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The Impact of Using a Computer Assisted Instructional Package (CAIP) on the Acquisition of Mathematical Concepts and Developing the Skills of Scientific Thinking among the Tenth Grade Students at Irbid 1st Directorate of Education

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Abstract

The aim of this study is to identify the impact of the use of a computer assisted instructional package in the acquisition of mathematical concepts and develop the skills of scientific thinking among the tenth grade students in Irbid 1st directorate of education.

The members of the study were selected from the tenth grade students Ruqaya bint Al-rasoul school, and they studied mathematics. They were divided into two groups:

The number of study members was (114) students, which were taught using the computer assisted instructional package, the experimental group and the number of its members was (58) students who were taught using the traditional teaching method. And the control group and the number of its members (56) students. The study showed statistically significant differences at the mean level (α =0. 05) between the mean scores of the experimental group members and the mean scores of the control group members when the study was conducted by:

- Test of scientific concepts (mathematical).

- Test of the skills of scientific thinking.

Keywords: Computer Assisted Instructional Package (CAIP), Mathematical Concepts, Skills of Scientific Thinking

Introduction

Recent years have witnessed a remarkable development in the field of teaching in general, and in university teaching in particular, since interest in information is no longer the only goal, rather, interest increased significantly, by encouraging the student to do more activity and interaction, and providing an opportunity for him to learn through self-teaching and group teaching methods. As a result of the changes and developments in science and its applications, it is necessary to search for methods and strategies that interest students, and create opportunities for them to interact positively with the educational situations that meet them, thereby contributing to making learning of value and benefit. (Abdel Fattah, 2010).

In keeping with these developments and changes, self-group and educational teaching strategies have been developed to confront the abundant knowledge, the massive population increase, and technological development, learning in educational bags came in response to some educational trends that call for the singularity of education and self-learning, based on the differences among learners in the capabilities, characteristics, inclinations and speed of learning, and giving the student the freedom to learn according to his speed and capabilities, and the time he chooses to learn, so that he does not have to keep up with others. The educational bag represents an educational program designed to teach a knowledge unit by providing multiple resources, or alternatives to education, the learner can choose what is appropriate from it, and use it in multiple ways to achieve specific goals, so education in it provides an element of excitement. Also, education through it depends on the method of self-direction, as the bag contains instructions and instructions that direct the student towards the goals that he is intended to achieve (Attia, 2009).

Educational Package concept

The educational bag is centered around the effectiveness of the individual, and is designed according to his capabilities and preparations, and what is presented in the bag of educational tasks are in the form of graded levels that correspond to the individual differences between their users (Al-Hila, 2008, p. 221), as it is a well-organized program that proposes a set of educational activities and alternatives that It helps to achieve specific educational goals (Obaid, 2011, p. 283).

It is a form of individual learning that helps the learner to self-learn and the teacher prepares it in order to help the learner to master learning educational content according to his abilities, preparations and desires. The degree of achievement and mastery of the learning subject is also related to the speed of the learner who chooses the appropriate tools and various sources of learning (audio-visual-written) taking advantage of the bag guide, which the learner perceives how it is used (Tawalbeh et al, 2010, p. 231).

Educational Package labels

The term educational bag has been associated with several terms used in educational institutions and this multiplication is due to the multiplicity of English language terms that are used in talking about educational bags. Some circles use the term (educational bag) and the other (training bag) and some use (training package) and (educational complex) it also called (educational kit)

Despite these differences in terms, they only express one concept (the educational bag), and this difference is due to the difference in the translation of terms from the English language (Al-Khatib, 1997, p. 806).

The Problem of the Study

The researcher, through her communication with female teachers in the field of basic teaching, found poor academic achievement for students in the mathematics course, and this may be attributed to using the traditional method (blackboard) in teaching the course, and the researcher saw the possibility of using the educational bag, which may help in facilitating the student's comprehension of the mathematics course.

Questions of the Study

1. What is the effect of using a computerized educational bag on the academic understanding of tenth grade students in Jordan?
2. What is the effect of using a computerized educational portfolio on developing scientific thinking skills among tenth grade students in Jordan?

Significance of the Study

The importance of this study comes from the importance of the role played by educational means, including the educational bag, in increasing students' comprehension and understanding of the curricula,

Definition of Terms

Computerized Educational Package: A knowledge container containing several learning resources, designed in the form of an integrated multi-modal program, used in teaching a unit from the tenth grade mathematics book.

Procedural definition: It is the bag that was designed by the researcher with the help of specialists and contains texts and concepts related to the subject matter of the book of mathematics to be taught for the tenth grade and its content is displayed through the computer screen.

Mathematics achievement: It is the score that the tenth grade students obtain in the mathematical concepts achievement test, which includes mathematical concepts.

Procedural definition: It is the mathematical information and concepts obtained by the members of the research sample as measured by the total score that students obtain by answering the achievement test paragraphs that will be prepared for this purpose.

Scientific thinking skills: It is the set of mental processes that individuals perform when they face a problem in order to collect, preserve and recall information, through analysis, planning and evaluation procedures, and to reach conclusions and make decisions (Al-Zoubi, 2004).

The traditional method of teaching: It is the method by which a unit of the tenth-grade math book is taught, and is limited to the use of the lecture method inside the classroom.

Previous Studies

Abbas (2013) conducted a study aimed to know the effect of using the educational bag (instructional package) on the achievement of fifth grade primary students in science. The study sample consisted of (98) students from the fifth grade primary in Diyala Governorate, where two divisions were chosen from the fifth primary grade one Control and experimental second.

The study concluded the following:

- The effectiveness of using the educational bag in teaching general science and raising the level of academic achievement for fifth-grade primary students compared to the usual method that aims to preserve and teach information.
- The attitudes of female students towards the general science subject were positive.

A study by Al-Tayyeb (2013) aimed to design an educational environmental package to learn the ability of Kindergarten children to interact effectively while learning experiences, as well as investigating of the effectiveness of the educational bag in developing both the cognitive achievement and the ability of visual taste among children of the second level. The research sample was divided into two groups, one is experimental and the other is control, the study showed that there were statistically significant differences at (0.05) level in favor of the experimental group.

Khalil and Al-Maqtari (2011), this study aimed to know the effectiveness of using an educational bag to overcome the difficulties faced by students of the Faculty of Education at Taiz University in the skill of formulating behavioral goals, an educational bag was prepared in the skill of formulating behavioral goals as a therapeutic program to overcome these difficulties, the sample of the study consisted of students of the departments of geography and mathematics (the fourth level) as an experimental group, and the Arabic and Islamic Studies departments as a control group.

The study concluded the following results:

The effectiveness of using the educational bag, to overcome the difficulties faced by students of the College of Education in the skill of formulating behavioral goals.

Fath Al-Rahman (2009) study aimed to identify the impact of the use of modern educational techniques on the academic achievement of students, and the extent of design, construction and implementation of an educational bag for the vocabulary of electronics course in solving problems of engineering and technical side. The sample of the study was (48) students, distributed into two groups: one is experimental and the other is control. The most important results have emerged: There are statistically significant differences in academic achievement in the electronics course, where the experimental group outperformed the control group.

The study (Al-Batrikhi) (2009) aimed to know the effect of the use of educational bags in developing the skills of Arabic calligraphy among students of the ninth grade class in North Gaza Governorate, the sample of the study consisted of (60) students from the ninth grade, who were chosen intentionally, they were divided into two groups: one of them was control and consisted of (30) female students who learned in the traditional way, and the other was an experimental woman, which reached (30) female students who learned by the educational bags method, an achievement test was applied to them after completing the experiment, and results emerged, the most important of which are: There were no statistically significant differences at the level (0.05) between the average grades of female students in the control and experimental groups in the skills of Arabic calligraphy (transcription and patch) attributed to the use of educational bags in post application.

Methodology

Study population

The study population consisted of students of all tenth grade students at Irbid 1st Directorate of education in the city of Irbid in Jordan, who were distributed among six sections and numbered 290 students, during the first semester of the academic year 2014/2015.

The study sample

Two of the six sections were selected in a simple, random manner. So one was chosen to be an experimental group of (58) students, and the other is a control group of (56) students, thus, the number of members of the study sample (114) students.

Educational Material

To implement the study, the educational material was prepared by following these steps:

- Analysis of the content of the second chapter of the mathematics textbook for the tenth grade.
- Determine the mathematical concepts contained in the second chapter of the mathematics textbook for tenth grade, where 11 concepts were identified.
- Review the educational literature related to the design of computer assisted instructional package.
- The design of the educational bag containing the required educational material. Each lesson includes the following elements:
    1. PowerPoint slides contain lesson title, learning objectives and lesson concepts.
    2. Flash movie (video) in which the lesson is presented.
    3. Links to lesson-related websites, including experiences, photos and videos that enrich the lesson content.
    4. Flash movie (video) presents a set of questions and exercises on the lesson.
    5. A video showing scientific thinking skills relevant to study.
    6. Structural evaluation designed in a programmed learning manner.

After completing the design of the educational bag, presented to the arbitrators, a group of faculty members at Al-alBayt University, and a group of mathematics teachers, and asked them to take notes on the way the bag was prepared and its contents, and their suitability for field application. Based on the comments received from the arbitrators, the necessary modifications were made, and show the bag in its final form.

Study tools

Testing mathematical concepts

In light of the concepts identified when preparing the course material, mathematical Concept Achievement Test was constructed, consisting of (15) items of multiple choice type, covering the required concepts, in preparing the paragraphs, it was necessary to include no hints for the correct choice and to be free from ambiguity. One score is assigned to the correct answer, and a zero to the wrong answer. Thus, the total score for the test is (15).

To verify the validity of the test, it was presented to a group of arbitrators from the faculty members of the Faculty of Education at Al-alBayt University, and a group of mathematics teachers, they were asked to comment on the following points: the accuracy of the scientific wording of the test vocabulary, the extent to which the test paragraphs matched its objectives; and suitable test questions. For students in tenth grade, and make the necessary suggestions regarding the time of the test. In the light of the opinions of the arbitrators, some adjustments were made to the test, adjusted to its final form.

To calculate the reliability of the test, it was applied to a sample of (25) students from the tenth grade who are not members of the study. Studying mathematics at Ruqayya Bint Al Rasoul School, after monitoring the students' answers to the test items, the reliability of the test was calculated using the Koder-Richardson equation (20-KR). Where the coefficient of stability (0.8) where it is acceptable for the study purposes (1976, Brown).

Scientific Thinking Skills Test

The Scientific Thinking Skills test was prepared by following these steps:

- Analysis of the educational activities contained in the second chapter of the mathematics textbook for the tenth grade, they show that they focus on four thinking skills: observation, model building, measurement and data analysis.
- Prepare the test in its initial form, including 16 paragraphs, each paragraph. It has been taken into account in the test paragraphs that cover the four scientific thinking skills, and it does not require in-depth or specialized prior knowledge.
- The scale was presented to a group of arbitrators from education professors, curriculum experts and mathematics teachers. Through the observations of the arbitrators, one paragraph was deleted, because it was agreed that it could not measure one of the relevant thinking skills, thus, the number of paragraphs of the scale (15). An amendment was also made to the alternatives of some paragraphs.
- The application of the test to a sample of (28) students from the tenth grade who are not members of the study, studying mathematics at Ruqayya Bint Al Rasoul School, when calculating the reliability coefficient of the paragraphs using internal consistency using the Koder-Richardson equation (-20KR), it was (0.79), which is an acceptable value for the application of the test in the study.

Study Procedures

1. Organizing several meetings between the researchers and the director of Ruqayya Bint Al Rasoul School and the mathematics teacher there. To inform them of the study procedures and objectives, as of the beginning of the first semester of the academic year 2014/2015
2. Selection of study groups and verification of their equivalence are as follows:

Obtain the grades of students in the 9th grade (preceding the 10th grade) from the school administration, the data are then processed using SPSS, by calculating both the mean and the standard deviation of these two sets, the differences between the mean scores of the two groups were tested using single-contrast analysis (ANOVA). Table (1) shows the mean and standard deviation of the scores of the members of the two study groups. And table 2 shows the results of the analysis of unilateral variation of these signs.

Table (1): Arithmetic mean and standard deviation of the scores of the two groups in the third grade

Group	Number	SMA	Standard deviation
Control	28	86.68	7.71
Experimental	29	89.45	6.67

Table (2): results of the analysis of the uneven variation of the comparison between the arithmetic mean for the scores of the students of the two study groups in the 10th grade

Contrast Source	Total squares	df	Average squares	F value
Between groups	109.28	1	109.28	
Within the group	2851.28	55	51.84	2.11
Total Contrast	2960.56	56		

Comparing the calculated F value as in Table 2 to the critical tabular F value at a degree of freedom of 1 - 55, which is (4.02), and there are no statistically significant differences between the mean scores of the experimental and control groups, which indicates the equivalence of the two groups.

3. Organizing a first meeting with the students of the two study groups and informing them of the content and objectives of the study, and motivating them by researchers and teachers to cooperate.
4. Hold a second meeting with the students of the experimental group to brief them on the components of the educational bag and how to use it, the duration of learning was determined and at the end of the meeting the students were distributed bags.
5. Monitoring students' learning in both study groups either directly or through the subject teacher throughout the experiment.

6. Conduct a study test after the completion of the experiment.

Study variables: This study includes the following variables:

Independent variable: The teaching method followed and has two levels:

- Teaching method using the educational bag.
- Normal teaching method.

Two dependent variables: It is as follows:

- Achieving scientific concepts.
- Scientific thinking skills.

Experience Design

The quasi-experimental design of the study is as follows:

Experimental group O2 X O1 O1: G1.

Control group O2 O1.... O1: G2.

O1 test of scientific thinking skills.

O2 Achievement test of scientific concepts, X processing using educational pouch.

Presentation and discussion of the results of the study

Results related to the first question: "What is the effect of using a computerized educational bag on the achievement of scientific concepts among 10th grade students in Jordan?

To answer this question, the arithmetic mean and standard deviation of the scores of the experimental and control groups were calculated in the test of the achievement of physical concepts, the results are as shown in Table (3).

Table (3): Arithmetic mean and standard deviation of the scores of students of both study groups on the test of achievement of physical concepts

Group	Number	SMA	Standard deviation
Control	28	7.68	3.18
Experimental	29	9.90	3.20

Table 3 shows that the mean of the experimental group student scores (9.90) and the mean of the control group student scores (7.68), this means that there is a difference between the two averages of (2.22) in favor of the experimental group. To test the significance of the difference (the first zero hypothesis test) at the level ($\alpha \leq 0.05$) one-way ANOVA analysis was applied, the results are shown in Table 4.

Table (4): Results of one-way analysis of variance to compare the two arithmetic averages for scores of students of both study groups on the achievement test of mathematics concepts

Contrast Source	Sum of squares	df	Mean of squares	F value
Between groups	70.08	1	70.08	
Within the group	558.80	55	10.16	6.90
Total Contrast	628.88	56		

Table 4 shows that the value of (F) (resulting from mono-variance analysis) is (6.90), which is statistically significant at a level ($\alpha \leq 0.05$), this means that there is a statistically significant difference between the mean of the scores of the experimental group members and the average of the scores of the control group to test the attainment of physical concepts for the benefit of experimental group members. This means rejecting the first

zero hypothesis, which states that "there is no statistically significant difference (α=0.05), between the average scores of the experimental group students studying using the educational bag, and the scores of the control group students who use the usual method to test the achievement of scientific concepts.

Previous results indicate the effectiveness of using a computerized learning kit, it gives the student the opportunity to gain experience directly by viewing relevant photos and videos, interact with exercises and questions with immediate feedback, without the need for a school laboratory, which is not available in many schools in the Arab world. Thus, the learner is able to grasp the different scientific concepts, and to provide a clear and specific meaning of the concept and link it to the scientific phenomenon, and this concordance with the findings of each study (Abbas, 2013) and the study of (Al-Tayyeb, 2013) and the study of (Khalil and Al-Maqtari, 2011) that the use of a computerized educational bag improves the performance of learners.

Their ability to provide diverse areas of expertise such as sensory, abstract experiences, and practical practices allow the learner to use more than one sense of learning, leading to the integration of experience. Providing more than one educational tool in order to use the most appropriate means to achieve each of the educational objectives of the subject of the bag, this leads to achieving as much sensory perception as possible for each learner, and a deeper understanding of the concept (Mazen, 2009).

Results related to the second question: "What is the effect of using a computerized educational package on the development of scientific thinking skills among tenth grade students in Jordan"?

To answer this question, the arithmetic mean and standard deviation of the scores of the experimental and control students were calculated to test the scientific thinking skills of each of the four skills, the results were as shown in Table (5).

Table (5): Arithmetic mean and standard deviation of the scores of students of both study groups on the test of scientific thinking skills for each skill

Scientific thinking skills	Group	SMA	Standard deviation
Observation	Experimental	3.48	0.91
	Control	2.25	0.80
Build the model	Experimental	1.66	1.17
	Control	0.82	0.55
Measurement	Experimental	1.59	0.73
	Control	1.54	0.84
data analysis	Experimental	3.00	0.89
	Control	2.07	0.94

Table 5 shows that the arithmetic mean of the experimental group students' scores is greater than the arithmetic mean of the control group students in the scientific thinking skills test, where the amount of increase in the arithmetic mean on skills (Observation, model building, measurement, data analysis) are worth (0.93,0.84,0.05,1.23) respectively, this refers to the overall effectiveness of the computerized educational portfolio in the development of scientific thinking skills, as shown in Figure (1) as well.

The mean and standard deviation of the scores of the experimental and control groups in the test of scientific thinking skills were calculated on the skills as a whole, and the results are arranged in Table (6).

Table (6): Arithmetic mean and standard deviation of the scores of students of the two study groups on the scale of pre and post thinking skills

	Experimental group	Control group
Arithmetic mean	9.76	7.14
standard deviation	1.53	2.57

The results in Table (6) show that the arithmetic mean of the experimental group student scores (9.76) and the arithmetic mean of the control group student scores (7.14), this means that there is a difference between the two

averages of 2.62 in favor of the experimental group. And to test the significance of the difference (second hypothesis test) at (α=0.05) One one-way ANOVA analysis was applied; the results are shown in Table 7.

Table (7): The results of the analysis of uneven variation to compare the arithmetic mean of the scores of students of the two study groups on testing scientific thinking skills

Contrast Source	Sum of squares	df	Mean of squares	Calculated F value
Between groups	97.47	1	97.47	
Within groups	248.7	55	4.52	21.55
Total	346.21	56		

Table (7) shows that the value of (F) resulting from the analysis of single variance (21.55), which is statistically significant at (α≤0.05). This means that there is a statistically significant difference between the mean of the scores of the experimental group members and the average scores of the control group on the test of scientific thinking skills for the benefit of the experimental group. This means rejecting the second null hypothesis which states that "There is no statistically significant difference at (α = 0.05) between the mean scores of the experimental group students studying using the educational package, and the marks of students of the control group who use the traditional method to test the skills of scientific thinking.

It is clear from this result that the use of computerized educational package in the development of scientific thinking skills, where it allows the learners to choose freely from the various activities contained in the bag to suit their thinking and they interact with these activities as if they were in a real lab, through pictures, video clips and simulations.

It also helps in the development of scientific thinking skills, where concepts are the basic units that help to think, being aware allows students to categorize ideas and things, access rules and fundamentals and help them understand and interpret many of the things that interest them in the environment.

References

Abbas, W. (2013). The effect of using the educational bag on the achievement of fifth primary school students in general science, *Humanities Journal*, 1 (15) University of Babylon, Iraq.

Abdel Fattah, A. (2010). "Collaborative Learning and Social Skills", United Arab Emirates, Al-Ain, University Book House.

Al-Batrikhi, I. (1119). "The effect of using educational bags in developing the skills of Arabic calligraphy among ninth grade students in northern Gaza", unpublished master's thesis, College of Education, Islamic University, Palestine.

Al-Hila, M. (2008), Designing Education Theory and Practice, 4th floor, Al-Maysarah Publishing House, Amman.

Al-Khatib et al. (1997) training bags, Dar Al-Mostakbal for Publishing and Distribution, Amman

Al-Tayyeb, Z. (2013) "The effectiveness of using an educational environmental portfolio in developing knowledge and visual appreciation, a case study of children in the Faculty of Education, University of Khartoum".

Attia, M. (2009). "Modern curricula and teaching methods", Amman, Dar Al-Manhajj

Fath Al-Rahman, A. (2009), "The Impact of Using an Educational Bag on Academic Achievement in Electronics Course for Technical Port Sudan Students", The British Arab Academy for Higher Education

Khalil, M., and Al-Maqtari, A. (2011) The effectiveness of using an educational bag to overcome the difficulties faced by students of the Faculty of Education - Taiz University - in the skill of formulating behavioral goals. College of Education, Taiz University, Yemen

Mazen, Hossam Hammad. (2009) Learning Resource Technology. Amman: Al-Fajr House for Publishing and Distribution.

Obaid, M. (2011) Educational Means and their Production for Regular and Special Needs, Safa Publishing House, Amman

Tawalbeh et al. (2010). Teaching Methods, Al-Maysara Publishing, Distribution and Printing House, Amman