The Impact of Applying Computer-Based Training Strategy upon Developing the Skill of Solving Mathematical Word Problem among Students with Learning Disabilities

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Abstract

The present study aimed to investigate the impact of applying a computerized strategy based on training upon developing the skill of Math word problem solving among students with learning disabilities (attention-deficit) in Mathematics. The study sample consisted of (14) students with learning disabilities in Mathematics, randomly chosen from elementary public

schools in the city of Najran, Saudi Arabia, and distributed evenly into two groups: The control group (7) students who studied in the traditional way and the experimental group (7) students who studied in computer-based training strategy. Pre-and-post achievement test conducted in Mathematics. The results showed that there are statistically significant differences at the post-achievement test in mathematics in the skill of Math word problem solving in favor of members of the experimental group, which indicates the effectiveness of the computer-based training strategy upon developing the skill of Math word problem solving. Accordingly, the study made several recommendations; the most notably is urging official bodies and educational institutions to provide educational computerized software and to be circulated to elementary public education schools.

Keywords: computerized strategy, math word problem, students with learning disabilities

1. Introduction

Rapid development in teaching and learning strategies occurred in the 20th century; hence, it has become difficult to expect the individual's performance in the future. So, the total objectives of education have been directed to develop the ability to solve problems, which is the most important capability that should be reinforced among students to help them adapt and cope with various problems in the rapidly-changing life.

Utilizing of computer capabilities and benefiting from them is an apparent feature of the present era because of the benefits that emerged from life styles. We should adapt to these rapid changes in our societies that will build comprehensive and integrated policies and cultures in order to ensure getting rid of the traditional pattern in the daily and professional life and reinforce the scientific, analytical, and experimental methodology as a way to solve problems and various issues; where the scientific and technological progress is closely related to computer systems and software. So, the official educational institutions are required to do their best to cope with such growing challenge for which concerted efforts are required to technologically qualify our children for making them capable of adaptation and competition (Sobh and Ajlouni, 2003).

In this connection, Ray (2002) indicated that students have positive attitudes towards learning by modern strategies, which differ from traditional strategies, such as using the Internet, e-learning and computer software. Anil (2002), Kara (2009) and Dinder (2008) confirmed that it is needed to design new strategies in learning Mathematics that contribute to the acquisition of skills necessary to solve Math word problems among students of learning disabilities (attention-deficit).

The emergence of software techniques entitled us to apply them easily in all professional areas of life, especially in education and learning. In this regard, Al-sabagh (2005) pointed out that Mathematics based on the inductive method to get mathematical knowledge included some scientific skills such as drawing, measurement, and solving math word problems. Math requires particular arrangement to provide the subject matters. It helps the students develop their thoughts to make them able to take decisions and make solutions appropriate to confront

the problems and attitudes in daily and future life; so it is necessary to use modern scientific methods that contribute to improve math learning, such as computer and software techniques.

Nunes and Moreno (2005) assured that educational technology has been recently utilized in all educational trends, as the computer played a major role in teaching all courses and at all various levels of education. Therefore, the current study seeks to convey the significance of utilizing a computerized strategy based on training in Mathematics; because of its impact on improving the level of students with learning disabilities (attention-deficit) in solving Math word problem.

A number of Arab and foreign studies confirmed the obvious impact of using the computer upon the academic achievement of the students, where Abu-Raiya (1993) pointed in his study to the use of computerized learning-by-playing strategy in the acquisition of skills of the four arithmetic operations among students of the elementary sixth grade in private schools of Amman, Jordan. The results showed that there were statistically significant differences in the academic achievement of participants in the four arithmetic skills due to the computerized learning-by-playing strategy. Shashanni (1995) and Kirkpatrik & Caban (1998) confirmed that the study of Mathematics through the computerized software has a positive impact on student achievement in Mathematics. Martindale, Pearson and Curda (2005) showed that there is an impact of the use of educational software in Mathematics upon improving the fifth grade students' performance in Math and the statistical differences were in favor of the experimental group. Al-Maliki (2008) showed that there is an effect of utilizing the enriching activities by a computer program in the treatment of learning disabilities in Mathematics among a sample of third grade students with learning disabilities and the differences were in favor of the experimental group. Bcal and qu, lee (2008) confirmed that the computer software contributes to the development of motivation and achievement in Mathematics among students. Dinder (2008) also confirmed that the use of computer educational software contributed to increasing the student achievement of Mathematics in the elementary stage. Kara (2009) assured that the use of educational computer software contributed to the development of achievement for students in improving their attitudes towards Science and Mathematics. The study of Jeanine, et al. (2012), conducted in the southwestern of America, showed that there is an impact of the use of educational computer activities over the Internet upon improving academic achievement among students with learning disabilities in Mathematics.

Reviewing the pieces of literature mentioned above supports conducting the current study and achieving its objectives because Saudi Arabia lacks such studies to detect the effectiveness of applying computerized strategy for the acquisition of skills of solving Math word problems among students with learning disabilities (attention-deficit) in Mathematics in elementary schools.

2. Statement of the Problem

The studies conducted on Mathematics pointed that the students are low-achievers in the skill of solving mathematical problems and showed that there is a need to design new strategies in teaching of Mathematics that contribute to the acquisition of skills necessary to solve Math

word problems – these results shown in Hall (2002), Marge (2002), the study of Ersan & AbuZeina (2005) and the study of Al-Maliki (2008).

Therefore, the study sought to detect the effectiveness of a computer-based training strategy to develop skills of solving Math word problem among students with learning disabilities (attention-deficit) in Mathematics. Thereby, the study tried to answer the following two questions:

1. Are there statistically significant differences at the level of (a = 0.05) between the control group and the experimental group on the pre-test of skill of solving Math word problem?

2. Are there statistically significant differences at the level of (a = 0.05) between the control group and the experimental group on the post-test of skill of solving Math word problem?

2.1 The Significance of the Study

−   The results of this study draws the attention of educators and planners of programs and curricula to the importance of computerized strategy based on training in the teaching process, especially in mathematics; because of its impact on improving the level of students with learning disabilities (attention-deficit)in solving Math word problem.

−   The computer-based training has the ability to make the learner active and effective during the acquisition of facts, skills and processes, in addition to the lack of Saudi Arabia studies on this topic; hence, there is a real need to investigate the effect of using computer software to acquire skills of solving Math word problems among students with learning disabilities in elementary schools.

−   Parents are given an active role in the education of their children with learning disabilities (attention-deficit) inside the house with less effort and cost.

2.2 Study Population and Sample

The study population consisted of all students with learning disabilities in Mathematics in the city of Najran, enrolled in the program of learning disabilities in elementary schools for the academic year 2014/2015, numbered (70) students. The study sample consisted of (14) students with learning disabilities (attention-deficit)in Mathematics in the city of Najran, selected randomly from two schools, the control group is (7) students and the experimental group is (7) students as well.

2.3 Instruments

2.3.1 First: Mathematics Achievement Test

The authors of the current study developed a pre-and-post achievement test in Math word problems to measure the level of students with learning disabilities (attention-deficit) (the

participants) in solving Math word problems. The number of paragraphs of the test is (20) Math word problems of multiple choice. The authors prepared the test considering test instructions, objectives, and how to answer it. They made sure that each paragraph must measure the four arithmetic skills (addition, subtraction, multiplication and division).

Test Validity and Reliability

A number of professors at the College of Education in Najran University, as well as supervisors and teachers who teach Mathematics for elementary school students reviewed and evaluated the test paragraphs and items. They expressed their opinion about the appropriateness of the paragraphs of the test for students with learning disabilities in Mathematics of the elementary stage, and necessary modifications have been made in line with the recommendations of the reviewers.

The test has been applied in its final draft to a sample of (10) students from non-study sample in order to verify reliability in a way of Re-test (Test-Retest) with seven-day interval, where Pearson correlation coefficient value was (0.80) that considered an appropriate score for the purposes of the study.

2.3.2 Secondly: Computer-based training strategy

Training-based computerized strategy is the most common strategy, it is the first strategy used in teaching, so named because it helps the student review the scientific material and training, and it does not provide new information. Accordingly, it is the individual's ability to learn and train through computer programs that are mentally, skillfully, and scientifically suitable to the capabilities of the learner, so learner can feel confident during the learning process.

Computers offer a range of exercises and questions on Math word problems that have been explained by the teacher in order to enhance and enrich the student's skills, these exercises are offered individually so that the student can master the skill.

2.4 Steps of Preparing the Strategy

The following steps are followed to prepare this strategy:

1. Access to educational literature review to identify this training-based strategy, in terms of concept, its components, teaching methods, and how to apply it educationally, especially to Mathematics.

2. Access to literature review that have designed educational strategies in teaching of various courses, especially Mathematics, in order to determine the objectives of teaching, and how to follow the teaching methods.

3. Designing the computerized strategy through (Power Point) tech.

4. Setting a schedule for achieving the objectives, content of strategy based on the Mathematics curriculum at the elementary level. The strategy application took two weeks: one session a day.

5. The strategy designed in collaboration with specialists, supervisors and teachers in Mathematics from the city of Najran.

6. Validity of the strategy content has been verified through presenting it to a group of evaluators and reviewers in Mathematics and Computer to give their feedback about the system and the content of the course related to solving Math wordproblems, the methods used in teaching, and the appropriateness of the strategy to the level students.

7. It was agreed with the teacher, who is responsible for teaching the experimental group, that the teaching process is monitored by the authors of the study themselves, for verifying that the teacher applied this strategy.

2.5 Elements of the strategy

1. Introduction to the subject of training: It is a reboot of the learner for the training process.

2. Thread the shape and type is included in the program: texts, charges and pictures.

3. Stop: the learner can stop during the learning process and the closure of the program then returns to the program to be able to end it.

4. The sentence response: the learner can recognize the result of what he learned through feedback in the program.

2.6 Application

The study was conducted in the second semester of the academic year 2014/2015, the teachers in learning disabilities was trained in Al-Markib Elementary School on how to use the training-based software, the teachers of mathematics at the school conducted a pre-test for all members of the study sample and then divided the students randomly into two groups: experimental group and control group, and began training the experimental group to skillfully solve the Math word problem through computerized strategy, with an average daily period for two weeks under the direct supervision of one of the authors. The control group had been trained by the math teacher in another school (Al-areysa Elementary School) with an average daily period for two weeks on the skills of solving word Math problem by the traditional method in the classroom.

At the end of the training, posttest of Math achievement applied to the study sample to measure their extent of achievement.

2.7 Statistical Analysis

After applying and conducting the present study, means and standard deviations of the total scores for the members of the study sample have been calculated. Mann-Whitney U Test was conducted to investigate statistically significant differences between the control group and the experimental group.

3. Results

3.1 Results of the First Question:

To answer this question, Mann-Whitney U Test was conducted to investigate statistically significant differences between the control group and the experimental group on the pre-test of the skill of solving Math word problem as shown in Table (1).

Test	Group	No.	Mean	Sum	Mann-Whitney	Z-Value	Significance Level
Pre-	Control	7	6.79	47.50	19.500	-.651	0.515
	Experimental	7	8.21	57.50			

Table (1) shows that there are no statistically significant differences between the means of the control group and the experimental group for pre-test of the skill of solving verbal math problem; where the value of "Z" is (-.651) with statistical significant (.515) that is bigger than the level of statistical significance. (a = 0.05).

3.2 Results of the Second Question

To answer this question, Mann-Whitney U Test was conducted to investigate statistically significant differences between the control group and the experimental group on the post-test of the skill of solving Math word problem as shown in Table (2).

Test	Group	No.	Mean	Sum	Mann-Whitney	Z-Value	Sig. Level
Post-	Control	7	4.00	28.00	.00001	-3.162	0.002
	Experimental	7	11.00	77.00			

Table (2) indicates that there are statistically significant differences between the means for members of the control group and the experimental group to the posttest for the skill of solving verbal math problem; where mean for members of the control group is (4.00), while mean for members of the experimental group is (11.00), and Z-value is (-3.162), statistically significant at (0.002) which is lower than the level of statistical significance (a= 0.05). Therefore, the results conclude that there is an effect of computerized strategy based on training on solving verbal math problem among students with learning disabilities.

4. Discussion

The results showed that there are statistically significant differences in the skill of solving the word Math problem in favor of the experimental group members who have studied using a computerized strategy based on training compared to members of the control group who studied in the traditional method, which means that the strategy used in this study has been effective in the development of skill of solving verbal math problem among the members of the experimental group. The current results are consistent with Al-Maliki (2008), who showed that there was an effect of utilizing the enriching activities by a computer program in

the treatment of learning disabilities in Mathematics among a sample of third grade students with learning disabilities and the differences were in favor of the experimental group.

The study resulted that the computerized strategy is effective in making the student with learning disabilities learn actively and effectively during the acquisition of skills in educational situations full of excitement and competition, where educational programs take care of the capabilities of the learners, and enable them to learn according to their abilities. In addition, the computer software includes a collection of graphics, shapes, colors and music in educational units that provide entertainment and fun.

The authors of the current study confirm that the environment provided by the computer during the learning and teaching process in terms of communication and interaction among learners reflects positive attitudes among those students towards computer software as an educational method on the one hand, and towards courses that are taught on the other hand, which increases the motivation to learn, and thus increases their academic achievement in Mathematics, The attitudes of student with learning disabilities towards the use of computer software as an educational method are affected to a large extent with the efficiency and effectiveness of the entire computerized software. Therefore, the results given here are consistent with the study of Jeanine et al. (2012), conducted in the southwestern of America, which showed that there was an impact of the use of educational computer activities over the Internet upon improving academic achievement among students with learning disabilities in Mathematics.

The results of this study are in consistent with the results of studies that have pointed to the effectiveness of the computerized-learning method over the traditional learning method, although those studies have been conducted in other communities, and addressed various grades and measurement tools such as the study of Sobh and Ajlouni (2003), Martindale et al. (2005), Maliki (2008), Dinder (2008) and Kara (2009).

5. Recommendations

In the light of the results of the study, the authors recommend the following:

1. Conducting further studies about the impact of the use of computerized strategy based on training on developing the skill of solving problems, creative thinking and critical thinking among students with learning disabilities.

2. The educational institutions must provide educational computerized software for elementary school students in public schools.

3. Teachers of Mathematics at the elementary level should be made aware of the importance of applying the computer software in education.

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