

The Effect of Math prof 4.0 Software to Facilitate LSD Students' Learning Geometry

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ABSTRACT

This study aimed to evaluate the effect of math pro 4.0 software to facilitate LSD students' learning of geometry. The method of this study was quasi-experimental and pre-test and post-test design with a control group. To fulfill the purpose of this study, 30 students with learning difficulties in mathematics were selected from all female students in six grade in Qaemshahr after the diagnostic test (Wechsler intelligence test for children and also Iranian KI MAAT diagnostic test) in the form of cluster multi-stage random sampling. Then they randomly assigned to two experimental and control groups. Experimental group was trained educational software for 10 sessions, but the control group did not receive any treatment. Data obtained were analyzed by using variance analysis combined of repeated measurements. Data analysis showed that there was significant difference between mean scores of the geometry of experimental group and control group. Therefore, on the basis of this study it can be concluded that the educational software program facilitated learning geometry among students with math learning inability in mathematics, and applying this educational method led to stability of learning (after 3 months) in the group of children. Based on the results of this research it can be suggested to a learning disorder specialists and psychologists and teachers to use *math pro 4.0* software and other similar math software to facilitate learning geometry of students with math learning inability.

KEY WORDS: *Math pro 4.0* Software- math learning inability- geometry- sixth grade students.

INTRODUCTION

One of the most important courses in primary school is mathematics. Because mathematical learning helps children to improve their ways of understanding the world around. Children live in a world that is rapidly changing. So what is important is to learn the methods of collecting information and update them, and not just receive information as an educational package. Approach to teaching mathematics should bring students to discover and witnesses, prepare her to research, accustom her to logical thinking, encourage her to question and search and be creative mind. To make her happy to math, demonstrating its widespread use in everyday life, we should compatible whatever she wants to learn with the real world. Compatibility to learn what is supposed to be compatible with the real world. Teaching and learning mathematics is more than transformation of concepts and definitions. Planning is also responsible for the development and teaching mathematics, motivation and training creativity for applying and making communication between students learning. The traditional method of teaching mathematics with experience of many years has failed to properly carry out the task of learning for all students, especially those who have a difficulty in learning (Thornton and Langral and Jones, 1997 quoted Mir-Hosseini, 2010). The most basic mathematical concepts that have been studied by mankind is "geometry" (Willow Abad, 2000) in which properties flat and space shapes are discussed. Geometry is an ancient source and it was almost equal to mathematics in ancient times (Alemzadeh, 1999). According to the concept of holistic learning, teaching mathematics includes all learners of all ages and all levels from early childhood to adulthood. The issues that arise in teaching mathematics have different quality and quantity. As these issues includes the most minor to the most general mathematics topics, teaching and learning processes, teaching methods, learning styles and educational programming (Ebrahim Abadi, 2009). Mathematics learning disorder is now recognized as disabilities that are serious problems in school learning. Accordingly, they cause the major challenges for family members and professionals (Hardman and others, translation Alizadeh et al., 2010). Under the guidance of the Diagnostic and Statistical Mental Disorders (DSM-IV) a type of learning disorder is mathematics disorder. Which identified as deficiencies in four groups of skills: 1-verbal skills 2- perceptual skills, 3. mathematical skills, 4- attention skills (Kaplan and Sadock, translated by Rafiei and Sobhanian, 2009).

Impaired students in mathematics operate significantly below the standards expected in cases such as the four main actions, spatial – perception skills (e.g. copy of an image, calculating the sum total or recognition of the number of cubic in a shape, understanding the mathematics signs and concepts, providing the correct solution in verbal problems and use of relevant numbers to the problem and learning multiplication tables (Fryar and Derakhshan, 1992). The mathematics differentiating factors include: (1) the perceived motion (2)

differentiating visual disability (3) visual disability movement (4) inability perceptual speed (5) visual-spatial differentiation. Ability to successfully understand spatial in mathematics, geometry and algebra is correlated. Children who have problem to understand the communication between lines and objects in space will have a lot of problems in recognition or reconstruction of geometric shapes and design.

Computer technology entered to teach math skills to people with learning disabilities and it's expected that computer technology can play a greater role in teaching. Computers can provide beneficial and efficient teaching for some students with learning disabilities (Hardman *et al.*, translated by Alizadeh and others, 2010). The use of ICT to achieve quality learning is inevitable for all, hence the revision of the traditional ways of teaching and learning and its replacement is necessary (Garrison & Anderson, 2003, translated by Zarei and Safai 2005). Educational multimedia combination of text, graphics, sound, animation, and video animation which is available for users through computers or other electronic equipment (Keynejad, 2008). Meyer (2001), states that an educational multimedia message is, the communication, using words and images which lead to promote learning (according to Avaz Zadeh, 2005). Elements of a multimedia system consists of several elements, including: (a) text (b) graphics (C) computer animation (D) digital video, (E) voice, etc. which are combined by the manufacturer's software. Today, with the development of vast amount of knowledge and the latest scientific research and development of new technologies as well as smart schools and virtual learning (On Line) in Education Organization, the need to use active model of teaching in class to be felt harder (Miza Begay, 2001). The choose of mentioned styles makes traditional teaching methods increase the learning math more difficult (Movafagh Azad, 1999). This is the need to use active patterns of teaching which lead teaching from one-way to interactive way (teaching - learning).

Knowing that the mathematical understanding has been actually created by every learner, we need to intervene in this process in order to support it, assign a time for exploration, discussion about the correct answer that is irrelevant, speak properly, use of assistive technology, and with the support and understanding of students vision.

Considering that one of the major problems of elementary students is to solve problems in geometry topics in mathematics, and this disrupts their academic performance, so the researcher was going to investigate the effect of on Math prof 4.0 software to facilitate LSD students' learning geometry.

Therefore, given the importance of this issue, the question of this study include:

1. Do math pro 4.0 software facilitates LSD students learning geometry?
2. Do the software math pro 4.0, will lead to retain learning method in students with mathematics learning disorder?

4. METHODS

The method of this study was quasi-experimental design and pre-test and post-test with control group.

5. Population, Sample and Sampling Procedure

The method of this study was quasi-experimental and pretest-posttest design with control group. The population of this research was 2560 sixth grade students in Qaemshahr in the academic year of 2013-2014. In this study, subjects selected through cluster multi-stage random sampling. Four schools were selected randomly first among elementary female schools of Qaemshahr in a region, then among the region's schools. After that 6 sixth grade classes were selected randomly. Among these mentioned classes, 45 students were selected based on the teacher's ideas and symptoms of mathematical problems. After performing diagnostic tests (Wechsler Intelligence Scale for Children and test Iranian KI MAAT diagnostic test), 30 students with mathematical problems were selected and randomly assigned into two groups (an experimental group and a control group, the number of each group was 15). After running the pre-tests on both groups, experimental group were taught in the use of educational software for 10 sessions (45 minutes). The control group did not received any treatment. Immediately after completion of teaching, the post- test was carried out on groups. To investigate the stability of the teaching, after three months of teaching, follow-up test was performed on both groups. At the end data were analyzed by using variance analysis combined of repeated measurements.

6. Research Tools

Wechsler Intelligence Test for Children was used to measure the subjects' IQ (Shahim, 2006) and to diagnose the mathematics disorder Iranian KI MAAT diagnostic test was applied.

1. The Use of Software

1.1 Math pro 4.0 Software: Math pro 4.0 Software is a specialized mathematical software which is easy to use and versatile. The mathematical concepts are shown clear and easy in the software environment with two and three-dimensional charts. The software includes a significant number of solved and dynamic math

examples which have application in different mathematic discussions. This software has the ability to calculate the most important indicators of mathematical functions remarkable accuracy. And in this case, this software is superior a lot of graphical and geometrical soft wares such as algebra (Shah Mohammadi, Maryam).

2.1 Researcher made educational software: The characteristics of education using educational software: designing of application keys, the test / evaluation and using of graphics and animation and music (Yavari, 2006). Two kinds of feedback are applied in designed software: a) consecutive feedback b) non-consecutive feedback, positive feedback was applied more (Yavari, 2006). Selection authority (Mohammadi, 2005). Test section: click on the "test" in the main page, consequently another page opens. And some keys are embedded in that page such as the four options, connect, match, fill in the blanks, true and false and descriptive questions (math of sixth grade). Click on the different options to open the question pages. So users can answer the questions. If the answer is wrong, it will be given the opportunity to resolve it. And also the correct answer will be given if the answer is false.

3) Wechsler Intelligence Scale for Children-Revised (WISC-R): WISC-R was used to measure the intelligence quotient (IQ) of students who had mathematic disorder. It has two subscales: verbal IQ (information, similarities, math, vocabulary, comprehension and digit span) and non-verbal intelligence (complete pictures, designing of cubes, arranging of images, the incorporation of parts, switching and مزها) (Shahim, 2006). 3) Iranian diagnostic test of Key matt: It is one of the most important diagnostic test which is used by consultants, the experimenters and other educational groups to identify and recognize students' strengths and weaknesses or deficiencies in mathematical basic skills students use math this test has been revised. Student's performance is divided to three areas inn this test including:

- Fundamental concepts area: it includes three secondary subtest; counting, rational numbers and geometry
 - Operations area: addition, subtraction, multiplication, division and mental calculation
 - Field of application: sub-tests of measurement, time and money, estimates, analysis and problem solving
7. The method of implementation of educational sessions of software training

Before the implementation of the training, a meeting was organized to meet the educational environment and students. Then during ten sessions, the procedure was conducted as following:

1. Description of the importance and the application of mathematical educational software in the field of geometry.
2. Introduction to the software environment
3. Training of the course of "Measurement area" by the use of software "math prof 4"
4. Repetition and practice of "measurement are"
5. Training the topic of "geometric shapes" by the use of "math prof 4"
6. Repetition and practice of "geometric shapes"
7. Training the course of "measuring the volume" by the use of "math prof 4"
8. Repetition and practice of "measuring the volume"
9. Training the course of "The volume of geometric shapes"
10. Repetition and practice of "The volume of geometric shapes". (In all stages, the students see geometric shapes and geometric volumes directly in the computer). The test was administered in a predetermined session.

8. Results

To analyze the data, analysis of variance of repeated measures and least significant difference (LSD) were applied. Table (1) shows the result of mean and standard deviation obtained from the mean scores of geometry in experimental and control groups. The average scores of geometry in the experimental group from 47/3 in pretest to 93/7 in posttest and in the follow-up tests about 00/7 was increased. Therefore it can be concluded that there was a difference among the mean scores of pre-test, post-test and follow-up in experimental groups. But there was no different among the mean scores of the control group in these tests.

Table 1. Mean and standard deviation scores in geometry for the experimental and control groups

Follow-up test	posttest	pretest		
7/00	7/93	3/47	mean	Experimental
1/732	2/344	2/264	SD	
3/43	4/47	2/93	mean	Control
1/598	2/134	2/052	SD	

The obtained results, analysis of variance of repeated measures in the effectiveness of software "math prof 4.0" to facilitate the learning geometry of female students who have math disorder in the sixth grade in (Table 2), shows that the main effect of the group and test is significant at 0/001 and the interaction between the test and group also is significant at 0/001. Therefore, the results of statistical analysis of the hypothesis of this study show that learning the geometry of the experimental group compared with the control group significantly improved because of training by the use of educational software.

Table 2. The results of combined variance analysis (3×2) to investigate the effects of group and test on geometry scores of experimental and control groups

Level of significance	ratio F	Mean square	Degree of freedom	Total squares	Change sources
0/001	13/553	141/878	1	141/878	Between group
		10/468	28	293/111	Group
					Error
0/001	70/400	703/344	2	140/689	Within the group
0/001	22/029	22/011	2	44/922	Group interaction test and
		0/999	56	55/965	Test of error

The analysis of the main effects due to the interaction of the test and group is significant at $p < 0/001$, the main simple effects are investigated. So that the impact of test, in each group separately is studied by the use of one-way repeated measures analysis of variance test. The obtained results of the repeated measures analysis of variance test to study the effects of test on geometry scores of experimental group in table 3, shows the main effect of the test is significant at $p < 0/001$. This indicates that there is a significant difference among the means of the scores of pre-test, post-test and follow-up of the experimental group. But there is no significant difference among scores of control group. This means that learning of the geometry of the experimental group compared with the control group significantly improved because of educational software program.

Table 3. The results of the repeated measures analysis of variance to investigate the effects of test on learning geometry of experimental and control groups

Level of significance	F ratio	Mean square	Degree of freedom	Total squares	Change source	group
0/000	18/342	83/267	2	166/533	error	experimental group
		4/540	42	190/667	test	
0/102	2/41	9/089	2	18/178	error	control group
		3/771	42		test	

The results of the all four statistical characteristics F in Table 4 with the amount of 719/6 is significant at 0/003. Therefore the statistical result of the hypothesis of present study shows that learning of the geometry of the experimental group compared with the control group significantly improved because of educational software program. According to significance result of F value, least significant difference (LSD) was applied to investigate the mean difference among all scores.

Table 4. The results of 4 characteristics of F value of repeated measurement analysis about geometry scores of experimental and control group

Level of significance	Error degrees of freedom	Degrees of freedom of hypothesis	ratio F	value	Change sources
0/003	42	2	6/719	0/242	Pilaie test
0/003	42	2	6/719	0/758	Lambda Wilks
0/003	42	2	6/719	0/320	Hotelling
0/003	42	2	6/719	0/320	Rey test

Table 5. The post hoc test for comparison of the mean scores of geometry in pretest, posttest and follow-up

Level of significance	Standard error	Mean difference (I - J)	I	J
0/000	0/778	4/467	posttest	Pretest
0/000	0/778	3/533	Follow-up	
0/000	0/778	4/467	pretest	Posttest
0/237	0/778	0/933	Follow-up	
0/000	0/778	3/533	pretest	Follow-up
0/237	0/778	0/933	posttest	

The result of table 5 shows that the significant difference between pretest and posttest and also between pretest and follow-up. However, there was no significant difference between posttest and follow-up. In other word, the post hoc test shows that training effects by the use of math pro 4.0 software makes learning geometry in experimental group compared with the control group remained stable after 3 months. So in general, statistical

results show that training by educational software facilitates learning of geometry of students with mathematical disorder. It also leads to stability of the effects of treatment (after 3 months of treatment) in these students.

9- Conclusion

A lot of students have severely learning disorder to solve geometry questions. The present study investigated the impact of "math prof 4.0" software on facilitating learning of geometry on female students of the sixth grade in Qaemshahr who have mathematical disorder. The results of the research show that educational software training causes geometry learning of experimental group has improved significantly compared with control group. In addition to these results, this study shows that frequent using of educational software strengths solving of geometry questions on students who have mathematical learning disorder. Therefore, it can be concluded that the application of learning methods by the use of educational software results in facilitating of learning of students who have math learning disorder. In line with the results of the present study, Safi Yari (2007), Yavari (2006), Golzari (2004), and Zakeri (2003) study of California University (1978 quoted by Asadi) and Mehrmohammadi, Sheikhzadeh (2004) emphasized that there is a strong relation between the use of educational media and the amount of student's progress, and students with learning disorder need education, repetition and practice to extend their learning to real life. Studies in the field of teaching and learning suggests that the real goals, which result people's motivation, causes people learn the content in the best way (Bell Vshank, 1994). Traditional educational classes are not effective because they are dependent on time and specific research and are not able to provide real context for learning. Information and communication technology network is highly flexible and can provide multimedia content and other resources that are assumed to result in learners' progress. Learning opportunities are based on the theoretical framework that will link education with life and the problem which it is considered crucial. The most important objective of this approach is to create a collaborative learning environment that allows learners and teachers to search, and to examine the different types of issues. "MATH" program is a multimedia program based on personal and group training, which has been effective for some children with mathematics disorder. Therefore, based on the results of this research, it can be suggested to learning disorder experts and psychologists by the use of math educational software to improve math skills, especially geometry section for students with mathematics disorder.

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