through offering students an access to electronic libraries, journals, and websites specialized in math.

It was found that using smartphones in math classes provides students with more math concepts, because the mean of the third item (4.75) is high. This result is consistent to the one found by Aleghwairy (2021). It may be attributed to the fact that using smartphones allows students to access many search engines, and e-dictionaries that allow students to have a better understanding for the math concepts used by the teacher or embedded in the curriculum. It was found that using smartphones in the math classes increases students' engagement in the teaching-learning process in such classes, because the mean of the fourth item (4.60) is high. This result is consistent to the one found by Baya'a and Daher (2019). It may be attributed to the fact that the information delivered through smartphone applications allow students to engage more in solving more math problems.

It was found that using smartphones in the math classes increases students' motivation to learn math, because the mean of the fifth item (4.48) is high. This result is consistent to the one found by Almubarak (2017) and Alalwneh (2020). It may be attributed to the fact that the smartphone-based educational activities carried out in class shall make students highly motivated to learn math with enthusiasm. It was found that using smartphones in the math classes promotes a sense of creativity among students in solving math problems, because the mean of the sixth item (4.51) is high. This result is in agreement with the one found by Almubarak (2017). It may be attributed to the fact that smartphones allows students to gain information about innovative methods used for solving math problems. It was found that using smartphones in the math classes develops students' skills in solving math problems, because the mean of the eighth item (4.35) is high. This result is consistent to the one found by Ale'layan (2019). It's attributed to the fact that smartphones allow students to gain knowledge about the methods used for addressing many mathematical problems.

It was found that using smartphones in the math classes allows teachers to use a variety of teaching strategies in such classes, because the mean of the 9th item (4.72) is high. This result is consistent to the one found by Ale'taiby and Ale'taiby (2023). It may be attributed to the fact that using smartphones allows teachers to use the instructional method that's based on electronic games, teams or electronic brainstorming technique. All those methods shall make the learning process entertaining. It was found that using smartphones in the math classes allows students to take the individual differences between students into consideration, because the mean of the 10th item (4.42) is high. This result is

consistent to the one found by Salaman and Amin (2019). It may be attributed to the fact that using smartphones allows math teachers to divide students into groups based on their achievement in order to assign different math problems to each group.

It was found that using smartphones in the math classes allows students to connect theoretical knowledge with daily life, because the mean of the eleventh item (4.84) is high. This result is consistent to the one found by Alegh'wairy (2019). It may be attributed to the fact that search engines allows students to access mathematical knowledge related to practical aspects in people's daily life, such as: the mathematical knowledge related to human body or nature. It was found that using smartphones in the math classes promotes a sense of autonomy among students in the learning process because the mean of the thirteenth item (4.63) is high. This result is consistent to the one found by Baya'a and Daher (2019). It may be attributed to the fact that using smartphones allows students to access e-books and applications specialized in math. That shall enable students to acquire knowledge without asking the teacher

Such use of smartphones allows teachers to present the academic material in an interesting manner because the mean of the fourteenth item (4.56) is high. This result is consistent to the one found Almubarak (2017) and Albayer (2021). It is attributed to the fact that using smartphones allows teachers to present academic videos before students and use auditory and visual effects. That shall allow teachers to present the material in an organized and good manner.

However, such use of smartphones doesn't maintain students' concentration and attention in class, because the mean of the seventh item (2.29) is low. That's because students may use social media for entertainment or access electronic entertainment games in class. That shall distract students in class. It was found that such use of smartphones doesn't improve their communication skills, because the mean of the twelfth item (2.24) is low. That's because relying on the use of social media in math shall reduce the degree to which students interact with their colleagues and teachers

12.2. Second question

Q.2. What are the challenges that may hinder the use of smartphones in the math classes in the basic schools in Jordan?

Table (4): The challenges that may hinder the use of smartphones in the math classes in the basic schools in Jordan

No.	Statement	Mean	Std.	level
The challenges that may hinder the use of smartphones in the math classes include:				
1.	Having high cost incurred by students	1.96	0.89	Low
2.	The need to design electronic curricula that fit with the use of smartphone	4.76	0.52	High
3.	The need to design a special electronic system for managing the teaching-learning process	4.51	0.63	High
4.	The high probabilities of having chaos in classrooms	4.73	0.94	High
5.	The need of math teachers to plan and prepare much for the electronic activities and material	4.68	0.81	High

6.	The absence of good internet connection in some schools	4.97	0.43	High
7.	Having some students with poor skills in using smartphones	2.22	0.35	Low
8.	Having the smartphones causing problems in physical health	2.14	0.72	Low
	Overall	3.74	0.66	High

The severity of the challenges that may hinder the use of smartphones in the math classes high, because the overall mean (3.74) is high. Such challenges include: the need to design electronic curricula that fit with the use of smartphones, because the mean of the second item is 4.76. This result is attributed to the fact that designing electronic curricula requires creating special committees for meeting this goal. This designing process requires adding many electronic activities to electronic curricula. That requires dedicating much time and effort. It was found that such challenges include the need to design a special electronic system for managing the teaching-learning process, because the mean of the third item (4.51) is high. This result is in agreement with the one found by Salaman and Amin (2019). It's attributed to the fact that designing this system is costly and requires assigning a big team of specialists who are specialized in programming. Such a system must be upgraded and maintained in an ongoing manner.

Such challenges include: the high probabilities of having chaos in classroom, because the mean of the fourth item (4.73) is high. This result is in agreement with the one found by Salaman and Amin (2019). It may be attributed to the fact that using smartphones in classroom may make students talk to their colleagues in class through applications and social media. That shall make it difficult for the teacher to manage classroom effectively. It was found that such challenges include: the need of the math teachers to plan and prepare much for the electronic activities and material because the mean of the fifth item (4.68) is high. This result is in agreement with the one found by Salaman and Amin (2019). It may be attributed to the fact that using smartphones in class requires dedicating much effort and time by teacher for designing electronic worksheets and materials for illustrating the lesson (e.g. educational videos and images). Such use requires having the teacher planning for the way of carrying out electronic activities through using smartphone. Such activities include: the brainstorming activities through using smartphones.

Such challenges include: the absence of good internet connection in some schools, because the mean of the sixth item (4.97) is high. This result is in agreement with the one found by Alsaif (2018) and Ghanam and Ale'baikan (2016). It may be attributed to the fact that some schools –especially the ones in remote areas and the countryside- don't have internet connection of high speed or good coverage. That shall hinder the use of smartphones in math classes.

Such use of smartphones isn't costly for students, because the mean of statement one (1.96) is low. This result is not in agreement with the one found by Ale'taiby, and Ale'taiby (2023). That is because the prices of smartphones are reasonable and can be paid by all categories of people. It was found that students master the use of smartphones, because the mean of the seventh statement (2.22) is low. This result is in agreement with the one reached by Alghanam and Ale'baikan (2016) which is attributed to the fact that students use smartphones in a daily manner. Such use shall enable students to master the use of

smartphones. It was found that such use of smartphones shall not cause problems in physical health for students, because the mean of the eighth statement (2.14) is low. This result isn't consistent with the one found by Nikpeyma et al. (2021) and Albayer (2021). That's attributed to the fact that the English period isn't long. Thus, students won't use their smartphones for a long time in math classes.

13. Conclusion

The results indicate that the attitudes of basic school students towards using smartphones in math classes in Jordan are positive. In fact, such use improves students' achievement in the math course, because it enriches their knowledge due to offering them access to electronic libraries, journals and websites specialized in math. Furthermore, it provides students with more math concepts due to offering them access to many search engines and e-dictionaries that offer better understanding for math concepts.

The use of smartphones in math classes raises students' motivation to learn math and improves their attitudes towards math course. That's because the classroom activities carried out through smartphones shall make students motivated to learn math with being enthusiastic. Such activities shall make students perceive the math course as an easy course that can be understood through entertaining activities. The use of smartphones in math classes shall promote creativity among students and develop their problem solving skills, because smartphones allows students to access many math problems and the methods used for solving them creatively. It allows students to get acquainted with the way of using math to solve real life problems in a creative manner.

There are several challenges that may hinder using smartphones in math classes in basic schools in Jordan. Such challenges include: The need to design electronic curricula that fit with the use of smartphone and the need to design a special electronic system for managing the teaching-learning process. They include: the need to provide school schools with good internet connection. Addressing such challenges requires exerting much effort and dedicating much time. It requires forming specialized committees. It requires setting effective plans and making effective decisions.

14. Recommendations:

In the light of the results, the researcher recommends:

- Conducting studies about the effectiveness of using smartphones in Jordan in other courses, such as: physics, chemistry and etc..
- Conducting studies about the effectiveness of using smartphones in Jordanian universities with targeting various majors.

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