THE IMPACT OF MOBILE LEARNING ON DEVELOPING THE SKILLS OF INTEGRATED SCIENCE OPERATIONS AMONG STUDENTS OF THE OPTIMUM INVESTMENT DIPLOMA

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ABSTRACT

This research aims to study the impact of mobile learning on developing the skills of integrated science processes among the students of the optimal investment diploma at Najran University. The current research relied on the experimental approach with quasi-experimental designs by applying it to (60) students in the "Computer Science Curriculum" course, provided by the Department of Curricula and Teaching Methods at the College of Education. The students were randomly distributed into two groups (experimental and control), each of which consisted of (30) students. The mobile application service was used in the Blackboard system by downloading an electronic copy of the course content on this system for the students of the experimental group. A printed copy of the course content was also handed over to the students of the control group at the first meeting. Data was collected through a product evaluation card consisting of five domains, namely procedural definition, variable identification and control, hypothesis formulation, experimentation, and results interpretation. The results showed that the skills of integrative science operations among the participants in the experimental group (which received learning through mobile) were better than the skills of their colleagues in the control group (which received learning through the traditional method). In light of these findings, the study concludes that mobile learning can have interesting benefits for research and development of learners' integrative science processes skills.

Keywords: Mobile learning; science operations skills; integrative science processes skills; optimal investment; Computer science curricula

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INTRODUCTION

Mobile learning is a term that has been widely used in different places all over the world. In Saudi Arabia, for example, the idea of using it in higher education institutions was encouraged because of a combination of factors, including the availability of mobile devices, their ability to motivate students, and the freedom and privacy they provide for the exchange of information. Mobile learning is defined as e-learning using mobile devices or learning based on a mobile device [1, 2]. Mobility technology is the mainstay of mobile learning. Learner and learner mobility is an increasing scene in higher education [3, 4].

Today's educational institutions are faced with the reality of the rapid development and proliferation of mobile devices [5, 6]. The development included an increase in speed, storage capacity, and proliferation resulting from the continuous decline in the prices of these devices [7, 8]. This made it an integral part of the daily life of students (boys and girls). Mobile phones are no longer accessories, but will become our companions like clothes [9, 10]. Mobile phones, although they are mainly used in the communication process [11, 12]. However, some have come to consider it an essential educational activity in institutions of higher education [13]. The number of teachers and learners who use mobile phones as a teaching or learning tool is constantly increasing [9, 14]. Mobile learning has been used by most students to overcome the difficulties of space and time factors through the effective use of their mobile phones [15, 16]. Teachers are starting to think seriously about providing learning content and various activities to students through their mobile phones [17, 18]. Now mobile learning has become widely accepted by the learners. In other words, learning through mobile devices has become widely accepted by a wide range of learners because of its ease of use as well as its philosophy and standards [9, 19]. In order to increase the effectiveness of teaching and learning materials, they should be redesigned, developed and published to suit this new type of learning [7]. The technological development employed today in mobile phones qualifies them to be educational tools in addition to the communication function [20]. In addition to their main purpose, mobile phones are used to send and receive educational messages through text, voice, or even pictures [21]. Moreover, mobile phones and associated

mobile learning facilitate access to online learning resources and help create and develop engaging educational content that can be used inside or outside the classroom [22]. Mobile learning can deliver the right information to the right person at the right time better than any other teaching and learning technology that has been devised to date [23, 24]. Motivating students to use all learning resources available for mobile learning, whether through mobile phones or personal digital assistants (PDAs), to access information at anytime and anywhere also played an important role in the success of the spread of mobile learning [22]. Mobile learning not only enhances access to information, but also helps learners to solve problems innovatively [7, 25].

Most people believe that the main role and function of science is to systematically explore nature [26, 27]. Therefore, the skills of the scientific process can be either procedural that tests and verifies the habits of the learner's mind, or it can take the form of scientific research capabilities [28]. Scientific process skills are those skills that allow students to acquire knowledge and thus understand it [29, 30]. They are those basic abilities needed to use and understand science [31]. Science processes have two main forms; the first figure indicates basic skills related to conducting empirical inductive reasoning. The second figure represents the integrative science processes skills associated with performing hypothetical deductive reasoning [32]. Integrative science processes skills may, by their nature, be more important than Basic skills in a student's cognitive development because of the important role they play in developing their problem-solving abilities [33]. Integrative science processes skills are an important indicator of whether or not there is transfer of knowledge [34]. The use of the science processes skills model allows Diversity in teaching and provides opportunities to organize rich educational environments. It mainly consists of five main aspects: procedural definition, identification and control of variables, formulation of hypotheses, experimentation, and interpretation of data. The skills of integrative science operations are a very common version of constructivism has a greater impact on developing learners' integrated scientific processing skills [35, 36].

Whereas, Jabbour [37] revealed that mobile phones based on 3G technology develop student attitudes when used for educational purposes. In addition, students enjoy a positive learning experience. Mobile phones also had a positive impact on their learning outcomes. The study Naderi, Ayati [38] also concluded the effectiveness of using the mobile learning method in academic achievement and self-regulation learning. Elfeky and Masadeh [39] also emphasized the importance of mobile learning activities in involving students in the learning process more effectively than the traditional method. Liu, Chow [40] revealed that the mobile phone helps in learning English as a second foreign language. Conversely, other studies have found that the use of mobile learning has not always been effective. For example, the study Kuznekoff and Titsworth [41] aimed at measuring the impact of student learning by watching video clips on mobile phones. The study found that the students who studied through the mobile phone remembered and wrote down less information than the students using the traditional method write. In addition, their scores in the achievement test were lower than their peers who did not use their mobile phones. Chu [42] also found that the achievement of students in the control group was better than the achievement of students in the experimental group who received mobile learning. Based on the foregoing, it can be said that mobile or mobile learning devices definitely affect the lives of university students, whether negatively or positively. However, if these devices are used in the right way, they can influence the pattern of interaction between students, teachers and students with each other, and enhance the teaching and learning processes. Thus, several educational, methodological and organizational factors should be taken into account when adopting mobile learning in higher education institutions to achieve effective use.

Therefore, the current study started from the aforementioned advantages of mobile learning, and aimed to determine the impact of mobile learning on developing the skills of integrative science operations among students of the optimal investment diploma. The study seeks to answer the following main research question: What is the impact of mobile learning on developing the skills of integrated science operations among students of the Optimum Investment Diploma?

STUDY PROCEDURES

Experimental Processing Material

In order to present the course content through the mobile-based educational website, the teaching content of the "Computer Science Curriculum" course has been prepared. It was divided into separate lectures using PowerPoint presentations and uploaded to the Blackboard system provided by Najran University. The course consists of (10) lectures that can be accessed by clicking on the "Content" link at the top right of the main screen. In addition to the 'Content' link, there are other links for discussions, groups, and announcements, and a set of tools has been added to encourage interaction between participants, lecturers, and participants on the other hand.

Experimental Design of the Study

The current study relied on the experimental approach with quasi-experimental designs to study the impact of mobile learning in developing the skills of integrative science operations among the students of the Optimum Investment Diploma. This required the use of a pre-posttest group design using two homogenous groups. This design also shows how to implement the statistical aspects, in addition to showing how to determine the relationship

between independent and dependent variables and to neutralize extraneous variables [43]. The following table shows the research design:

Table 1: Research Design

	Pre-test	**Treatment**	**Post-test**
Experimental Group	O_1	X_1	O_2
Traditional Group	O_1	X_2	O_2

Note. O1 = Integrative science operations skills of pretest

O2 = Integrative science operations skills of posttest

X1= Mobile learning Treatment

X2= Traditional Treatment

The Study Sample

The study sample in the final experiment consisted of (60) participants from the optimal investment diploma students, by dividing them into two groups (experimental and control) randomly according to the experimental design of the research, the strength of each group (30) participants. Then teaching the content of the "Computer Science Curriculum" course within (10) weeks. The experimental study is done through the mobile phone and the control study is done in the traditional way. The mobile application service in the Blackboard system (provided by Najran University for its employees) was also used in the design and production of an educational mobile site to present the content of this course.

Study Tool

In order to answer the study's main question, a product evaluation card was used, in order to collect data through a number of operations. 1- Each participant is required to submit a research plan at the end of the first week of study for pre-evaluation by an independent faculty member. 2- Each participant is required to submit another research plan at the end of the tenth week, for the final evaluation using the product evaluation card with five developed areas, where each area represents one main skill for the skills of integrated science operations. There were five sub-skills in the first and second domains while there were six sub-skills in the third and fourth domains. In the last realm, there were only four sub-skills. Each sub-skill is measured on a five-point scale ranging from one = strongly disagree to five = strongly agree was used, according to the Likert scale. Cronbach Alpha has an internal reliability scorecard of 0.86. In addition, another independent faculty member was asked to analyze a random sample of about 10% of all research plans to ensure the reliability of the results and to check for mutual reliability which was 91%. Then, three independent faculty members were asked to evaluate the final research plans of all participants, thus each research proposal was evaluated three times and awarded three marks. The average score of the three assessors was extracted for each participant. The differences between the average scores of the participants in the pre- and post-application of the product evaluation card were considered to calculate the adjusted earning percentage for all participants.

Pre-Application of the Study Tool

What is meant here is to apply the product evaluation card tool beforehand on the main sample of the study (the experimental group that is taught through mobile learning, and the control group that is taught in the traditional way). In order to ensure the homogeneity of the two groups in the skills of integrative science operations before applying the experiment. As previously mentioned, each participant is required to submit a research plan at the end of the first week of study for pre-evaluation by an independent faculty member. To ensure the homogeneity of the participants in the two groups, the results of the pre-measurement were analyzed for them, and the One Way Analysis of Variance (ANOVA) method was used to identify the significance of the differences between the mean scores of the two groups in the pre-measurement, as follows:

Table 2: Significance of differences between the experimental and traditional groups in the Integrative science operations skills Pre-Test

	Sum of Squares	DF	Mean of Square	F. ratio	Sig.
Between Groups	0.631	1	0.631	0.426	0.194
Within Groups	135.279	58	2.982		
Total	135.91	59			

It is clear from the previous table that the results of the statistical treatment indicate that the percentile reached a value of (0.426), which is not significant at the level of (0.05). This means that there are no statistically significant differences between the two groups in the pre-measurement. This indicates a homogeneity of the participants' levels of integrative science processes skills before exposure to the experimental treatment.

RESULTS

To answer the study's main question, "What is the impact of mobile learning on developing the skills of integrated science operations among students of the Optimum Investment Diploma?" This is done by extracting the arithmetic mean scores for the post application of the product evaluation card for the two study groups (experimental and control). This is to try to find out if there are statistically significant differences between the two groups in the skills of integrative science operations due to the use of mobile learning. Table (3) shows the results of the T. test to compare the average scores of the integrated science processes skills of the two study groups.

Table 3: The difference between the mean scores of the skills of the integrated science processes for the two study groups (experimental and control)

Group	N	M	SD	Mean Difference	T. Ratio	Sig.
Experimental Group	30	81.25	6.473	14.31	8.264	0.009
Traditional Group	30	66.94	5.862			

From the previous table, it is clear that the value of "t" for the difference between the average scores of the skills of the integrated science processes for the two study groups (experimental and control) amounted to (8.264). The average score of the participants in the experimental group was (81.25). While the average score of the participants in the control group was (66.94). Thus, we find that the value of "t" is statistically significant. In such cases, the statistical significance is directed in favor of the group with the highest average, which is the experimental group, as its arithmetic mean was (81.25), an increase of (14.31) from the control group. This indicates that there is a statistically significant difference at the level (0.05) between the mean scores of the participants in the experimental group (studying via mobile phone) and the participants in the control group (studying in the traditional way) in the skills of integrative science operations in favor of the participants in the experimental group. Thus, the study reached an answer to the main study question.

DISCUSSION

The analysis of the collected data revealed that mobile learning had a greater impact than traditional learning in developing the skills of integrative science operations among the participants enrolled in the "Computer Science Curriculum" course. These differences can be attributed to a number of advantages enjoyed by mobile devices. Mobility provided by Mobile learning, which allows access to interactions and discussions at any time and at any time, helps participants make use of their lost time in a useful activity. In addition, the participant's role became positive through active interaction with the course through mobile devices, meaning that mobile learning contributed to supporting the interactive features of the teaching and learning environment. The private privacy recipe provided by mobile learning, which supported the privacy of the participant in his learning, as he could access the content of the course through his mobile phone whenever he wants independently of the other participants, which helped to take into account the individual differences between the participants. In addition, since mobile learning is characterized by contextual and spontaneous, which makes the educational process centered on the learner-centered and is consistent with the constructivist philosophy of teaching and learning, which helped the participants to voluntarily access the course content and interact around it. The use of mobile devices gave the participants the opportunity to access a large amount of information available on the Internet and benefit from it for learning purposes and completing assignments.

The results of this study agree with the results of da Silva Melo and Carvalho [44] study regarding the quality of students' achievement and metacognitive awareness as a result of mobile learning. The results of the Jabbour [37] study confirm the development of positive attitudes among students and their enjoyment of a positive learning experience. The results of this study also agree with the study of Naderi, Ayati [38] regarding the effectiveness of using the mobile learning method in academic achievement and self-regulatory learning, which indicates that the content and method used for teaching are effective. It should be noted that the results of this study do not agree with the results of a number of other studies that dealt with mobile learning, such as; Kuznekoff and Titsworth [41], Chu [42], which found that mobile learning was not an effective learning style. However, this disagreement does not negate or confirm the effectiveness of mobile learning in improving the skills of integrative science processes, as each study has its own circumstances related to learners, teachers, and assessment methods.

RECOMMENDATIONS

- Training the teaching staff on the skills of using mobile learning in the educational process.
- Using various other technical products to develop integrated science processes.
- Interest in developing the skills of integrated science operations in other educational levels and different courses.

SUGGESTED RESEARCH

- Carrying out similar research and studies in another educational stage, to confirm the success of using mobile learning in other environments.
- Using virtual reality to conduct more research to develop the skills of integrative science operations.
- Conducting studies to develop the skills of integrated science operations using the project method.

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