

The Effectiveness of Using Educational Programming for Teaching the Students of Class Teachers Some Scientific Concepts in Chemistry and Physics at University of Jordan

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Abstract

This study aimed at investigating the effectiveness in using the Educational Programming for teaching the students of Class Teachers some Scientific concepts in Chemistry and Physics at University of Jordan. The study sample consisted of (57) female students who were distributed randomly into two groups; one is experimental and the other is Controlling. The experimental group was taught on using the educational program while the controlling group was taught on using the normal method. In order to achieve the study goals, a readymade relevant educational program was used. It included scientific concepts in the curricula of the classroom teacher specialization. Moreover, a test for cognitive achievement was developed. After collecting and analyzing data, the study realized some statistical differences in the experimental group in the cognitive achievement test.

Key words: Educational Programming, Scientific concepts, cognitive achievement, and students of Class Teachers.

Introduction

The last decade of the twentieth century and the first few years of the twenty first century has witnessed a tremendous advancement in technology in general and in telecommunication and IT in particular. This advancement is still growing rapidly and producing many knowledge building mechanisms as well as more recent technological means. Thus, the world has developed very fast, where as all the strategies and tools have increased in order to improve the students' participation in the educational activities within variant educational environments (Hutinger et al, 1996).

Where as, the rapid development in telecommunication and IT and their applications has provided new opportunities and a new trend towards "information highway" as well as economic, social and educational effects related to it. Thus rapid change can also lead to great changes in aspects of control, creativity, cooperation, participation and knowledge it can also lead to wider participation and application on international, regional and national levels at international organizations and institutions (Mohammad and others, 2004).

In order to benefit from technological advancements in education, UNESCO held a conference in 1996 entitled "the new technological and educational policies". Which discussed many topics such as learners' new roles and options to learn inside and outside the institutions in addition to the current applications of the new technologies and training during or before service in addition to the teachers' new roles.

It is noticed that technology has provided the education with several recent methods, communication systems, information transference, video and visual systems, and multi media systems by which avails great opportunity for teachers and students to achieve a tangible professional advancement in the educational field.

Within these huge and accelerating developments in technological matrix, it is worth identifying its role with the selected people to teach the elementary classes (first, second and third classes). Thus, to what extent this accelerated technology can respond to the needs of these people in the educational process?

Technology succeeded in opening the door for this category who would become as producers for technology generations in the coming days. If you used these tools correctly and provided their services, then these individuals will be developed in presenting knowledge and their self- confidence will be enhanced (Skylar, 2006). Computer is considered one of the most prominent current technological revolution achievements.

This technology was invested in different ways; it was used in developing many of educational and scientific aspects as well as in facilitating many of their tasks especially in educational curricula and units. This harmonizes with changes that were witnessed by the scientific community due to the era of technology and communication revolution. Which requires development in educational institutions' programs in order to keep up with these changes. Therefore, many have requested reconsidering the educational process content, goals, and methods to avail students in benefiting from the technical means and tools in scholastic achievement as well as to acquire knowledge, concepts, and tasks that correspond to this age we live in (Roddy, 2004).

Study problem

Education is affected by the astounding acceleration in communication and information technology, which requires reconsidering scientific concepts teaching methods at universities and schools.

Development in both the technological and educational fields led to the increase of interest in presenting the programs that suit students' capabilities through using supportive technology in their learning. This technology is represented by the computerized educational programs whereas scientific concepts especially the abstract science need tangible figures to help the students in representing the concepts. Therefore, they can form conceptual knowledge to help them understand these concepts, form cognitive structure for application, and benefit from them in solving daily problems. Accordingly, this study was an attempt to go along with recent trends in teaching sciences that make students' learning meaningful.

The study problem lies in the attempt of revealing the affects of using educational programs to teach some scientific concepts in Chemistry and Physics regarding cognitive achievement as well as teaching abstract concepts for classroom teacher students.

Study question

1. Is there any effectiveness in the methods of teaching by using computerized educational program on cognitive achievement of classroom teacher students?

Importance of the study

The importance of this study is derived from the following:

- Using a program that facilitates the learning process as soon as possible for classroom teacher students. This process is represented by using supportive technological tools.
- Helping classroom teacher students in using the educational programs that depend on supportive technological tools and treating conceptual errors in less time and effort.

Previous studies

There are many local, Arabic, and global studies in this field. The following is a presentation of some of these relevant studies.

The study of unal, okur & kapucu (2010) titled "the effect of animation technique on the learning of properties of electromagnetic waves for pre-service science teachers". This study has been carried out with experimental and control groups consisted of 70 students in total. 34 students were randomly assigned to experimental group and control group respectively. Significant difference has been found between the experimental group and control group ($\alpha < 0.05$).

Furthermore, Bozkurta and Ilika (2010) performed a study entitled "The effect of computer simulations over students' beliefs on physics and physics success". The purpose of this study is to measure the impact of teaching which is carried out with interactive computer simulations on students' beliefs about physics and achievement of physics. The result was seen that the courses with interactive simulations have a positive effect on students' beliefs about physics and physics achievement.

The study of Al- Bashayrah & Al- Futainat (2009) titled "The Effect of Using a Computerized Educational Program in Performing Chemical Experiments on the Scholastic Achievement of Nine Graders in Chemistry and Geology". This study aimed at investigating a computerized educational program in performing chemical experiments compared to traditional program.

The study sample consisted of 116 students; the results showed statistical differences in students' scholastic achievements due to the method of teaching ($\alpha=0.05$) (using computers in performing chemical experiments). It was in favor of the experimental group.

Al- Mutairy (2009) performed a study entitled "the Effectiveness of Using an Educational Program on 12th Graders in Mathematics". The study sample consisted of 60 students divided into two equal groups in terms of number, age, and scholastic achievement. The researcher realized that there are statistical differences between students' achievement (controlling and experimental groups) on the post achievement test. The result was in the favor of experimental group and this was due to the experimental treatment (teaching by using educational programming).

Furthermore, Al- Huzaify (2008) performed a study entitled "the Effect of Using E- Learning on the Level of Scholastic Achievement, Mental Abilities, and Tendency towards science of medium stage students". The researcher used the semi- experimental method and found statistical difference between the average of experimental and controlling students' marks regarding the post application of the achievement test. This means that using e-learning is far more effective in enhancing the achievement level than the traditional method.

The study of (2005) entitled "the Effect of Science, Technology, Society and Environment curve (STSE) on Eighth Graders' Science culture and trends towards learning them" aimed at investigating the effect of STSE curve on Eighth graders' scientific culture and trends towards learning science in Jordan. The researcher found out statistical differences at the significant level ($\alpha= 0.05$) of marks means of applying scientific knowledge in making daily decisions as well as understanding science nature by eighth graders who learned according to STSE (experimental group) and students who learned according to the traditional method (controlling group). The results were in the favor of the experimental group.

Method and procedures

Research methodology: the researcher used the semi experimental methodology for being appropriate for this study.

Study sample

The study was performed on students who are registered in scientific concepts and methods of teaching material at the University of Jordan for the second semester 2010/2011. They amounted to 57 female students whereas study sample randomly consisted of controlling and experimental groups; 27 female students in experimental group and 30 female students in controlling group.

Study tools

First: the computerized educational program

- In order to achieve the goals of this study, a computerized educational program to teach some chemical and physical concepts and methods of teaching them in the course of scientific concepts for classroom teacher specialization and computerized educational program (Falcon, Version, 2012). It is a program designed to teach such concepts through a presentation of experiments using the Data Show and includes a number of questions at the end of each experiment regarding concepts to be taught. After that, the students can get the right concepts through new relevant experiments by the program.
- This program was presented to a number of arbitrators to ensure its appropriateness in teaching the investigated concepts. It was accredited without any modification according to the arbitrators' comments. This educational program sought to make the students acquire cognitive information and skills related to the use of laboratory tools relevant to the teaching of assigned scientific concepts. It also sought the identification of the new science and classroom teachers' roles during the program application. The computerized program was applied on the experimental group while the controlling group was taught using the traditional method for 4 weeks.

Second: cognitive achievement test

A test was prepared to measure the achievement of classroom teacher students in the assigned educational material.

For the sake of ensuring the test validity, it was presented to a group of arbitrators and experts in science teaching methods and curricula. After viewing their opinions, the necessary modifications were made. Afterwards, a surveying experiment of cognitive test was performed on a group of classroom teacher students to identify the test period as well as its statistical analysis in order to calculate difficulty, significance, and reliability coefficients.

Psychometric characteristics of cognitive achievement test paragraphs

In order to verify psychometric characteristics of the test paragraphs, it was applied on a surveying sample consisted of fourteen students and then difficulty and significance coefficients were calculated in the test's prototype which consisted of 50 paragraphs. Paragraphs in which difficulty coefficient amounted to 0.20-0.8 and significance coefficient to more than 0.20 were kept. 26 paragraphs achieved this criterion forming the final edition of the test used in this study; the significance coefficient means amounted to 0.41 while that of the difficulty coefficient amounted to 0.61. The following table shows difficulty and significance coefficients of the test paragraphs.

Table (1) difficulty and significance coefficients of the test paragraphs

Paragraph no.	Significance coefficient	Difficulty coefficient	Paragraph no.	Significance coefficient	Difficulty coefficient
1	0,21	0,47	26	0,27	0,73
2	-0,44	0,27	27	0,36	0,83
3	0,11	0,87	28	0,63	0,83
4	0,24	0,60	29	0,58	0,70
5	0,56	0,63	30	0,43	0,93
6	0,21	0,87	31	0,15	0,013
7	-0,13	0,87	32	0,49	0,57
8	0,28	0,93	33	0,31	0,80
9	0,16	0,43	34	0,12	0,57
10	0,32	0,57	35	0,05	0,13
11	0,43	0,20	36	0,34	0,63
12	-0,14	0,63	37	0,43	0,47
13	0,34	0,80	38	0,57	0,67
14	0,31	0,87	39	0,42	0,67
15	0,26	0,73	40	0,53	0,67
16	-0,21	0,13	41	0,36	0,50
17	-0,21	0,10	42	0,19	0,17
18	0,29	0,43	43	0,43	0,60
19	0,36	0,73	44	0,61	0,63
20	0,27	0,63	45	0,46	0,57
21	0,12	0,23	46	0,57	0,57
22	0,38	0,93	47	0,55	0,67
23	0,31	0,90	48	0,54	0,67
24	0,09	0,30	49	0,02	0,20
25	-0,25	0,27	50	0,06	0,37

Study terms

Supportive technology: the tools or programs that work to enhance learners' performance (classroom teacher students).

Cognitive achievement: knowledge (facts, concepts, laws, principles, and theories) that are learnt by classroom teacher students from scientific concepts curricula and the methods of teaching them. It is measured by the mark of the learner gets in the achievement test prepared by the researcher.

Traditional method of teaching: several procedures done by the faculty member to explain scientific knowledge contents in the course of scientific concepts and methods of teaching them. He/she uses the assigned curriculum and the traditional tools.

Classroom teacher: each individual who studies this specialization and is registered in scientific concepts and methods of teaching them course.

Study limitations

The results of this study can be generalized in the light of the following limitations:

- The study was only about physical and chemical concepts assigned in scientific concepts and methods of teaching them course.
- The application of the study was only confined on students of “classroom teacher” specialization who are registered in scientific concepts and methods of teaching them course in the second semester 2010/2011.
- The sample was intentionally selected from “classroom teacher” program at the University of Jordan.

Reliability

Reliability coefficients of internal consistency (Cronbach’s alpha) of the test and amounted to 0.83. It is considered high for this type of tests and acceptable for study purposes.

Study implementation procedures

- Educational programming was selected for being available in the Dry Lap of the educational sciences faculty at the University of Jordan.
- The study was performed after the first half of the second semester 2010/2011. It took 4 weeks to teach the assigned scientific subject; 3 lectures a week and each lecture took 50 minutes. The experimental group was taught using the computerized educational programming while the controlling group was taught in the traditional method (explaining and using traditional tools) with the same numbers of lectures and by the same researcher.
- The computerized educational program was applied on experimental group students; they watched the assigned scientific concepts through the data show inside the dry lap. Students were discussing these concepts and relevant comparisons.
- After finishing the teaching process, a cognitive achievement test was applied on the students of both, experimental and controlling groups.
- After applying the study tools, data was collected and statistically analyzed in order to answer the study question and reach results.

Results

Joint analysis results were extracted to examine the differences in students’ achievement between controlling and experimental groups. Table (2) shows that.

Table (2) joint variation analysis for examining students’ achievements in controlling and experimental groups

Variation source	Total squares	Freedom degrees	Squares mean	F value	Significance level
Pre	274,9	1	274,9	24,50	0,00
Group	64,2	1	64,2	5,72	0,02
Error	606,2	54	11,2		
Total	926,1	56			

Results in table (2) showed a statistical difference at less than 0.05 in the achievement degrees between controlling and experimental groups; F value amounted to 5.72. Post means in table (3) showed that this difference was in the favor of experimental group students; their post mean amounted to 19.47 while controlling group students’ amounted to 17.33. This means that the experimental group’s members have improved by (2.13).

Table (3) post means for students’ marks according to the group

Group	Mean	Standard error
Controlling	17,33	0,63
Experimental	19,47	0,61

Results discussion

Results that are related to the study question showed through table (2) statistical differences at the significance level of 0.05 between pre and post measures of experimental group members. This difference is attributed to the educational program and in the favor of the post test.

The researcher attributed this development to the computerized program which was applied on the sample. It helped enhancing the achievement of the experimental group students. This corresponds to the study (Al-Bashayre and Al- Futainat 2009; Al- Mutaury 2009; and Anel, Awker, and cabico 2010) about a relationship between using computerized educational system and the enhancement in students' achievements. Table (3) shows the difference between post means of both groups in the favor of the experimental group; the post mean of experimental group amounted to 19.47 while it amounted to 17.33 for the controlling group.

This result reinforces the researcher's explanation for these differences; the computerized program increased students' interaction with the program through computerized comparisons and scientific experiments shown in the class. This facilitated the understanding of scientific concepts and therefore it affected the cognitive achievement of experimental group students.

Recommendations

The study recommended:

1. Using computers in teaching scientific concepts for classroom teacher students in all science courses in order to deepen their understanding through relevant comparisons and experiments.
2. Increasing the classroom teacher students understanding for scientific concepts through increasing their practices for the directive relation between understanding and cognitive achievement.

References

- Al- Mutaury, Bandar. The Effectiveness of Using Educational Program on 11th graders in Math. Unpublished Dissertation, Um Al- Qura University, KSA.
- Al- Bashyra and Al- Futainat 2009. The Effect of Using a Computerized Educational Program in Chemical Experiments on 9th graders achievement in Chemistry and Geometry. Damascus University magazine (25) 1-2, p 405-435.
- Al- Hzaify, Khaled Bin Fahd 2008. The Effect of Using E-learning on the Scholastic Achievement, mental abilities and Tendency toward Science by Middle stage Students. King Saud University magazine, educational sciences and Islamic Studies (20) 3, p 675-715.
- Al- Attar, Yaser Ahmad 2005. The Effect of Using Science, Technology, Society, and Environment STSE in Scientific Culture of 8th graders and their Trends toward Science. Unpublished MA Dissertation, University of Jordan, Amman.
- Muhammad, Mustafa Abd Al- Samee'; Mahmoud, Hussein Bashir; Yunis, Ibrahim Abdalfattah; Swidan, Amal Abdalfattah and Al- Jazzar, Muna Mohammad 2004. Technology of Teaching: concepts and applications. T1, Alfikr publishers and distributors. Jordan
- Aphra, K. Pat, B; Julian, K. & Roddy, F. (2004). NewMedia: New Pleasures? Stem Working Paper, Dublin City University. - Bozkurta, E. & Ilika, A (2010). The Effect of Computer Simulations Over Students' Beliefs on Physics and Physics success. *Precede-Social and Behavioral Sciences* (2) 2 P. 4587-4591.
- Hutinger, P., Johanson, J. and Stoneburner, R. (1996). Assistive Technology Applications in Educational Programs of Children With Multiple Disabilities: A Case Study Report On The State Of Practice. *Journal of Special Education Technology*, 13(1): 16-35.
- Skylar, A. (2006). Assistive Technology Online Resources. *Journal of Special Education Technology*, 21(1): 45-47.
- Unal, I.; Okur, N, & Kapucu, S. (2010). The Effect Of Using Animations On Pre-service Science Teacher's Science Achievement. *Procedia Social and Behavioral Sciences* 2(2010) 5357-5361.