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Jigsaw Teaching Method and Mastery Learning Teaching Method on the Academic Achievement

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A B S T R A C T

The aim of this study is to evaluate the effectiveness of Jig Saw teaching method and mastery learning teaching method on the academic achievement of students. The research population includes all sixth grade students. Sample volume is 2817 subjects that are selected through multi-stage random sampling from schools students. The study has been conducted through quasi-experimental method in two groups of experimental and control. Jig Saw teaching method and mastery learning teaching method have been applied for a given period in the experimental group. Achievement test at two pre-test and post-test groups has been used to collect data. Statistical methods of data covariance analysis and independent t-test have been used to analyze data. The results of the data analysis showed that: Jig Saw teaching methods and mastery learning teaching method have a significant effect on the academic achievement.

Keywords: Jig Saw Teaching Method, Mastery Learning, Academic Achievement, Students.

INTRODUCTION

Academic achievement is the success of students in one or more subjects. Such progress is measured by academic adjusted testing. Academic achievement also is referred to the individual progress in the classroom, as it is evaluated in the school works (Morris, McGuire, & Walker, 2017; Qltash, 2004; Schonert-Reichl, 2017). Academic achievement refers to a manifestation of the student's academic position. This manifestation may indicate a score for a period, mean of scores in a period relevant to a topic, or scores mean of different periods. A variety of criteria can be taken into consideration for the academic achievement; the most famous of them is the classroom scores mean(Altun, 2017; Keramati, 2007).

Years after years, researchers of education and social psychologists have conducted many studies about factors affecting students' achievement and have always taken it into consideration(Kilic, 2008). Academic achievement is a topic that has already attracted the attention of all nations around the world. Every year a large amount of societies' funds is spent on education of children and youths. A lot of studies are done to investigate the different factors that can have an impact on academic achievement; factors such as family, life environment, school and dedicated educational programs(Peña-López, 2009; Publishing, 2009; Schleicher, 2011). Nowadays students' academic achievement, as an important indicator for the evaluation

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of educational systems is considered. In addition, the academic achievement is important for teachers, students, parents, theorists, and scholars of education. For example, the academic achievement of students is the most important criteria to evaluate teachers' performance. Learners' academic progress depends on the quality of teachers' teaching and benefiting from active teaching methods. Active teaching methods refer to methods that can boost students' activities and convert learning into a two-way flow(SEDIGHI & Zarafshan, 2006).

One of the reasons for improved dynamics and efficiency of educational systems in developing countries is that in these systems teaching and learning methods have been studied and evaluated perpetually and they always use the best and the most effective methods(Faqihi, 2002). Theory, research and practice, the investments of improvement and development, in these countries are served to promote and increase staffing as the best tools and devices. In these countries developing basic learning and teaching methods, and examining as well as evaluating them are one of the main tasks of teachers and educational specialists. No wonder, about new and active learning and teaching method hundreds of research studies and hundreds of articles and scientific works can be seen in these countries(Prahmana & Kusumah, 2016; Warfa, 2015).

It is a long time that in Iran educational system teachers relying on traditional methods, especially the lecture, persuade students to memorize and repeat scientific concepts and despite the fact that in scientific and pedagogical and event administrative gatherings the discussions are about student being active, free-thinking, and intellectual growth, virtually such theories have not become practical(Bimmel, Van Den Bergh, & Oostdam, 2001; Klingner & Vaughn, 1996; Takala, 2006). Education experts believe that the students who are learning through active learning, not only learn better, but also they enjoy learning more. Instead of being only the listener, they actively participate in the learning process and consider themselves responsible for their own learning(Çelik, Çetin, & Tutkun, 2015; Mirzakhani, 2005). Jig Saw pattern and mastery learning teaching method is two of active methods that have attracted the attention of education experts.

Mastery learning teaching method is one of the most successful techniques in the learning process. Mastery learning theory was introduced by Bloom and Block. According to this theory, learning and academic achievement of students, largely depend on the learning time **4**. Bloom and others by introducing this theory with regard to giving the required time to the student, have increased motivation, teaching quality and ability to understand the teaching, learning and academic achievement of students. Bloom believed that in enough time, only 5 to 10 percent of the students in a class cannot obtain grade A or B. According to him, the concept of mastery learning skill affects students' concept. In this method, students realize their competence and self-worth and ensure that they are able to be successful. General skills knowledge leads to students' reinforcement, trust, and confidence to themselves. This process is very effective for students' mental health.

Thus, mastery learning is one of the strongest mental health resources. If students learn through this method, they will need fewer treatments and assistant treatments. Mastery learning approach highlights the value of tutoring methods. This method proves that one person educating another person makes educational activities more correspond with the student demands. Teacher tries to adjust teaching methods based on individual differences. Meetings with small groups, supplementary textbooks, program teaching, plays and tutoring help students understand educational concepts. Similarity of mastery learning approach with chlorine design is that both pay especial attention to tutoring and other individual and independent instruction methods and they consider these methods quite different from the traditional methods in terms of feedback and teaching time.

Jig saw teaching method is a special cooperative method that has nearly three-decade of success and usefulness background in various aspects of training. This approach has played an important role in reducing racial conflict and inequality, as well as creating a positive and dynamic learning environment(Filgona, Filgona, & Sababa, 2017; Shekari Kashani, 2009). Jig saw teaching method, compared to other specific methods of cooperative learning, has a salient feature in which individuals make up special and expertise teams for the topic of discussion that have chosen. This is a special opportunity to practice responsibility skill, and other social skills **7**. This method is one of the models of cooperative teaching methods that are appropriate for learning environments. It was used by Aronson in 1978. In this approach, students are divided into groups of 4 to 5.

In this method, all students study a shared subject such as a chapter of the book, a short story, or biographies. However, each student is asked to provide a deeper study on one of the topic titles (a particular part). Those students who study the same title form a specialized group and deepen their learning about the subject. Then they return to their teams to teach their learning to other members of the group. Finally, all students participate in individual tests. The score for each group will be determined based on the average scores of the members of that group. Groups who have reached a certain threshold are awarded a certificate or bonuses.

According to this introduction, it is determined that the cooperative learning approach as a rich and fertile area of research, has special methods of teaching and learning. On each of the specific cooperative methods, especially Jig Saw approach, there are different theoretical foundations, principles, and points of view. The majority of Iran's school trainers and teachers do not have enough information about these methods. In addition, few studies have been done on the effects of them on personality development of students. Lack of research and information as well as knowledge related to this topic for educators had made the researcher to start a new research study considering Jig Saw teaching method. Furthermore, this study aims at investigating the impact of modern methods of teaching - learning and Jig Saw learning on the development of various aspects of the students' personality. Accordingly, the following hypotheses are considered for the study:

Jig saw teaching method effects on the sixth grade student's academic achievement in science.

1. Mastery learning teaching method effects on the sixth grade students academic achievement in science.

2. There are significant differences between the level of students' academic achievement in science through Jig Saw teaching method and mastery learning method.

METHODOLOGY

The quasi-experimental method has been used in the present research, because this study controlling or manipulating the entire variable or variables is not possible. The subjects in the study are randomly divided into two groups: experimental and control. This project is displayed using the following symptoms:

Table 1. Pre-test and post-test design with experimental and control groups

Groups	Pre-test	Independent variable	Post-test
Experimental group	+	+	+
Control group	+	-	+

As this scheme table shows in both experimental and control groups, pre-test and post-test

are executed and experimental group is the only group that is exposed to the effects of the independent variables of the investigation. Control group has remained immune from that influence.

The research population includes all sixth grade students of district 2 elementary schools. The population is consisted of 2817 students (1333 girls and 1484 boys). Through multi-stage random sampling method, 80 subjects using random assignment have placed in experimental and control groups. In order to describe and demonstrate the students' academic achievement and academic performance, the descriptive method is used that include frequency, mean, standard deviation, percentage, and the Table is applied. Inferential statistics are obtained from the chi-square test. To analyze data obtained from the study, SPSS software, independent group's t-test and analysis of covariance are used.

The study has been conducted having experimental group and the control group and applying Jig Saw teaching method and mastery learning teaching method for the experimental group for a certain period (six 50-minute sessions). To gather information from the sample, the achievement test is used in two groups of pre-and post-tests.

RESULT

First hypothesis: Jig saw teaching method effects on the sixth grade student's academic achievement in science.

Table 2. Summary of the independent group's t-test results of pre-test and post-test of academic achievement variable

Test	Groups	Mean	Std. deviation	Means differences	t	p
Pre-test	Experimental group	2.47	1.34	-0.01	0.25	0.8
	Control group	2.57	1.16			
Post-test	Experimental group	16.17	2.88	-13.07	-18.3	0.01
	Control group	3.1	1.37			

The table above shows the results of the t test for independent groups based on Jig Saw teaching method between control and experimental groups in the variable of science course scores in two stages of pre-test and post-test. As can be seen, in the pre-test stage no significant difference between the two groups is observed, but in the post-test stage, the difference between two groups is significant in academic achievement scores variable with the t of -18.30 at the alpha level of 0.01.

Table 3. Results of covariance analysis test of Jig Saw teaching method effectiveness on academic achievement

Dependent variable	Changes source	Mean of squares	Sum of squares	F	p	Eta
Academic achievement	Between group factor	841.75	841.75	161.26	0.01	0.8
	Between group error	5.22	198.34	-	-	-
	Within group factor	1011.75	1011.75	693.12	0.01	0.94
	Within group error	1.46	55.46	-	-	-
	Interaction	867.9	867.9	594.57	0.01	0.94

The above table shows the covariance analysis test results of the effectiveness of Jig Saw teaching method on science course academic achievement of sixth-grade students. As it is clear from the above table characteristics, between-group factor is significant with F=161.26 at 0.01 Alpha level. Also the within -group factor is significant with F=693.12 at 0.01 Alpha level. Interaction between the two positions (pre-test and post-test) and groups (experimental and control) with the F value of 594.57 at 0.01Alpha level is significant. In general, the results show

that the increase in post-test scores mean in the experimental group is significant. Thus, we can say that the Jig Saw teaching method significantly increases academic achievement scores mean of science course of sixth-grade students.

Second hypothesis: Mastery learning teaching method effects on the sixth grade student's academic achievement in science.

Table 4. Summary of the independent group's t-test results of pre-test and post-test of academic achievement variable

Test	Groups	Mean	Std. deviation	Means differences	t	p
Pre-test	Experimental group	2.7	1.33	-0.12	-0.3	0.76
	Control group	2.57	1.24			
Post-test	Experimental group	13	2.65	-10.12	-15.58	0.01
	Control group	2.87	1.19			

The table above shows the results of the t test for independent groups based on mastery learning teaching method between control and experimental groups in the variable of science course scores in two stages of pre-test and post-test. As can be seen, in the pre-test stage no significant difference between the two groups is observed, but in the post-test stage, the difference between two groups is significant in academic achievement scores variable with the t value of -15/58 at the alpha level of 0.01.

Table 5. Results of covariance analysis test of mastery learning teaching method effectiveness on academic achievement

Dependent variable	Changes source	Mean of squares	Sum of squares	F	p	Eta
Academic achievement	Between group factor	525.61	525.61	124.77	0.01	0.76
	Between group error	4.2	159.31	-	-	-
	Within group factor	561.8	561.8	333.83	0.01	0.89
	Within group error	1.68	63.95	-	-	-
	Interaction	500	500	297.1	0.01	0.88

The above table shows the covariance analysis test results of the effectiveness of mastery learning teaching method on science course academic achievement of sixth-grade students. As it is clear from the above table characteristics, between-group factor is significant with F=124.77 at 0.01 Alpha level. Also the within -group factor is significant with F=333.83 at 0.01 Alpha level. Interaction between the two positions (pre-test and post-test) and groups (experimental and control) with the F value of 297.10 at 0.01Alpha level is significant. In general, the results show that the increase in post-test scores mean in the experimental group is significant. Thus, we can say that the mastery learning teaching method significantly increases academic achievement scores mean of science course of sixth-grade students.

Third hypothesis: There are significant differences between the level of students' academic achievement in science through Jig Saw teaching method and mastery learning method.

Table 6. Summary of the independent group's t-test results of pre-test and post-test of academic achievement variable

Test	Groups	Mean	Std. deviation	Means differences	t	p
Pre-test	Jigsaw	2.47	1.34	-0.22	0.53	0.59
	Mastery learning	2.7	1.33			
Post-test	Jigsaw	16.17	2.88	3.17	3.69	0.01
	Mastery learning	13	2.65			

The table above shows the results of the t test for independent groups between two Jig Saw and mastery learning teaching methods in the variable of science course scores in two stages of pre-test and post-test. As can be seen, in the pre-test stage no significant difference is observed between the two methods, but in the post-test stage, the difference between two groups is

significant in academic achievement scores variable with the t of -15.58 at the alpha level of 0.01. This means that the scores of students who have been trained using Jig Saw teaching method are high than the scores of students who have been trained through mastery learning teaching method.

Table 7. Results of covariance analysis test of Jig Saw and mastery learning teaching methods effectiveness

Dependent variable	Changes source	Mean of squares	Sum of squares	F	p	Eta
Academic achievement	Between group factor	43.51	43.51	6.2	0.01	0.14
	Between group error	7.01	266.37	-	-	-
	Within group factor	2880	2880	1174.24	0.01	0.96
	Within group error	2.45	93.2	-	-	-
	Interaction	57.8	57.8	23.56	0.01	0.38

The above table shows the covariance analysis test results of the effectiveness of Jig Saw and mastery learning teaching methods on science course academic achievement of sixth-grade students. As it is clear from the above table characteristics, between-group factor is significant with F=124.77 at 0.01 Alpha level. Also the within -group factor is significant with F=33.83 at 0.01 Alpha level. Interaction between the two positions (pre-test and post-test) and groups (experimental and control) with the F value of 297.10 at 0.01Alpha level is significant. In general, the results show that the increase in post-test scores mean in the experimental group is significant. Thus, we can say that the Jig Saw and mastery learning teaching methods significantly increase academic achievement scores mean of science course of sixth-grade students.

CONCLUSION

The first hypothesis analysis results using covariance analysis test showed that Jig Saw teaching method has a significant effect on academic achievement and increases academic achievement of science course of sixth-grade students. In addition, the t test results of independent groups indicated a significant difference between control and experimental groups (Jig Saw teaching method). So that the post-test scores mean of the science course academic achievement of sixth-grade students of experimental group increased significantly after the implementation of Jig Saw teaching method. This difference suggests the significant impact of Jig Saw teaching method.

To explain these findings of the study it can be said that, learning through cooperation is achieved by forming learning teams. In a learning team, all the team members think, make decisions, and do the tasks, and every member is charged with leadership and responsibility. This scheme is based on two assumptions: The first assumption is that each participant reads a different part of the subject that all the students are going to learn. The second assumption is that every learner can teach his/her team members. When learners understand that, the team performance requires that every person learn a part of the subject and then teach others, he/she is motivated to study his/her part to help the team and it will acquire competence. In this method, when all the members have done their tasks, the entire course is taught. It should be noted that all obtained academic achievement in the experimental group (Jig Saw teaching method), is not due to a particular teaching method. Instead, to reach satisfactory academic achievement, the method must include the factors such as proficiency of students on the prerequisites related to the desired learning, level of student's motivation for learning, and level of teaching method fitness with students' conditions and characteristics that can play an important role in academic

achievement. As, Jig Saw teaching method include these factors, it has a significant impact on the academic achievement.

The second hypothesis analysis results using covariance analysis test showed that mastery learning teaching method has a significant effect on academic achievement and increases academic achievement of science course of sixth-grade students. In addition, the t test results of independent groups indicated a significant difference between control and experimental groups (mastery learning teaching method). So that the post-test scores mean of the science course academic achievement of sixth-grade students of experimental group increased significantly after the implementation of mastery learning teaching method. This difference suggests the significant impact of mastery learning teaching method. The findings of this study have been consistent with the study results of Shekari Kashani (2009), in her research found that, at high levels of learning the lesson, there is a significant difference between the learning performances of those weak learners who are trained through mastery learning teaching method compared with the learning performance of those weak learners who are trained through the conventional method. The results of the study also showed that the students who have been trained by mastery learning teaching method have had positive changes in their attitudes towards learning in comparison with students who have been trained by conventional method. Besides the above cases, mastery learning increases students' inner motivation to reach higher levels of learning. Generally, Shekari Kashani (2009), research results showed the superiority of mastery learning method in comparison with conventional methods.

To explain these hypothesis findings, it should be noted that although the mastery learning seems useful at all levels of learning, the influence domain of this method is higher cognitive levels more, such as the skill ability Mirzakhani (2005). It seems that educational objectives of learning higher levels include cognitive domain higher classes, which involves complex mental abilities and skills such as applying principles, problem solving skill, analysis and evaluation. So learning these complex educational purposes requires special techniques to provide the content. So using conventional training methods, where the focus is on superficial and elementary objectives, educational goals at higher levels of learning cannot be achieved.

Therefore, we can say that teaching method has a remarkable impact on the achievement of high-level goals of learningMirzakhani (2005). According to Bloom (1968), in mastery learning method there is a basic assumption. Based on this assumption, if the appropriate teaching conditions are provided and the time is enough, all learners can learn all or almost all of lesson educational goals. That is to say, they can dominate it. In traditional education it is assumed that in learning process there are strong learners as well as weak learners. This is a relatively stable trait in individuals. So that strong learners can learn complex and abstract ideas, while weak learners are only able to learn the easiest and most sensible ideas. Lee, Park, Lee, and Kim (2014), believes that the objective of mastery learning teaching method is that all students reach high levels of learning. Based on this principal, besides teaching and implementing mastery learning approach, high levels skills and mental processes, such as applying principles, problem solving, analysis and creative composition, are focused more. Also in the new curriculum of mastery learning approach, the emphasis must be on the process of mastering the content, instead of only content, and achieving high levels of learning.

The third hypothesis of the present study has a comparative approach. To achieve this goal, first t-test of independent groups compares two groups of Jig Saw and mastery learning teaching methods. Then applying covariance analysis test the effectiveness of these teaching methods is evaluated. This comparison revealed that students who have been trained using Jig Saw teaching method compared to those students who have been trained by mastery learning method have higher academic achievement mean. This finding is the same in two groups of boys

and girls. Perhaps it can be said that the major advantage of the Jig Saw method is not only cognitive learning and major cognitive changes, but also responsibility and social skills practice are the other its major benefits. On the other hand, Jig Saw teaching methods instead of boosting competition among students strengthens the participation and reinforces a spirit of collaboration among them. This is why Jig Saw learning method is not used only in the field of cognitive skills transfer and school issues, but it includes a wide range of topics and social and emotional categories.

Generally, the pattern of Jig Saw that can be involved in cooperative patterns family, as the model used in the present study, suggests a favorable impact on academic achievement. Using Jig saw cooperative model considering the calculated effect value and also to test represents its remarkable and good impact on the teaching of science basic course at the sixth grade. So that it excels not only the traditional common method, but also its relative superiority over mastery learning teaching model has been confirmed in the present study. What is displayed numerically is based on the direct training effects on students' academic achievement. However, educational and indirect effects of using Jig Saw model on social, interpersonal and behavioral skills as well as students' self-awareness are very high and more research needs enough time. The results of this study promise the effect of using this model in other different subjects, courses and grades.

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