JEAS | Journal of Economics and Administrative Sciences
E-ISSN: 2148-1792 P- ISSN: 1302-2024
Volume 3, Supplement Issue 3
www.jeasweb.org

Evaluating the effect of using educational multimedia on learning and retention of geography and Arabic courses among first-grade secondary school students in Gomishan, Golestan province

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ABSTRACT
The present study aimed at evaluating the effect of using educational multimedia on the learning and retention of Arabic and geography courses in first grade secondary school students. The present study is an applied study. In the present study, a quasi-experimental design of unequal control group with pretest and posttest was used. The statistical population of the study included first-grade female secondary school students in Gomishan city of Golestan province in the academic year of 2018-2019. The sample size included 40 first-grade female secondary school students, who were selected and assigned into experimental group and control group (20 subjects in each group). To conduct the present study, each group was first exposed to a teacher-made academic achievement test as a pretest. Then, the students in the experimental group were educated using multimedia teaching method and the students in the control group were educated using traditional teaching method for 4 weeks. At the end of the course, they were post-tested. Also, three weeks after the posttest, retention test was administrated on both groups and the obtained scores were analyzed using dependent t-test and independent t-test. Based on the results of this study, in learning and retention of the concepts of Arabic and geography courses, multimedia teaching method was more effective than traditional teaching method. There was no difference between learning the concepts of Arabic and geography courses and retention of them in multimedia method.
Keywords: education, multimedia software, learning, retention

Introduction

Given rapid developments and advances in science and technology and its increasing expansion in all areas of human life, adhering to traditional education without considering of the latest scientific developments and teaching a subject for several years results in learners with little and non-applied information in the current society. Thus, by making better use of advanced technologies such as modern computers, educational devices in schools and universities should make modern science and technology accessible to students. Without the use of these tools and facilities, education, especially school education, will be impossible based on the standards that exist in today's world. Nowadays, human beings are looking for methods of information that can retrieve and process information quickly, but diversity of information forms and the effectiveness and efficiency of each of these methods make it necessary to use several types of informing tools and media. At present time, human needs an environment to bring different media together. In other words, an information base must be a multimedia environment (Shah Jafari, 2006). For

many years, human beings have constantly used the verbal speech tools to teach and learn. Learners learned their courses through oral explanations and written books. However, encyclopedias have nowadays emerged from the composition of multimedia that goes beyond the apparent composition of the media to help learners achieve their learning goals and needs. However, in this new approach, the power of conversation and teaching and oral and written learning is not underestimated, but with the expansion of multimedia facilities of computers, other ways of using learning resources are opened (Hoern, 1998, quoted by Afzalnia, 2009).

Multimedia is widely used in e-learning, since it attracts the learner and provides various facilities for him or her and ensures the continuity of his or her learning. Students who use multimedia and those who supervise this education should have sufficient and necessary familiarity with multimedia skills or media literacy (Razavi, 2007). The multimedia technology that is created by combining speech, writing, music, film, photos, slides, and animated video and graphics images has high interactive power, so that it provides learners with a wide range of options and deep challenges (Afzalnia, 2005). Jonassen (2005, quoted in Razavi 2007) suggests that tools such as multimedia and mind tools should be used to activate learners, engage them in thinking, and enable them to learn. The fact that our students are poor at learning courses annoys us, but we still teach the main courses in the form of lectures and homework. If we can find ways to help these students learn how to do homework and use it in the real world, we can expect our students to make progress in these courses. Computers and multimedia can help us achieve this goal sooner (Tilston, 2004). Multiple facilities of multimedia systems in transmitting information in different ways and covering it in different ways of learning of users made these systems become an effective and efficient tool in education. Providing information through multimedia can be lively, active and exciting, since it is a multisensory communication (Emadi, 1999). Multimedia programs increase the long-term memory efficiency of users and enable them to make information more accurate and organized. Memorize more findings (Wang et al., 2000, quoted in Razavi, 2007). Multimedia provides activities for students while they are learning and makes students act quickly and make optimal use of different senses in learning. In this process, learners can learn their desired concepts in shorter time and remember them for a long time (Amir Teymouri, 2004). The advent of electronic technologies has drawn the attention of many people to their effects on the education system, especially in the process of teaching and learning. In fact, using new technologies, especially educational multimedia has rapidly affected the foundation of the teaching-learning process and all components of education. By providing a rich environment full of various stimuli and interacting with the user, multimedia can lead to more effective and deeper learning of concepts and problem solving (Rabiee, 2006). Another important necessity of this research is poor performance of many students in learning different subjects. Thus, it seems necessary to take steps to compensate for these shortcomings and to think of a solution to solve this problem. Researchers have found that the use of traditional methods has led to a continuous reduction in students' understanding and engagement with passive knowledge at all levels of education and even in universities (Perkins, 2001).

Research hypotheses

1-Multimedia teaching method is more effective than traditional teaching method in learning the concepts of Arabic and geography courses.

2-Multimedia teaching method is more effective than traditional teaching method in retention of the concepts of Arabic and geography courses.

3- There is a difference between multimedia teaching method and traditional teaching method in learning the concepts of Arabic and geography courses.

4-There is a difference between multimedia teaching method and traditional teaching method in retention of the concepts of Arabic and geography courses.

Methodology

The present study is an applied study in terms of nature of its subject, its goals and hypotheses and due to the use of its results in the area of teaching and learning. In this study, non-random (unequal) control group design with pretest and posttest was used. In this study, two groups participated, the experimental

group, which were educated using multimedia, and the other group, the control group, which were educated in the traditional and conventional methods (lectures, plays, questions and answers). Pretest and control group were used to prevent the effect of unwanted factors in the research. The statistical population of the study includes all female first-grade secondary students of Gomishan, studying in the academic year of 2018-2019. In this study, random cluster sampling method was used. Since randomly selection of subjects from different classes disrupts the classroom order and teachers and principals do not allow random selection for researchers, a quasi-experimental pretest-posttest design with non-random or unequal control group was used. To evaluate the validity of the teacher-made questions made in this research, a table of specifications was prepared, which includes the content and educational behavioral goals related to them and the number of questions that were considered for each of them. Also, the opinions and corrections of 5 experienced teachers of Arabic and geography courses of the first-grade secondary school, the head departments of Arabic and geography courses, and advisor and advisor professors were used. For this purpose, a rating form was used. After reviewing their opinions on each question, 38 questions in geography and 23 questions in Arabic were approved. The test-retest method was used to evaluate the reliability of the test. Accordingly, the test was administrated for a class in a sample similar to the research sample, and after 3 weeks, the same test was administrated again for the same group and after correcting the questions, the correlation coefficient between scores was calculated using Pearson correlation coefficient. SPSS software showed the correlation between the two tests of Arabic course and geography course at r = 0.97 and r = 0.98, respectively. Thus, it can be stated that the correlation between the two tests is significant and the degree of correlation indicates the high reliability of the test.

Data analysis method

In the present study, descriptive and inferential statistics were used to analyze the data. The design used in this study was an unequal control group with pretest and posttest. Since parametric tests are more accurate than non-parametric tests, t-test, which is among the parametric tests, was used. In the descriptive statistics section, the data collected using central and dispersion statistics such as mean, standard deviation, minimum and maximum are described. Using SPSS software, the mean and standard deviation of the scores of both groups in the Arabic and geography entrance behavior test, pretest, and posttest and retention test are compared. Inferential statistics are also used to test hypotheses. The independent variable is collected through a qualitative measurement scale and the dependent variable is a quantitative type that is measured with an interval scale. Also, to measure the degree of retention between the two groups and to measure the difference between learning and retention of the concepts of Arabic and geography courses by multimedia method, dependent t-test and independent t-test are used. Table (4-1) shows the frequency, mean, standard deviation, minimum and maximum scores of students in the two groups in pretest, posttest and retention test of Arabic course.

- **Description of data**

Table (4-1) Mean and standard deviation of learning scores (pretest and posttest) and retention scores of Arabic course in experimental and control groups

tests	group	frequency	mean	SD	min	max
pretest	experimental	20	4.4	27.2	1	5.8
	control	20	17.4	37.2	1	9
posttest	experimental	20	61.18	14.1	17	20
	control	20	55.13	83.3	75.5	20
retention	experimental	20	6.17	5.1	15	20
	control	20	77.8	42.3	3	5.14

As shown in Table (4-1); The mean pretest score of Arabic learning in the multimedia group is 4.4 with a standard deviation of 2.27 and the mean pretest score of the traditional group is 4.17 with a standard deviation of 2.37, which this rate increased in the multimedia group after using the multimedia method with a mean of 18.61 and a standard deviation of 1.14. However, in the traditional group, the mean with 13.55 and a standard deviation of 3.83 did not change significantly. The mean score of Arabic retention test performed three weeks after the training was 17.6 with a standard deviation of 1.5, which shows a slightly reduction compared to posttest, while the mean retention in the traditional method decreased to 8.77.

Table (4-2): shows the mean and standard deviation of the difference between the experimental and control groups in learning scores (pretest and posttest) in Arabic course

Arabic	frequency	mean	SD	min	max
experimental	20	21.14	19.1	16	5.11
control	20	47.9	7.1	11	75.4

As Table (4-2) shows, the mean of the multimedia group after subtracting scores is 14.21 with a standard deviation of 1.19 and the mean of the traditional group is 9.47 with a standard deviation of 1.7. The data show that the difference between the means in the traditional group is much less than the difference between the means in the multimedia group.

Table (4-3): Mean and standard deviation related to learning scores (pretest-posttest) and retention of geography course in experimental and control groups

tests	group	frequency	mean	SD	min	max
pretest	experimental	20	98.4	34.2	1	5.9
	control	20	17.5	25.2	1	9
posttest	experimental	20	55.18	23.1	5.16	20
	control	20	45.13	05.4	5.5	20
retention	experimental	20	47.17	45.1	15	5.19
	control	20	65.8	74.3	3	16

As shown in Table (4-3), The mean pretest of learning geography course in the multimedia group is 4.98 with a standard deviation of 2.34 and the mean pretest of learning geography course in the traditional group is 5.17 with a standard deviation of 2.25, which this rate increased in the multimedia group after applying the multimedia method to 18.55 with a standard deviation of 1.23. However, in the traditional group, the mean changed to 13.45 with a standard deviation of 4.05, which is a slight decrease. The mean retention of geography course one month after the education was 17.47 with a standard deviation of 1.45, which shows a slight reduction compared to posttest, while the mean retention in the traditional method decreased to 8.65.

Table (4-4): Mean and standard deviation of difference in scores of learning (pretest-posttest) of geography course in experimental and control groups

retention of geography course	frequency	mean	SD	min	max
experimental	20	56.13	17.1	5.15	5.10
control	20	27.8	86.1	11	4

As Table (4-4) shows, the mean of the multimedia group after subtracting scores is 13.56 with a standard deviation of 1.17 and the mean of traditional group is 8.27 with a standard deviation of 1.86. The data show

that the difference between the means of traditional group is much less than the difference between the means of multimedia group.

- **Analyzing the entrance behavior test and pretest**

Table (4-5): Independent t-test to measure the difference between the experimental and control groups in the entrance behaviors test in Arabic course

entrance test of Arabic	mean	means difference	t	df	sig
experimental	05.14	33.0	3.0	38	76.0
control	38.14				

As shown in the table above, before using the multimedia method, there was no significant difference between the two multimedia and traditional groups in the entrance test of Arabic course (sig = 0.76 and t = 0.3).

Table (4-6): Independent t-test to compare the pretest scores of Arabic course in the experimental and control groups

pretest	mean	means difference	t	df	sig
experimental	4.4	22.0	3.0	38	76.0
control	17.4				

As shown, the difference between the pretest mean scores of the Arabic course before education with the multimedia method in two groups is almost the same and there is no significant difference (sig = 0.76 and t = 0.3).

Table (4-7): Independent t-test to measure the difference between the experimental and control groups in terms of entrance behaviors test in geography course

entrance	mean	means difference	t	df	sig
experimental	15.14	27.0	0/2	38	83.0
control	87.13				

As shown in the table above, before using the multimedia method, there was no significant difference between the two multimedia and traditional groups in terms of entrance behavior test of the geography course (sig = 0.83 and t = 0.2).

Table (4-8): Independent t-test to compare two experimental and control groups in terms of pretest score of geography course

	mean	means difference	t	df	sig
experimental	98.4	18.0	25.0	38	79.0
control	17.5				

As shown, the difference between the pretest means of the geography course before education with the multimedia method in the two groups is almost the same and there is no significant difference (sig = 0.79 and t = 0.25).

Testing of the hypotheses

- ✓ Testing of the first hypothesis: teaching with multimedia method is more effective than teaching with traditional method in learning the concepts of Arabic course.

Table (4-9): Independent t test to measure the difference between the two groups in learning Arabic course using differential scores

group	mean	Levene's f	sig	means difference	t	df	sig
experimental	21.14	23.1	27.0	83.4	4.10	38	001.0
control	37.9						

The table above compares the difference between the mean scores of Arabic course in the multimedia and traditional groups using differential scores. Before performing the t-test, it is necessary to ensure that the variances are homogeneous, which is one of the presuppositions of the t-test. Hence, the presence or absence of this homogeneity is tested using the Levene's f test. The obtained t-value is 1.23 with a probability value of P = 0.27, indicating the homogeneity of the variances. Thus, t-test can be used for homogeneous data. The obtained t-value is 10.4 with a probability of P = 0.001, indicating that there is a significant difference between the multimedia and traditional groups after teaching with multimedia method. Thus, the first hypothesis is confirmed with confidence level of 0.99% and the null hypothesis is rejected.

- ✓ Testing of the second hypothesis: teaching with multimedia method is more effective than teaching with traditional method in learning the concepts of geography course.

Table (4-10)- Independent t test to measure the difference between the two groups in learning geography course using differential scores

group	mean	Levene's f	sig	means difference	t	df	sig
experimental	56.13	16.2	15.0	28.5	71.10	38	001.0
control	27.8						

The table above compares the difference between the mean scores of the geography course in multimedia and traditional groups using differential scores. The value of obtained f is 2.16 with a probability value of P = 0.15, indicating the homogeneity of the variances. Therefore, t-test can be used for homogeneous data. T value was obtained at 10.71 with a probability of P = 0.001, indicating a significant difference between the multimedia and traditional groups after teaching with multimedia. Hence, the second hypothesis is confirmed with confidence level of 0.99% and the null hypothesis is rejected.

- ✓ Testing the third hypothesis: In retention of the concepts of Arabic courses, multimedia teaching method is more effective than traditional teaching method.

Table (4-12): Independent t-test to measure Arabic course retention between experimental and control groups using differential scores

	difference	means difference	t	df	sig
experimental	01.1	76.3	75.15	38	001.0
control	77.4				

Differential scores were used to measure the difference in retention between the two groups (posttest scores were subtracted from retention scores) and then independent t-test was performed. As shown, the mean of differential scores in the multimedia method and traditional method is 1.01 4.77, respectively. The

mean difference between the two groups is 3.76 and obtained t-value is 15.75 with a significance level of 0.001, indicating that this difference is significant with a confidence of p = 0.99. It means that retention in the traditional group in Arabic course is much less than that in the multimedia group.

- ✓ Testing the fourth hypothesis: In retention of the concepts of geography course, teaching with multimedia method is more effective than teaching with traditional method.

Table (4-14): Independent t-test to measure the retention of geography course between experimental and control groups using differential scores

group	difference	means difference	t	df	sig
experimental	07.1	72.3	58.15	38	001.0
control	8.4				

As shown in the table above, the mean of differential scores in the multimedia method and in the traditional method is 1.07 and 4.8, respectively. The mean difference between the two groups was 3.72. The obtained t-value is 15.58 with a significance level of 0.001, indicating that this difference is significant with p = 0.99 confidence. It means that retention in geography course in the traditional group is much less than that of the multimedia group.

- ✓ Testing of the fifth hypothesis: There is a difference in learning the concepts of geography and Arabic courses in teaching with multimedia method.

Table (4-15): Dependent t test to measure the difference in learning Arabic and geography courses in the experimental group

	mean	correlation	t	df	sig
Arabic	61.18	99.0	56.1	19	13.0
geography	55.18				

As shown in the table above, the mean of Arabic course in the multimedia method is 18.61 and the mean of geography course is 18.55. The correlation between these two courses is r = 0.99 and the obtained t-value is 1.56 with a probability of 0.13, indicating that the difference between the mean of two Arabic and geography courses is not significant and Hypothesis 5 is not confirmed.

- ✓ Testing of the sixth hypothesis: There is a difference in retention of the concepts of geography and Arabic courses in teaching with multimedia method?

Table (4-16): Dependent t test to measure the difference in retention of Arabic and geography courses in the experimental group

	mean	correlation	t	df	significance level
Arabic	6.17	97.0	64.1	19	11.0
geography	47.17				

As shown in the table above, the mean of Arabic course in the multimedia method is 17.6 and the mean of geography course is 17.47. The correlation between these two courses is r = 0.97 and the obtained t-value is 1.64 with a probability of 0.11, indicating that the difference between the mean of two Arabic and geography courses is not significant and Hypothesis 6 is not confirmed.

Discussion and Conclusion

Multimedia teaching method is one of the teaching methods that has attracted the attention of experts in this area and its efficiency has been proven by several studies, since it activates the learner during the

training and engages him or her with teaching materials, and accordingly, facilitates and deepens the learning. The aim of this study was to evaluate the effect of using educational multimedia on the learning and retention of Arabic and geography courses among first-grade secondary students.

- In learning the concepts of Arabic and geography courses, multimedia teaching method is more effective than traditional teaching method. Based on the data analysis in Arabic course, t = 10.4 with probability of P = 0.001, and in geography course t = 10.71 with probability of P = 0.001 show a significant difference between multimedia and traditional teaching methods. Thus, the null hypothesis is rejected and the research hypothesis is accepted. The results of the present study indicate that the rate of learning in the group educated with multimedia method is higher than that of the group educated with traditional method, indicating the positive effect of multimedia teaching in increasing the rate of learning.

These results are consistent with the results of the studies conducted by Rabiee (2006), Kamel (2006), Razavi (2004), Sheikhzadeh and Mehr Mohammadi (2004), Karami (2003), Shabiri (2003), Munzer & Seufert & Brunken (2009), Eilam & Poyas (2007), Glang (2005, quoted in Kharamideh, 2006), Mayer & Moreno (2002, quoted in Hassanabadi and Sarmad, 2008), Guha (2000), Mandell & Susan (1999, quoted in Kamel, 2006), Liao (1999, quoted in Khosravi, 2001), Ann Erdner & Guy & Bush (1998, quoted in Kharamideh, 2006).

The results of these studies suggest that using computers and educational media enhances students' learning and education with the help of multimedia has enhances students' performance compared to education through conventional methods and multimedia teaching method can be used to increase students' learning. M (2001, quoted in Ashna, 2002) also concluded in his research that mental tools, combination of different media and paying attention to individual differences are important principles and characteristics of multimedia that enhance learning.

-In retention of the concepts of Arabic and geography courses, multimedia teaching method is more effective than traditional teaching method.

Based on the data analysis in Arabic course, t = 15.75 with probability of P = 0.001, and in geography course t = 15.58 with probability of P = 0.001 show a significant difference between multimedia and traditional teaching methods at p=0.99 level. It means that retention in traditional group in Arabic and geography courses is much lower than that of the multimedia group. The results of the present study indicate that the rate of retention in the group educated with multimedia method is higher than that of the group educated with traditional method, indicating the positive effect of multimedia teaching in increasing the rate of retention.

These results are in line with results of the studies conducted by Rabiee (2006), Razavi (2004), Ebrahimi (2003), (Mayer, 2003, quoted in Hassanabadi and Sarmad, 2008), Mayer (2001, quoted in Afzalnia, 2005), and Zahed et al. (2000 quoted by Rabiee, 2006). The results of these studies show that computer-based and multimedia teaching methods are more effective in increasing student retention than other traditional methods of education. The results of the retention test in the experimental group received multimedia teaching method were significantly better compared to control group received traditional teaching method. Thus, when multimedia with designed content is used, learning becomes more meaningful and sustainable compared to traditional teaching method, and the use of multimedia facilitates retention of information in the long term. The use of multimedia teaching method activates students during learning, improves their motivation and attitude, and creates a deeper and more sustainable understanding of what they have learned. The interesting point about multimedia learning is that comprehension occurs when learners can make meaningful association between multisensory data and thus relate multidimensional symbols. It increases the mental involvement in learning and causes deeper and more sustainable learning, so a distinctive characteristic of this type of learning is its quality and the level of retention through this way of learning (Afzalnia, 2009). One of the advantages of multimedia application is that students are active in teaching and learning. Studies have indicated that the use of different media, especially if it is associated with more activity and involvement of students during learning, it not only increases the level of initial learning, but also increases the duration of remembering (Amir Teymouri, 2006).

-There is no difference between learning the concepts of geography course and learning the concepts of Arabic course through multimedia teaching method.

Based on data analysis, t = 1.56 with a probability of P = 0.13, indicating that the difference between the means of the two Arabic and geography courses is not significant.

- There is no difference between retention the concepts of geography course and retention of the concepts of Arabic course through multimedia teaching method.

Based on data analysis, t = 1.64 with a probability of P = 0.11, indicating that the difference between the means of the two Arabic and geography courses is not significant. The results of the present study suggest that there is very little difference in learning the concepts of Arabic and geography courses and teaching these courses through multimedia teaching method and it is not significant.

In a study conducted by Khosravi (2001), the rate of learning by collaborative lecture method and computer-assisted learning (CAI) in the first-grade secondary school geography course was compared and the results showed that computer-assisted learning in learning geography course was more effective that lecture method. Also, results of a study conducted by Ko (2006) showed that the use of multimedia in geography course increases students' motivation to learn and thus promotes their learning. Based on the results, multimedia can make changes in educational methods and a shift from passive learning to active learning, and also change the role of the teacher from the content provider to the content facilitator. Learning through educational multimedia is more enjoyable. Given the weakness of many students in learning and retention of various educational subjects, teachers and students can use appropriate educational multimedia that have a positive effect on the teaching-learning process. Equipping all schools at all levels of education with computers, new and sufficient hardware and software facilities, attracting the necessary investments for the development and production of standard multimedia software with appropriate quality based on the principles of learning psychology for different age groups of students and different academic topics and covering all levels of learning, teacher guide books with a new approach to new educational technologies such as how to use educational multimedia should be reviewed and compiled.

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