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The Effect of efficiency of cooperative learning method on increasing blind students' perception of mathematical conceptions

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Abstract Blind students have limitations that their teachers have to apply efficient educational methods for them. Since mathematics concepts are abstract for blind students and they cannot understand these concepts deeply, this research has tried that used and introduced cooperative learning method for this reason. Blind students have high listening capacity then cooperative learning method can promote other their capacities. Through quasi-experimental method, 40 girl blind students are chosen at third grade of elementary level. Basic mathematical operations are taught via cited method. The results of T-tests indicated that cooperative learning can be positive effect on solving capacity of blind students for basic mathematical concepts.

Keywords Blind, Mathematical Concepts, Cooperative Learning Method, Teaching.

1 Introduction

In present educational system, there are special students who need special teaching. These students have not proper ability for learning. Teachers of these students have to use of special methods. Disabled students are several groups. In this research, blind students are considered as disabled students. Blindness is a person's ability to not charge under any form of light, this includes the inability to move in an unknown environment and unable to perceive, from the distance of one meter, the number of fingers moving. Perception shapes and colors can also be altered [1]. In blindness, sound becomes an important factor in maintaining the direction of motion and maintain a continuous line. This skill is a gradual evolution [2]. According to Hatlen (2004), for blind children, learning social skills is as important as learning to read. Appropriate social behavior, which is taken for granted as having been learnt incidentally at a very young age, and which is not consciously thought of when one engages in social interactions, adds to the factors that affect social competency of students with visual impairment [3,4]. Mathematics is a field which has often been considered beyond the capacity of the blind to master. Traditionally it has been inaccessible to visually impaired and blind students because its content is rich with visually presented concepts and information [5]. Regard to this disability, it needs that used of motivated and interested methods to learn of mathematics. Students, who learn by active learning method, not only learn better, but also take more pleasure from learning experience. One of the main methods of activate students in learning use of studying groups in the class, and provide discussion list, is exchange of views, questioning and answering [6, 8]. It seems that activates students by way of cooperative

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approach, can be better performed because in this manner, better opportunities will be given students to discuss and exchange their views. Cooperative learning point to a learning method in which students struggle together in the figure of small groups to get a joint (common) aim, moreover, in this manner not only they are liable for their own learning, but also they hold themselves responsible for others learning [7,8]. One of these methods, is cooperative learning. Since blind students have not any vision power, they must use of verbal capacity. Cooperative learning method can promote this capacity among blind students. Cooperative learning promotes a positive environment for students to learn together in a small group in a cooperative and supportive environment. Rooted in social interdependence theory and cognitive developmental theory, both theories support cooperative learning would promote interaction among learners, thus resulting in higher achievement, in particular, improved learning quality and skills, such as academic achievement, interpersonal skills and self-esteem [9]. Social interaction among learners can create collaboration, leading to a significant positive impact on learning [10,11,12]. Social interaction among learners can create collaboration, leading to a significant positive impact on learning [12]. Through collaboration, learners will have opportunities to discuss, reflect, defend, and critique ideas or knowledge. According to Harasim (1989), through a discussion and interaction with peers and experts, learners will be engaged in constructing knowledge [13]. According to Johnson and Johnson (1994), cooperative learning is the instructional use of small groups through which students work together to maximize their own and each other's learning [14]. Cooperative learning is working together to accomplish shared goals. Cooperative learning is also an instructional approach in which high-ability and low-ability students work together to solve a problem [15,16]. The aim of this paper is that studied cooperative learning method to learn of mathematical problems solving at elementary level. Generally it seems that cooperative learning method have several advantages that can help blind students:

- To promote listening capacity to learn,
- To increase the creativity capacity to solve,
- To improve the communication and interaction,
- To develop the listening memory,
- To increase mathematical techniques to solve.

2 Literature

In this section, the samples of research in scope of cooperative learning method and blind students in particular for mathematics education are introduced such as; I) Hiltz (1994) and Panitz (1999) found that the complex concepts or difficult problems are to become easier when they learn mathematics by using cooperative learning. One of the reasons to promote performance may be that students get help through discussion to create peer support and expand deeply thinking and perspectives with their group members [17, 18], II) Ozsoy and Yildiz (2004) conducted an experimental research on the use of cooperative learning in mathematics. The purpose of their study was to investigate the effect of learning together, a cooperative learning strategy, had on mathematics achievement. Findings indicated a significant difference regard to the learning together cooperative learning techniques [19], III) Pezeshki et al (2011) explored the relationship among working memory, mathematics anxiety, mathematics attitude and math performance in order to examine their effects on seeing and blind students. The results shown that there was no significant difference between blind and seeing student in working memory capacity and math anxiety. These findings could help

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provide some practical implications for improving blind students' math performance and studying their math disabilities [20]. As it is cited above, there are lack of research in field of blind students and mathematics education via cooperative learning method. It needs that stated a new method to learn and teach of blind students for mathematical problem solving.

3 Hypothesis

Cooperative learning can be positive effect on solving capacity of blind students for basic mathematical concepts.

4 Method

The method that is used for this study, is quasi-experimental method. Accord to this method, two groups are selected as control and experiment groups randomly. In control group, it is used of usual teaching for blind students and new method; cooperative learning method is applied in experiment group. The quasi-experimental method will indicate real behaviors of blind students in experiment and control groups. Therefore, regard to statistical population (one selected special center of blind students in Tehran province), 40 girl blind students are chosen at third grade of elementary level randomly from one special center of blind students in Tehran thereby cluster sampling method. Through this method, researchers have taught basic mathematical operations such as addition and subtraction (one and two digit) to blind students for two months nearly via cooperative learning method for experiment group. These students have difficulties in basic concepts such as addition and subtraction in particular for two digits.

5 Research instruments

Researcher made exam was applied for blind students as math exam for pretest and posttest. This exam was included of 10 questions for addition and subtraction operations and for pretest and posttest separately. Researcher made exam was controlled under of teachers' opinions in blinds centers. Its validity of this exam is proved with Cronbakh's alpha equal to 80 percent. Researcher made exam has numerical and word problems. These questions were designed regard to math textbook at third grade of elementary level. Also this exam was written via Braille for blind students. General mark was 20.

6 Collecting data

At first phase, pretest was implemented to recognize knowledge level of blind students. After studying, it is clear that level of blind students were same. Then cooperative learning method was applied for experiment group and also traditional method was used for control group. In cooperative learning method, blind students solve numerical and word problems via interactions through beads regard to supervision of teacher and researchers. In this method, difficulties and problems relate to math problems are stated among students. Blind students

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with proper performance help to blind students with weak performance. Finally posttest is implemented for control and experiment groups.

7 Data analysis

Regard to data, descriptive and deductive statistics are applied to analyze. In descriptive section, mean and Std and also in deductive section, One-Sample Kolmogorov-Smirnov test, Levene test and independent samples T-test are used at 0.05 level.

8 Findings

As it is shown in Table 1, means of control and experiment groups are same nearly for pretests. In addition, the mean of experiment group's posttest is more than mean of control group's posttest.

Table 1 Descriptive statistics for control and experiment groups

	N	Mean	Std
Pretest of control group	۲۰	11.87	2.97
Posttest of control group	۲۰	12.75	2.57
Pretest of experiment group	۲۰	12.45	3.51
Posttest of experiment group	۲۰	15.18	2.78

As it obvious in Figures 1,2, posttests bars are higher than pretests bars for both control and experiment groups.

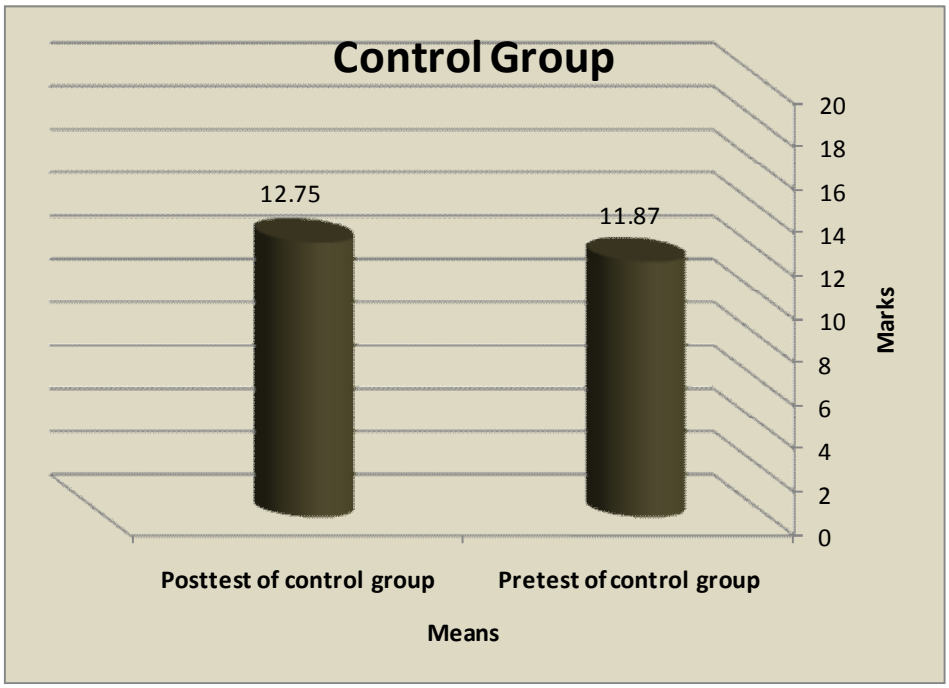

Fig. 1 The comparison between pretest and posttest for control group

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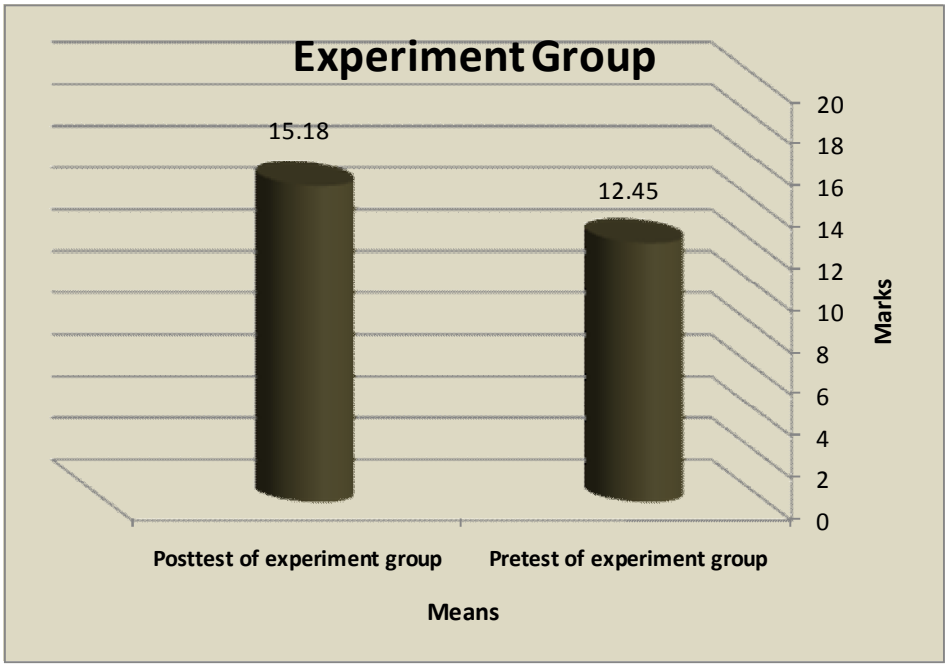

Fig. 2 The comparison between pretest and posttest for experiment group

Researchers have used of One-Sample Kolmogorov-Smirnov test for studying the normality of data. The results of this test indicated that data are normal (P>0.05) at level of 0.05. Therefore it can use of parametric tests.

Table 2 The results of One-Sample Kolmogorov-Smirnov test

	Pretest control	Posttest control	Pretest experiment	Posttest experiment
N	20	20	20	20
Z	0.37	0.76	0.38	0.68
Sig	0.99	0.6	0.99	0.74

The results of levene test indicates that variances of pretests are equal (P>0.05). In Table 3, pretests' means are studied via independent samples T-test. This test has shown that there is not significant difference between control and experiment groups' pretests (P>0.05). That is, knowledge level of blind students are same.

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Table 3 The results of Levene and T-test for pretests

	Leven's Test for Equality of Variances		T-test for Equality of Means				
	F	Sig	t	df	sig	Mean Difference	Std.Error Difference
Equal Variances Assumed	0.28	0.6	-0.55	38	0.58	-0.57	1.02
Equal Variances Not Assumed			-0.55	36.99	0.58	-0.57	1.02

In Table 4, findings of Levene test has shown that variances value of posttests are same (P>0.05). In addition, results of T-test show that there is significant difference between control and experiment groups' posttests (P<0.05). Then it clears that cooperative learning can be positive effect on solving capacity of blind students for basic mathematical concepts.

Table 4 The results of Levene and T-test for posttests

	Leven's Test for Equality of Variances		T-test for Equality of Means				
	F	Sig	t	df	sig	Mean Difference	Std.Error Difference
Equal Variances Assumed	0.1	0.74	-2.87	38	0.007	-2.43	0.84
Equal Variances Not Assumed			-2.87	37.76	0.007	-2.43	0.84

9 Conclusion

Blind students need special methods and tools to learn and teach. Since blind students have high capacities and talents, it needs that teachers or instructors promoted these capacities via modern instructional methods. In addition, learning mathematical concepts is difficult for blind students because these concepts do not observe and see exactly. In this study, it is used of cooperative learning method to learn of blind students in mathematics concepts. This method can increase and improve listening and communication capacities for blind students. Addition and subtraction operations have been taught via beads to promote tough sense and interaction among blind students. Cooperative learning method was effective. Its causes are such as; 1) weak students could create more communication to other students and improved their difficulties, 2) instruction via Braille text and beads developed tough sense and listening capacity, 3) mathematical concepts are understandable to blind students, 4) critical thinking capacity extend among blind students easily. Therefore it seems that teachers can apply cooperative learning method for blind students to learning mathematics. It suggests that cooperative learning methods have to use for teaching mathematical concepts in particular geometry. Also this method can apply to teach and learn for other text books at elementary level. This study has several restrictions. This research is limited to girl blind students and instruction of mathematical concepts.

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