The Effectiveness Of Web-based Curricula On Seventh Grade Mathematics Students In Jordan

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ABSTRACT

The purpose of this study is to investigate the effect of using web-based curricula on seventh grade students' achievement in mathematics in King Abdullah School in Irbid, Jordan. The researcher followed the equivalent pre/post T-test two group designs. To achieve the aim of the study, a pre/post-test was constructed to measure students' achievement in mathematics. The test consisted of twenty five questions on statistics and probability. The sample of the study comprised of (148) seventh grade students, they were 37 male students for the experimental group and 33 male students for the control group, while the female students for the experimental and control group were 38 and 40 respectively from King Abdullah School in Irbid during the first semester of the scholastic year 2009/2010. Descriptive statistical analyses were used (means and standard deviation) for the pre and post- tests of students' mathematical test to experimental and control groups. Comparison statistical methods were used (Two Way ANOVA) analysis of variance to make a comparison between the control and the experimental groups, gender variable (male and female), and interaction between them. The findings of the study indicated that there were statistically significant differences in the post-test between the control and the experimental groups in favor of the experimental group, and there was no statistically significant difference in the students' achievement due to gender. There was no statistically significant difference due to the interaction between gender and group. The researcher proposed some recommendations to enhance the effect of using performance-based assessment on students' language accuracy such as conducting further studies on other populations and for a longer time.

Keywords: Web-Based Curricula; Web-Based Mathematics Curricula

INTRODUCTION

Computers have been used as learning tools in education during the past decades. A better learning environment in education is provided by Computer-assisted instruction (Chang, Sung, & Lin, 2006; Crook, 1994; Li & Edmonds, 2005; Liao, 2007; Lin, 2008; Niewiec & Walberg, 1987; Ragasa, 2008). Through the Internet dynamic and interactive Web sites related to mathematics teaching and learning can be easily reached nowadays.

Among the wide range of available media for helping people learn, web technology is only one alternative (Boisvert, 2000). According to (Sabry & Baldwin, 2003), increasingly, web technology is becoming commonplace in educational institutions and is used for learning interaction (Nielsen NetRatings, 2002; McGraw-Hill, 2002, Whittington and Campbell, 1998; Collis et al, 2000).

Web-based Learning is considered as a method of computer-supported teaching. The effects of computer based environments on student learning have been studied by several researchers and have shown it to be effective in facilitating conceptual understanding and mastery of both content and process (Friedler et al., 1990; Leonard, 1990; Lunnetta and Hofstein, 1981; Rivers and Vokell, 1987). Since learning through discovery in a computer environment generally provides greater gains for high ability students and greater losses for low ability students, excessive use of unassisted or unguided exploratory activities could impede learning (Berger et al., 1994).

According to National Council of Teachers Mathematics, (2000), technology influences the mathematics that is taught and enhances students' learning, it is essential in teaching and learning mathematics. Teachers' attitudes play an important role in using technology in learning and teaching mathematics (p. 24). It is very important to improve teachers' attitudes toward using computers in the classroom because it may enhance mathematics teaching and learning. However, many in-service and pre-service teachers are unfamiliar with the types of technology available for teachers. Moreover, not all teachers are trained well on how to properly incorporate technology in the classroom (Doering, Huffman, & Hughes, 2003).

SIGNIFICANCE OF THE STUDY

The current study on the effect of using web-based curricula on students' achievement in mathematics is expected to serve two goals: To find solutions to some of the problems of using technology in Jordanian Schools and to help with integrating new ways of instruction in mathematics to meet the new century demand.

The choice of the topic for this study is motivated by several factors: Firstly, the study may motivate other researchers to reconsider the using of different types of curricula used nowadays. Secondly, the study responds to the increased demand in the use of technological instruction in education to meet the new educational needs. And finally, the using of web-based curricula might be a source of excitement and motivation to Jordanian students in their mathematic courses.

STATEMENT OF THE PROBLEM

Having observed some classes for teaching mathematics at some Jordanian Schools, the researcher noticed that students most often memorize information about statistics and probability, they learn without interaction with the material. They lack the motivation for learning mathematics. To solve this problem, the researcher aims at using web-based curricula and investigates its' effect on students achievement in mathematics.

PURPOSE OF THE STUDY

The purpose of this study was to compare the effectiveness of using web-based curricula compared to traditional curricula on students' achievement on mathematics.

RESEARCH QUESTIONS

1. Are there any statistically significant differences (α=0, 05) in the achievement of seventh grade students in mathematics due to the kind of curricula they are exposed to (web-based curricula and traditional curricula)?
2. Are there any statistically significant differences (α=0, 05) in the achievement of seventh grade students in mathematics due to the gender?

LIMITATIONS OF THE STUDY

This study is limited to the male and female seventh grade students at King Abdulla School in Irbid, and to any other similar samples. Besides, it is limited to the instrument which was developed by the researcher for the sake of the study.

REVIEW OF RELATED LITERATURE

The effectiveness of spreadsheets and dynamic geometry software on achievement has been examined by Research on technology integration in mathematics education (Isikal & Askar, 2005), computers and 2D geometric learning (Olkun, Altun, & Smith, 2005), and dynamic geometry sketches (Sinclair, 2004). The effect of computers in mathematics teaching and learning was supported by the findings of many studies. For example, Isikal and Askar (2005) investigated the effect of spreadsheet and dynamic geometry software on mathematics self-efficacy and mathematics achievement. The results indicate that students' mathematics achievement is improved by using

technology effectively as a learning tool. Olkun et al. (2005) found that students who had lower geometry scores are those who did not have computers at home. Therefore, Olkun (2005) suggests that it seems more effective to combine technology and mathematical content in a manner that enables students to do playful mathematical discoveries in schools.

A study was conducted by Spence (2004) in which he didn't found any significant influence of gender on the achievement of college students in mathematics when they were exposed to mathematics courseware in online and traditional learning environment. However, compared to their traditional female counterpart or male online counterparts, female online learners were significantly less likely to complete the course. Kirkpatrick and Cuban (1998) reviewed some studies on access, attitude, use, and achievement with computer and they concluded that when female and male students at all levels of education had the same amount and types of experiences on computers, female achievement scores and attitudes are similar in computer classes and classes using computer.

Barak and Dori (2005), in their study have been contributed to students' investigation of real life problems in a scientific manner as a student centered when they wanted to enhance achievement of university chemistry students with the information-assisted project-based learning. In this study, the students who were in the control group have solved traditional problems while the students who were in the experimental group have taken responsibility for the individual information technology projects. The projects have included the explanation of some scientific events and the researches about chemistry theories, the demonstration of molecular models with computer. It has been found that the performances of the students' of the control group were lower than students who participated to project-based learning applications in posttest and their final achievement. Namely, the freshman students' understanding of chemical concepts, theories and molecule structures has been enhanced by the project-based learning, which was enriched with information technologies.

Ganguli (1992) investigated the effect of the computer as a teaching aid on students' attitudes. The experimental group consisted of fifty-one students that involved a computer as an aid in teaching mathematical concepts. The control group consisted of fifty-nine students who were taught using traditional methods. The results indicated a significant treatment effect on students' attitudes in favor of the use of a computer as a teaching aid.

Tilidetzke (1992) investigated differences in achievement for experimental groups using computer algebra tutorials for three pre calculus topics compared to control groups learning college algebra using traditional classroom instruction methods. The results indicated no significant difference in mean scores on a post-test or a delayed post-test between computer assisted instruction and traditional instruction in a college algebra course when studying three topics of course material with two hours of computer lab time.

The effects of 38 sophomore college students in the basic statistics taught with the use of computer assisted instruction and 15 students with the use of the traditional method on the basic statistics achievement were compared by Ragasa (2008). The results show that there were statistically significant differences on students' achievement in post-test.

METHODS AND PROCEDURES

In this chapter the researcher discusses the procedures that she used to conduct the study. She describes the study population, sample, variables, instrument, procedures and the statistical analyses that were used in the study.

POPULATION OF THE STUDY

The population of the study consisted of:

All the students who are enrolling in King Abdullah School in Irbid during the first semester 2009/2010, they form (869); females and males.

SAMPLE OF THE STUDY

The sample of the study comprised of (148) seventh grade students, they were 37 male students for the experimental group and 33 male students for the control group, while the female students for the experimental and control group were 38 and 40 respectively.

VARIABLES OF THE STUDY

The independent variables include (1) The kind of curricula (web-based curricula, and traditional curricula) and (2) male or female. The dependent variable is the students' achievement in mathematics.

DESIGN OF THE STUDY

This study was carried out to follow the equivalent pre /post-test two-group design. The experiment consisted of two levels: The subjects of the experimental group were exposed to the web-based curricula for (8) weeks. However, the subjects of the control group were exposed to the traditional curricula for the same period. A pre-test was given before the application of the new strategy to both groups to make sure they are equivalent and the same test was administered as a post-test after applying the new strategy to see whether the web-based curricula had any influence on the experimental group and which kind of curricula had more influence on the subjects than the other.

INSTRUMENT OF THE STUDY

The researcher designed a test based on the instructional material of the 7^{th} Grade mathematics book to collect the data. Validity and reliability were ensured.

Both groups; the experimental group as well the control group, were taught by their teachers. The subjects in both groups underwent a pre-test to determine their actual level before starting the experiment, and the same test was administered as a post-test at the end of the experiment to assess subjects' achievement. The time interval between the pre-test and the post-test was (8) weeks; a period long enough to minimize the effect of the pre-test on the results and conclusions of the experiment. The test contained twenty five items (Appendix A).

RELIABILITY OF THE INSTRUMENT

To ensure the test reliability, the researcher followed test/retest technique. The researcher applied it to a pilot sample of (15) students outside the study sample in the same school in which the researcher will conduct his study with a two-week period between the two tests. By using correlation coefficient, the reliability of the test was calculated and found to be 0.88. This is appropriate for conducting such a study.

VALIDITY OF THE INSTRUMENT

The researcher constructed the achievement test taking into consideration the instructional material. The researcher validated the instrument by submitting it to a jury of two IT professors teaching at Al-Albayt University, three supervisors of mathematics working at the Directorate of Education, and two 7^{th} grade teachers of mathematics. The researcher followed the recommendations of the referees and made amendments accordingly. When producing the final version of the test, the remarks and recommendations of these mathematics experts were taken into account.

INSTRUCTIONAL MATERIAL

The instructional material is the seventh grade mathematics textbook. It consists of five units, but the researcher supposed to cover at least three units during the application period.

PROCEDURES OF THE STUDY

There were four groups of students: two experimental groups and two control groups. All groups received 8 weeks of instruction on the statistics and probability units. Topics related to statistics and probability concepts were covered as part of the regular classroom curriculum in Mathematics Content and Methods for the Elementary School course. The topics were statistics and probability concepts. Students in the experimental groups received instruction using Internet computer applets on the mathematics content. They spent all of their class time using WBI.

Interactive WBI was developed, as research suggests that animated demonstration may be more efficiently processed by learners than non animated demonstration (Wender & Muehlboeck, 2003). Therefore, students in the experimental groups had tasks making use of dynamic animated representations on computers.

The selected Internet computer applets are interactive and can illustrate a concept through attractive animation, sound, and demonstration. In addition, they allow students to progress at their own pace and to work individually or to problem solve in a group.

They provide immediate feedback, letting students know whether their answers are correct. If an answer is not correct, the program shows students how to answer the question correctly, and this helps them strengthen their procedural knowledge of statistics and probability. For the conceptual knowledge of statistics and probability, they could find many solutions (Becker & Shimada, 1997; Hashimoto & Becker, 1999) for many problems on the Internet. In addition, they could find a story or a meaning to explain some other problems on the Internet computer programs.

Students in the control group were instructed using traditional curricula. The traditional instruction in this study was lectures given by a teacher, use of textbooks and other materials, and a clear explanation of procedural knowledge and conceptual knowledge of statistics and probability to students. The teacher reviewed some of the textbook topics. They spent their class time using hands-on and manipulative activities. However, they did not have any tasks that made use of dynamic representations on computers.

FINDINGS OF THE STUDY

The purpose of this study is to investigate the effect of using web-based curricula on seventh grade students' achievement in King Abdullah School. The researcher followed the equivalent pre/post test two group designs. Therefore, the means, standard deviations and Two-Way ANOVA analysis of variance were used to analyze data. The results will be displayed based on the questions of the research.

To determine if there is a statistically significant difference between the male and the female groups, a T-test for independent samples was conducted. Table 1 shows the results.

Table 1: Means and Standard Deviations of the Achievement of Male and Female Groups on the Pre-test

Group	Sex	Mean	Std. Deviation	N
Experimental	Male	54.16	6.016	37
	Female	54.87	9.329	38
	Total	54.52	7.826	75
Control	Male	56.15	7.357	33
	Female	53.65	6.945	40
	Total	54.78	7.194	73
Total	Male	55.10	6.707	70
	Female	54.24	8.163	78
	Total	54.65	7.497	148

Table 1 shows the mean and standard deviation of the groups on the pre-test. It shows the experimental group at 54.52. While the control group at 54.78. As for the males and females, the males were 55.10 and the female were 54.24.

To determine if the two groups are equivalent in their performance in mathematics, a pre-test was conducted and Table 2 presents the results.

Table 2: Two-way ANOVAs Results of the Experimental and the Control Groups on the Pre-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Group	5.470	1	5.470	.097	.756
Sex	29.665	1	29.665	.525	.470
Group * Sex	94.710	1	94.710	1.676	.198
Error	8136.712	144	56.505		
Corrected Total	8261.730	147			

Based on the Two-way ANOVAs on the pre-test, the groups were equivalent. Hence, level of significance is .756 while is not significant at α≤0, 05. Also the groups in terms of gender were equivalent at a level of .470 this is not statistically significant at α≤0, 05. This means that the groups were equivalent on the pre-test.

At the end of the experiment, a T-test for independent samples was conducted to determine if there was any statistically significant difference between the males and the females on the posttest, which may be attributed to gender. Table 3 shows the results.

Table 3: Mean and Standard Deviations of the Achievement of Male and Female Groups on the Posttest

Group	Sex	Mean	Std. Deviation	N
Experimental	Male	84.59	8.503	37
	Female	87.13	6.983	38
	Total	85.88	7.822	75
Control	Male	76.94	9.601	33
	Female	79.60	11.322	40
	Total	78.40	10.592	73
Total	Male	80.99	9.762	70
	Female	83.27	10.135	78
	Total	82.19	9.992	148

Table 3 shows the mean and standard deviation of the groups on the post-test. It shows the experimental group at 85.88. While the control group at 78.40. As for the males and females, the males were 80.99 and the female were 83.27.

The researcher also conducted a two-way analysis of variance to analyze the posttest achievement scores of the two groups. Table 4 shows the results.

Table 4: Summary of the Two-way Analysis of Variance of the Achievement of the control and the Experimental Groups on the Post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Group	2122.845	1	2122.845	24.739	.000
Sex	248.651	1	248.651	2.898	.091
Group * Sex	.141	1	.141	.002	.968
Error	12356.740	144	85.811		
Corrected Total	14676.703	147			

To answer the first question: Are there any statistically significant differences (α≤0, 05) in the achievement of seventh grade students' in mathematics due to the kind of curricula they are exposed to (web-based curricula and traditional curricula)? The table shows that the level of significance is .000 which is statistically significant at α≤0, 05 on favor of the experimental group. To answer the second question: Are there any statistically significant differences (α≤0, 05) in the achievement of seventh grade students' in mathematics due to the gender? Table five shows significance .091 which means it is not significant at (α≤0, 05)

To sum up, the researcher believes that the difference in the achievement of the seventh grade students was attributed to the using of web-based curricula. The experimental group subjects managed to significantly improve their mathematical proficiency they already have in a period of 8 weeks. The improvement achieved by the control group subjects, however, was not statistically significant. By comparing the results achieved by the two groups, the researcher reached the conclusion that the improvement achieved by the experimental group may have been attributed to the way he rendered instruction; using web-based curricula.

As a result of this experience, the researcher concluded that students were more engaged in learning when they were given a chance to use technology such as web-based curricula.

Furthermore, using internet in general is a powerful tool with which students can learn mathematics with entertainment.

CONCLUSION

The results of the study revealed that using web-based curricula has a positive effect on the academic achievement of students, the findings of this study indicated that there were no statistically significant differences in the pre-test scores between the experimental and control groups. There was also no statistically significant difference in students' scores due to their gender. This indicated that the experimental and the control groups were equivalent before treatment.

After treatment, the experimental group got higher mean scores than the control group. The study also showed that there was statistically significant difference in a post-test between the control group and the experimental group in favor of the experimental group and this means that the using of web-based curricula is better than using the traditional curricula in developing students' achievement.

DISCUSSION

Web sites helped students explain why and how they work and also helped them do the basic statistics and probability constructions. Moreover, students are encouraged to use visual models to experience statistics and probability through interactive Internet resources. Second, interactive Web sites provided a rich environment for animated demonstration. Animated demonstration facilitates connections between a mathematical expression and the situation to which it refers, these made possible by the dynamic interactive Web sites. Students are helped not to stick a diagram in a book that cannot be examined or explored or to a description in words and symbols.

Students' participation in web-based instruction helped them to acquire meaningful learning in both conceptual and procedural knowledge of statistics and probability serve as a result to the greater success of students in the experimental group. They utilized different representations they found in the interactive Web sites encouraged their conceptual restructuring and also helped them in facilitating their understanding. In addition, web-based instruction encouraged students to use interactive and virtual representations. This helped them deepen their conceptual understanding of statistics and probability computations and to avoid some struggles and frustrations in addition to strengthen their procedural knowledge of statistics and probability. Therefore, it is recommended that mathematics teacher education programs should take into consideration the use of technology for training teachers to teach statistics and probability effectively in tomorrow's mathematics classroom.

RECOMMENDATIONS FOR FUTURE RESEARCH

If this study is to be replicated to bring further significance, some changes should be made

- Perform the experiment over a longer period of time so that students have adequate time to unlearn current habits of traditional curricula and become more familiar with the web-based curricula.
- Conducting other studies to investigate the effect of web-based curricula on other subjects such as English language.
- Conducting other studies on other classes in addition to seventh graders so that more students of different levels may be included to make generalizations more valid.

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