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The Effect of Computerized Multimedia on the Immediate and Delayed Achievement of Educational Sciences Faculty Students in an Educational Technology Course

Moh'd Mahmoud Al-Hileh

Professor of Educational Technology, Dean of Faculty of Educational Sciences, Al-Isra Private University, P.O.Box 33,22 Al-Isra University, P.O.Code 11622, Amman, Jordan

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Abstract. This study aimed at investigating the effect of computerized multimedia and the student's gender on the immediate and delayed achievement of Educational Sciences Faculty students in an educational technology course in comparison with the traditional method. The study sample consisted of 174 students (76 males and 98 females). The sample was randomly distributed among two groups; the experimental group was taught using the computerized multimedia, whereas the control group was taught using the traditional method.

Two instruments were used in the study; the computerized multimedia (slides and video films) and a 50-item multiple choice achievement test which was validated. The test - retest reliability coefficient of the test was 0.88.

The results of Two-Way ANOVA showed that there were statistically significant differences at (α=0.05) in the means between the computerized multimedia and the traditional method groups in favor of the computerized multimedia group on both the immediate and delayed achievement tests. Also, the study revealed that there were no statistically significant differences at (α=0.05) that can be attributed to gender or the interaction between teaching method and gender.

The study recommended employing computerized multimedia in teaching at university level and conducting further studies that investigate the effect of computerized multimedia on university students' achievement in various subjects..

Introduction

The computer is an effective educational method, where the majority of studies and researches in computer and education prove this effectiveness, and emphasizes that learning through computer promotes the students' level of achievement, saves their time and effort, helps them to train and practice, enables them to learn according to their capacities and capabilities, develops their skills in problem solving and logical thought, and leads to creativity (Soboleva and Tronenko, 2002; Alhelih, 2006).

In the field of education, some educators perceive the importance of computer as an educational media which plays a significant role in student's learning, stimulates their interests and provides motivation for learning in general, and individual learning in particular. In addition, the computer enriches student's experience, builds scientific concepts, and fulfills their needs (Wang and Lin, 2004). Given the electronic web, the computer became a scientific research tool, facilitates communication with others, and is considered a source of great knowledge (Al-Ajloni, 2003; Smith and Woody, 2002).

The access of computer as an educational-learning media leads to rethinking in the current teaching methods, hence educators found themselves forced to identify the behavioral objectives that the learner should achieve, to perform a precise analysis for the educational content and to choose the methods and strategies that should be accredited in learning (Green, 2004). Therefore, depending on computer in learning and education leads to detailed clarification of learning material and facilitates the control upon it from the teacher, in the form of steps and short assignments (Mayer *et al.*, 2004), and this, in turn, leads to motivating the learner and increasing his efficiency, hence he will work in an atmosphere characterized with efficiency and concentration, individually and actively.

By using computer in learning, it becomes possible to show figures, models and photos with its three dimensions, and this leads to enlarging the conceptual dimension and increasing student's achievements (Al-Ajloni 2003; Al-Hileh, 2006). The importance of computer as an educational method for group teaching as well as individual teaching has increased after new technology came with multimedia projector, which increased the fields of applying the computer and its programs in conferences, symposiums, lectures and general meetings (Al-Hileh 2006; Al-Ajloni, 2003; Lai, 2002). Due to projector unique features in presenting creative audio- mobile shows (Cole and Todd, 2003), it has been called: Multimedia projector, data show, data/video projector (Green, 2004).

The instructional multimedia technologies which depend on computer developed quickly with the development of technology, and the development of three dimensional stable and mobile photos, of sounds, music and video, etc. This quick development has lead, in turn, to increasing the conceptual awareness of the students learning in subjects like science (Al-Ajloni, 2003; Al-Hileh, 2006). In this context, Al-Hileh, (2006) states that computerized multimedia motivates the imagination and creativity, improves learner abilities and increases his efficiency in learning, because the information, using those methods, reaches the learner through more than one communication channel, and this, in turn, can increase the activity of mind and lead to meaningful learning.

Meaningful learning takes place when learners choose the information that motivates them, where they organize this information in an integrated structure in their minds, coordinate between different and various forms of educational material itself which includes both visual and verbal forms. They also integrate the new structure with the other visual structures (Mayer *et al.*, 2004). Here, the mind operations take place in two separate information systems, the visual system of visual information and the verbal system of the verbal information (Al-Hileh, 2006). Accordingly, the researcher examined the effect of the computerized multimedia methods on the immediate and delayed achievement of educational sciences faculty students' in an educational technology course, using Mayer's theory concepts to achieve student's meaningful learning (Mayer *et al.*, 2004).

Significance of the Study

Over the past few years, multimedia techniques have been incorporated in all facets of instruction. Multimedia presentation have become the norm at conferences, class lectures, and distance education courses. Lecturers as well as students have discovered the impact of multimedia presentations on the effective delivery of their messages. However, there have been very few actual studies documenting the effectiveness of computerized multimedia in Arabi universities (Al-Hileh, 2006). The purpose of this study is to measure the effects on student immediate and delayed achievement of both traditional and multimedia-based lecture by comparing and contrasting their effects on student learning.

Statement of Problem

In the last decade, some instructional experts suggest that a lecture format is not as effective as other formats due to the passive involvement of the learner (Al-Hileh, 2006). Others assert that the traditional lecture method is not suited for the ever-expanding educational objectives of today's society, diversity of learners' needs, and the increasing volumes of information (Mayer *et al.*, 2004). In today's society where there is an increasing emphasis on students to take ownership of learning processes, merits of the lecture approach to instruction are debatable, while the usefulness of computer-based instruction appears to be warranted. So, this study aimed at investigating the effect of computerized multimedia on student's achievement in an educational technology course, and attributing it to the gender or teaching method.

Research Hypothetical Questions

This study aimed at answering the following main question:

"Are there statistically significant differences (α= 0.05) in the immediate and delayed achievement of educational technology course students attributed to computerized multimedia and students' gender?"

The following two questions were derived from the main one:

1- "Are there statistically significant differences (α= 0.05) in the immediate achievement of educational technology course students that are attributed to the computerized multimedia compared with the traditional method and to the students' gender?"

2- "Are there statistically significant differences (α= 0.05) in the delayed achievement of educational technology course students that are attributed to the computerized multimedia compared with the traditional method and to the students' gender?"

Operational Definitions

The researcher described the research concepts and terminologies operationally as follows:

- Multimedia display machine (data show) is a light projection machine used to display texts, pictures, sounds, and videos simultaneously.
- Multimedia: is a method of information organization that includes the use of text, graphics, sounds, and video in any combination that inherently facilitates learner control. It is also a dynamic environment that allows supplemental information to be immediately available to the learner, depending on the type of lesson structure (Mayer *et al.*, 2004). One of the distinct features of multimedia is to be able to modify the structure of the lesson by allowing learners to have various levels of control over the pace and pathways through the lesson.
- Immediate Post-test achievement: the score obtained by the learner on the 50 multiple choice paragraphs reliable and valid test, which was prepared by the researcher, and implemented immediately after the study.
- Delayed Post-test achievement: the score obtained by the learner on the 50 multiple choice paragraphs reliable and valid test, which was prepared by the researcher, and implemented after one month of the immediate post-test exam without informing the student of doing it again.
- Traditional method: a method in which a lecturer plays amain role in the lecture management, information dissemination, explaining concepts, asking questions, giving feed-back and motivating students individually. On the other hand, the students' role is listening or participating only when asked to do so.

Study Limitations

The results of this study are limited by the following:

- The study was limited to a sample of four sessions of educational technology course in the educational sciences faculty (UNRWA) in the second semester of 2005/2006 .
- The sample of the study was limited to educational technology course only in the second semester of 2005/2006.
- The study depended on an exam prepared by the researcher. The exam is made of 50 multiple-choice paragraphs. Thus the result of this study is determined by the nature of the exam paragraphs, and their reliability and validity.

Literature Review

Several studies were carried out about the effects of the use of computer programs in students' education of different courses, especially on the field of science, and on their attitudes and creativity. As the researcher realized, a few studies examined the effect of computerized multimedia on the immediate and delayed achievement of educational technology course students in the Arab World (Al-Hileh, 2006), but he collected a number of foreign studies in this field. Following are some of these studies related to this study topic and variables:

Smith and Woody (2002)2002 analyzed five studies about the effect of coordination between written texts, explanatory pictures in obtaining creative solutions, compared with written text only. The result of the study revealed that the students of the multiple display groups (written text and explanatory pictures) provided creative solutions about questions more than the single display group.

A study carried out by Bucklry (2000) about the effect of using interactive multimedia and the model-based learning in teaching biology revealed that the students who studied the blood circulation using interactive multimedia had better results than those who learned by traditional method.

In a study carried out by Lee, McGee and Ungar (2001) about the effect of using multimedia in teaching self-defense in children who are suffering from learning disabilities revealed that the multimedia were effective in providing self-security and in curing learning disabilities. Similarly, McKethan and Evrhart (2001) carried out a study to investigate the effect of multimedia software and lecture based learning in teaching of principles of movement in physics for pre-service teachers. Results showed that multimedia software superseded lecture method in learning principles of movement.

These studies results agreed with the results of Dimitrov and McGee (2002) that showed positive effect of using multimedia in the understanding of the written and verbal logical and linear model in both math and astronomy, and the improvement of their results in the pre and post tests. This is also supported by Bishop and Cales (2001) study.

Moreno and Mayer (2002a) carried out a study about the way of learning sciences in a multimedia environment, with scientific fact and the role of methods and material in it. The multimedia of scientific fact was effective in teaching science for hostile students since their performance was improved and their cruelty even reduced.

In another study carried out by Moreno and

Mayer (2002b) about the effect of verbal repetition in multimedia learning on listening, results showed the effectiveness of multimedia based verbal repetition in increasing students' comprehension and listening abilities.

Soboleva and Trorienko (2002) studied the effect of multimedia learning package in Russian language in individual and class learning. Results revealed the importance of using multimedia in learning Russian language in Sussex University and British schools. Similarly, Segers and Verhoeven (2002) studied the importance of multimedia support for learning at early stage. The study revealed its importance in learning at early stage and the increase of language acquisition in nursery children by listening to stories through multimedia. This result was supported by Kekkone and Moneta (2002) in advance learning of computer as well.

Aly *et al.* 2003 studied the effect of interactive learning package of multimedia in teaching dentistry. Results showed its efficiency on students' achievement. The study recommended the generalization of the use of multimedia packages in the faculties of dentistry.

Al-Ajloni (2003) studied the effect of the display method of the course "design and use of educational materials" using computer linked to data show in the learning of the students of the faculty of educational sciences in Jordan University. Results showed statistically significant differences in the achievement of students related to the use of data show. There were statistically significant differences for students of high achievements due to the interaction between teaching method and level of student achievement.

Cole and Todd (2003) studied the effect of home works based on multimedia system and the internet, plus immediate feedback in learning chemistry. Results supported the use of multimedia-based home works with immediate feedback in learning chemistry.

Wang and Lin (2004) studied the effect of multimedia in distant learning. The electronic multimedia, called English multimedia learning group, including video, essays, and discussion, were found effective in English learning, written and verbal by a statistical significance compared to the control group who used the traditional method in distant learning.

Cheung, Li and Yee (2003) studied the effect of multimedia learning on self image in designing and forming data bases course. The results showed the importance of multimedia learning in supporting self confidence, and self image of the computer students in information systems management course. The students were highly self-confident with positive self image.

Mayer *et al.*, 2004 studied the individualized effect of multimedia instruction on students learned by didactic discussion against traditional learning. Students of individual learning were better on both immediate and retention exams. This is supported by the predictions of multimedia learning theorem.

Chi-Yan and Treagust (2004) studied the effects of interactive multimedia in encouraging and challenging students' willingness to study genes. Results were positive in Australian government schools where their results in electronic exams were high.

Viveckananda, Hassell and McLean (2004) studied the effect of computerized package of multimedia in the study of health sciences by students (skeletal system). Results showed the efficiency of using computerized educational packages where students showed competency and retention of information more than those who learned the same subject by traditional methods.

Methodology and Procedures

The study sample

The study sample consisted of (174) male & female students (98 females and 76 males) distributed over four sections randomly selected from five class sections of the students of Educational Sciences Faculty (UNRWA) who were studying the educational technology course during the second semester 2005-2006. The class sections (study sample) were randomly distributed as follows:

- The Control Group: consisted of 87 students (37 males and 50 females) who studied the educational technology course by the traditional method.
- The Experimental Group: consisted of 87 students (39 males, 48 females) who studied the educational technology course by using the computerized multimedia.

Study Instruments

Multimedia

A collection of 250 programmed PowerPoint animated slides designed to meet the course objectives and teaching units. The researcher designed and prepared the educational material pursuant to the educational unit prescribed to the course of the educational technology, the researcher was assisted in programming and computerizing the educational material and preparing them on the form of slides and video films by a programming engineer. In the field of video films, a collection of educational

films specific to the educational technology directly related with the study units subjects were used. They were redirected and recomputerized to fit the prescribed educational material. Having produced the slides and films in their primary form, they were referred to a group of referees amounting to eight holding Ph.D and MS degrees in Educational Technology. They were also referred to three engineers specialized in programming educational materials. In the light of the remarks made by the referees, the slides and films were amended and upgraded. The number of slides decreased from 250 to 220 amended and upgraded ones which were approved for the study. They were tried on a pilot sample of the students studying the Educational Technology Course during the first 2005-2006 semester.

The achievement test

The researcher prepared a test measuring the students' achievement of the Education Technology Course learned by the multimedia which was displayed by the data how. The final version of the test consisted of 50 multiple-choice paragraphs covering all the prescribed units of the educational technology course. The test was used to measure what the study sample had of previous information directly related to the subjects of the target units as a pretest and for ensuring the equivalence of the study groups. It was also used after teaching the educational material, which represented the post immediate test. The same test was introduced after 4 weeks of introducing the immediate test, which represented the delayed post test.

Test's Validity and Reliability

A referee committee who referred the educational material and the computerized slides. expressed some remarks and suggestions about the test and its paragraphs, and some of them were amended. The final version of the test consisted of 50 multiple-choice paragraphs. Consequently this test has validity indices that make it suitable for the study purposes.

With respect of the test's reliability, it has been generated through "person equation" after introducing the test in its final version to a pilot sample of the study population rather than the study subjects, the number of this sample amounted to 30 male and female students. Then, it was reintroduced to the same sample after two weeks of the first time (testing-retesting) as its reliability co-efficient amounted to 88%. Such value was considered sufficient for the study purposes.

Study Procedures

The procedures were comprised of the following steps:

- The researcher prepared and computerized the slides as well as the films. They were in the form of video images, colored and animated drawings, texts, sound effects and music. They were referred and tested. Then, they were stored on CDs in a sufficient number that allowed the students having computers borrow those CDs for learning and using them at home or in the faculty labs.
- Having determined the study sections for the study sample, the pre-achievement test was introduced to both study groups (the control and the experimental) after ensuring that the study groups were equivalent, and the results were statistically analyzed.
- With the beginning of the second Semester (2005-2006), the course instructor initiated the study which continued throughout the semester.
- After the course instructor had finished the application of the study, the time of the immediate test in the study material was determined on both study groups. The test was applied and the results were noted down.
- After four weeks of that, and in virtue of a prior agreement with the course students, the same test was applied once again on the study sample members without their knowledge of its time or that they shall be tested once more. The results of the delayed test were noted down.

Study Design

This study included the following variables:

1- The independent variable: it included the teaching methodology and it included:
   a-Utilizing the computerized multimedia in teaching.
   b-The traditional methodology.
2- The students Gender: male, female.
3- The dependent variable: It included achievement (the immediate post achievement and the delayed post achievement).

Statistical Processing

The arithmetic means, the standard deviation and the two-way analysis of variance test with the factorial design (2 x 2) via usage of the SPSS were used to test the study hypothesis.

Table 1. Means and standard deviations for the study two groups on pretest

Group	Gender	No of Students	Mean	Total Number	Total Mean	Total SD
Control	Male	37	8.32	87	7.72	4.04
	Female	50	7.28			
Experimental	Male	39	7.87	87	7.44	3.01
	Female	48	7.08			

Table 2. Results of two way ANOVA for the two study groups students' marks on pretest

Source of Variance	Sum of Squares	Degrees of Freedom	Sum of Squares Mean	F- value	P- value
Teaching Method	35.868	1	35.868	2.830	0.940
Gender	04.135	1	04.135	0.330	0.568
Interaction between teaching method and gender	00.700	1	00.700	0.055	0.814
Inside the squares (error)	2152.214	170	12.660		
Total	2192.374	173	12.673		

Table 3. Means & SDs for the two study groups students on the immediate achievement test

Group	Sex	No. of Students	Mean	Total	Total mean	Standard Deviation
Control	Male	37	30.81	87	31.89	8.64
	Female	50	32.68			
Experimental	Male	39	37.36	87	38.38	7.68
	Female	48	39.21			

Study Results

This study aimed at investigating the effect of using the computerized multimedia on the immediate and delayed achievement of educational technology course students comparing to the traditional method. The researcher presented the analyzed data to answer the research questions in the following two sections:

- Pretest results
- Research questions results

Pretest results

The researcher applied the study on the two students' groups before starting the experiment and calculated the means and standard deviations (Table 1). For determining any statistical differences among the two groups' means on pretest results, the researcher used two way analysis of variance, as Table 2 shows the result of this analysis.

Table 1 shows that the mean of control group is (7.72) and the SD is (4.04), while the mean is (7.44) and the SD is (3.01) for the experimental group.

Table 2 shows that the value of (F)is (0.33) with P-value of (0.568) which means there are no statistically significant differences between the two study groups on the pretest, which indicates that they have equivalent information regarding the course materials. Regarding the students gender, the value of (F) is (2.83) with P-value of (0.94) which is not significant at (α=0.05), and this means there are no statistically significant differences between the two study groups on the pretest related to gender.

Results of Research Questions

Results of answering the first research question

"Are there statistically significant differences (α= 0.05) in the immediate achievement of educational technology course students that are attributed to the computerized multimedia compared with the traditional method and to the students' gender?"

To answer this question, the means and the standard deviations for the two study groups students on the immediate achievement test were calculated as Table 3 shows

It is revealed from Table 3 that there are differences between the means for both the study groups as the mean for the students of the control group was (31.89) and the standard deviation was (8.64), while the mean of the experimental group was (38.38) and the standard deviation was (7.68). However, these differences need to test their statistical significance at the significance level (α=0.05). For this purpose, the Two-Way ANOVA of the factorial design (2 x 2 x 1) was used, as shown in Table 4.

It is revealed from Table 4 that the calculated F-value is (27.784) and P-value is (0.000). This means that there are statistically significant differences at the level (α = 0.05) on the immediate achievement test which are attributed to the use of the computerized multimedia and the non-existence of statistically significant difference (α = 0.05) attributed to gender or to interaction between the teaching method and students gender.

Table 4. Two Way ANOVA results of the means for the marks of both the study groups on the immediate achievement test as per the method and gender of the student

Variance Source	Sum of Squares	Degrees of Freedom	Mean of Sum of Squares	F- Value	P- Value
Teaching Method	1857.856	1	1857.856	27.784*	0.000
Student's gender	147.882	1	147.882	2.212	0.139
Interaction between Teaching method and students gender	0.004	1	0.004	0.000	0.994
Inside the squares (error)	111367.446	170	66.867		
G. Total	13349.960	173	77.176		

* Statistically significant at significance level ($\alpha = 0.05$).

Table 5. The means and the standard deviations of the two study groups on the delayed achievement test

Group	Gender	No. of Subjects	Arithmetic Mean	Total Number	Total Arithmetic Mean	Total Standard Deviation
Control	Males	37	27.19	87	27.36	9.10
	Females	50	27.48			
Experimental	Males	39	35.31	87	36.51	7.81
	Females	48	37.48			

Table 6. Results of the two way ANOVA of the means of the marks of both study groups students on the delayed achievement test as per the method of teaching and the student's gender

Variance Source	Sum of Squares	Degrees of Freedom	Mean of Sum of Squares	F. Value	P-value
Teaching Method	3662.169	1	3662.169	50.762	0.000
Students gender	65.431	1	65.431	0.907	0.342
Interaction between Teaching method and students gender	37.827	1	37.827	0.524	0.470
Inside the squares (error)	12264.443	170	72.144		
G. Total	16009.172	173	92.539		

Results related to the answer of the second research question

"Are there any statistically significant differences ($\alpha = 0.05$) in the delayed achievement of the Educational Technology Course students that are attributed to the use of computerized multimedia compared with the traditional method and to the students gender?"

To answer this question, the means and the standard deviation for the two study groups on the delayed achievement test were calculated as Table 5 shows.

It is revealed from Table 5 that there are differences between the arithmetic means for both the study groups on the delayed achievement test, as the arithmetic mean for the marks of the control groups students was (37.36), and the standard deviation was (9.10), while the arithmetic means of the marks of students who was learned by the computerized multimedia (experimental group) was (36.51), and the standard deviation was (7.81). Yet, these differences need to test their statistical significance at significance level ($\alpha = 0.05$). For this purpose, the Two-Way ANOVA test of the factorial design (2 x 2 x 1) was used. This is shown in Table 6.

It is revealed from Table 6 that the calculated F-value (50.762) and the P-value is (0.000) which means that there are statistically significant differences at the level ($\alpha = 0.05$) on the delayed achievement test that are attributed to the teaching method in favor of the students who were taught by the computerized multimedia and the non-existence of statistically significant differences ($\alpha=0.05$) that are attributed to the students gender or to the interaction between the multimedia method and the students gender.

Results Discussion

The results of answering the two questions of the study indicated that there are statistically significant differences ($\alpha = 0.05$) in the immediate and delayed achievement of the Education Technology course students due to the computerized multimedia compared with the traditional method. The results of this study supported by the outcomes stated by Mayer *et. al.*, 2004 in his Generative Theory of Multimedia Learning in which he confirms that comprehensive learning occurs when the learner chooses the information that interests him and attracts his attention from the data presented to him. He organizes these sections of information in an

integrated mental presentation and merges the new presentations built with other presentations,which results in increase achievement and retention.

The results of this study coincides with the results of studies conducted by Cole and Todd (2003); Aly *et al.* (2003); Moreno and Mayer (2002a) (2002b); Mckethan and Everhart (2001); Smith and Woody (2002); Buckley (2000); Vivckananda, Hassell and McLean (2004), and Chi-Yan and Treagust (2004).

This result could be interpreted as follows:

- This result could be attributed to the method of presenting the computerized educational material as for its organization, arrangement and presentation in a serial and logical manner so that the learner could obtain knowledge easily. This was confirmed by the literature and the Generative Theory of Multimedia Learning which indicates that comprehensive learning occurs to the learner when student chooses and organizes the visible and readable information in a constant and ordered manner. Due to the limitation of memory, the selection and organization occurs properly and effectively when the educational material is presented in a coherent and synchronous manner rather that separated presentation. (Mayer *et al.*, 2004; Moreno and Mayer, 2002b).
- The stable and mobile pictures may include symbols as organizers that assist the learners in building relations (cause-effect) between visible and audible data series, and may act as coordinator that helps the learner build relations among the actions in the visible and audible presentations. This may increase achievement and retention of knowledge. enforced (Mayer Lai, 2002; Mayer and Robinson, 2002; Mayer *et al.*, 2004).
- This result may also be attributed to the fact that multimedia system provides pictures, movement and texts that make the presentation more vivid and effective rather than using words only. Through pictures, we could clarify various things that words may fail to explain "One picture may be worth thousand words" (Moreno and Mayer, 2002a and b; Wand and Lin, 2004; Lee, McGee and Ungar, 2001).
- Careful selection of audio effects in a manner to cope with the pictures and drawings presented may have effect in providing an interesting atmosphere that encouraged the target category on positive participation and effective follow up of the presentation, thus increase immediate and delayed academic achievement and forming positive attitudes towards the multimedia (Hayes and Lai, 2002; Robinson, 2002).
- The use of video may have an effect in increasing immediate and delayed achievement and transferring the effect of learning since the video is considered one of the strongest communication media that gives the presentations interest and attraction (Cole and Todd, 2003; Aly *et al.*, 2003; Williams and Avraham, 1995).
- Excellence in the achievement of the students who learned by computerized multimedia may also be attributed to the seriousness because the new strategy of computerized multimedia and the data show are not common in our Jordanian environment. Thus, it is not impossible to find great success in applying it due to the enthusiasm and acceptance shown by the students towards the multimedia, which could increase learners' achievement.
- The researcher's enthusiasm and interest in the study and in the multimedia as a new strategy may have affected the immediate and delayed achievement by students who learned by multimedia, in addition to the teacher's enthusiasm which may have generated great enthusiasm to the students, thus increases their interest in the matter and increases their achievement which leads to their excellence compared to the control group.

Analysis of variance results for the study questions indicated the absence of statistical significant differences ($\alpha = 0.05$) in immediate and delayed achievement attributed to the gender of students. Thus, it could be said that the multimedia have positive effect on students of both genders (males and females) equally. This could be attributed to the similarity of educational and social environment of both genders. The equality in averages of both males and females may be attributed to the competitive environment during the application of study with males and females, since each class includes both males and females (mixed) that contributed in raising their enthusiasm. This was noticed by the researcher during the conduction of the study. The recognition of male and female students that they are under a particular trial encouraged them and pushed them to work seriously, that reduced variance between the averages of male and female.

The study results did not indicate statistical significant differences ($\alpha = 0.05$) attributed to the interaction between the student gender and the method of multimedia presentation. The researcher may attribute this result to the equality between the two genders of students in the opportunities available to them for learning, as provided by this study. This

led to the absence of differences attributed to interaction between the student gender and the method of presenting multimedia. This result has important educational indicators, as it is possible to help all learners, regardless of their gender, in benefiting from the multimedia that affected the increase in their immediate and delayed achievement and reduced loss of achievement.

Recommendations

On the light of the results reached by this study, the following recommendations could be presented:

- Promoting the use of computerized multimedia in university and school education as they are effective in achievement and student's innovative responses.
- Promoting the use of data show in lectures and teaching halls as an effective and interactive media for presentation of texts, pictures and videos, not only as a means of presentation.
- Future studies should consider testing on multiple topics and should be aver more length in order to average out any errors due to variations in content delivery.
- Finally, the author would like to advise caution against extending the results of this study to other subjects that may be very different.

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أثر الوسائط المتعددة المحوسبة في التحصيل المباشر والمؤجل لطلبة مساق تكنولوجيا التعليم في كلية العلوم التربوية (الأونروا)

محمد محمود الحيلة

أستاذ في تكنولوجيا التعليم، نائب رئيس جامعة الشرق الأوسط،
جامعة الشرق الأوسط، ص.ب (٣٨٣) الرمز البريدي (١١٨٣١)
عمان – الأردن
Prof.hileh@gmail.com

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الكلمات المفتاحية. الوسائط المتعددة المحوسبة، التحصيل، تكنولوجيا التعليم.

ملخص البحث. استهدفت هذه الدراسة استقصاء أثر الوسائط المتعددة المحوسبة وجنس الطلبة في التحصيل المباشر والمؤجل لطلبة مساق تكنولوجيا التعليم في كلية العلوم التربوية (الأونروا)، موازنة بالطريقة الاعتيادية.

وقد تكونت عينة الدراسة من (١٧٤) طالباً وطالبة منهم (٧٦) طالباً و (٩٨) طالبة من طلبة مساق تكنولوجيا التعليم، وزعت عشوائياً على مجموعتين، تعلمت إحداهما محتوى مساق تكنولوجيا التعليم بالوسائط المتعددة المحوسبة، وتعلمت الأخرى بالطريقة التقليدية.

استخدمت هذه الدراسة أداتين: الأولى هي الوسائط المتعددة المحوسبة (شرائح وأفلام وفيديو)، والثانية هي اختبار تحصيل تكون بصورته النهائية من (٥٠) فقرة اختيار من متعدد، تم التحقق من صدقه وثباته إذ بلغ معدل ثباته باستخدام معادلة "بيرسون" (٨٨٪).

أظهرت نتائج تحليل التباين الثنائي وجود فروق ذات دلالة إحصائية عند مستوى دلالة ($\alpha = ٠.٠٥$) في المتوسطات الحسابية بين طلبة مجموعتي الدراسة، والتي تعلم أفرادهما باستخدام الوسائط المتعددة المحوسبة، وطلبة المجموعة الضابطة التي تعلم أفرادها بالطريقة التقليدية، ولصالح الطلبة الذين تعلموا بالوسائط المتعددة المحوسبة والتي على شكل فيديو أولاً، ثم الطلبة الذين تعلموا بالوسائط المتعددة المحوسبة أمباشراً كان التحصيل أم مؤجلاً. ولم تكشف الدراسة عن وجود فروق ذات دلالة إحصائية ($\alpha = ٠.٠٥$) تعزى إلى جنس الطلبة، أو إلى التفاعل بين طريقة العرض وجنس الطلبة. وقد أوصت الدراسة بضرورة توظيف الوسائط المتعددة المحوسبة في التدريس الجامعي. وإجراء المزيد من الدراسات التي تبحث في أثر الوسائط المتعددة المحوسبة في تحصيل طلبة الجامعة وفي المواد الدراسية المختلفة.