

## **The Effect of Process Teaching Method on the Math Performance in Students at Sixth Grade of Primary Schools**

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**ABSTRACT:** *This study aimed to determine the effect of process teaching method on the performance of math students at sixth grade of primary school. The research method, according to the purpose and subject, is a quasi-experimental with pretest-posttest and control group. Statistical population consisted of all male students in the sixth grade District 2 of Karaj, in academic year 2016-2015. 25 students were selected using multi-stage random sampling method, and they were divided into two experimental and control groups. Research tools include the math performance test in two dimensions of area and volume in math. The analysis of covariance was used to analyze the data. The research findings indicate a significant difference between scores in the experimental group in pretest and posttest and compared to the control group. In addition, the main results of this study indicate that the process teaching methodology has a positive effect on the academic achievement of students in mathematics.*

**Keywords:** *Process Teaching Method, Math, Issue of Volume, Issue of Area*

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### **I. STATEMENT OF THE PROBLEM**

The realm of mathematics education on the one hand is understanding of mathematical concepts such as numbers and numerical computation, algebra and symbolic display (patterns, relations and functions); geometry and measurement, data, statistics and probability. On the other hand, in this field, students should become familiar with mathematical processes such as problem-solving and using problem-solving strategies, modeling (real issues and phenomena), reasoning, critical thinking and logical reasoning (generalizing, predicting, hypothesizing, guessing and testing the guesses, explaining the answers, confirming the answers, sorting, comparing, using spatial reasoning, solving unusual problems, patterns); visual thinking and creative thinking of visual patterns, producing problems in form of the story and realistic and imaginary texture), linking and thematic and conceptual connection of mathematics, mathematical discourse (cultural and communication-reading and writing mathematics), decision-making arbitration in mathematics and decision, estimating, and precision. The students must find skills. Technology and its applications (Calculator and computers, computer software) are the points of emphasis in the use of new technologies in mathematics (National Curriculum, 2012). Due to the need for students in everyday life and also in using it in other sciences, such as: chemistry, physics, biology, and particularly arts and math happens to them, also, in jobs that are in society or they need in continuing education, learning math topics, especially the volume and area is necessary and important for them (Kohzadi, 2015).

However, the reality shows that, academic failure of students in mathematics in our country has been one of the problems of the educational system. So that, with every effort of teachers, and even with the increased number of hours of math, more teachers and students do not have much satisfaction from the learning outcome in this lesson, and always, the question is, why students are weak in learning math, and they do not capable of solving problems and hate this lesson? The main reasons for poor mathematic in students is some teachers' lack of dominance in mathematics knowledge, non-use of educational tools, non-participation of students in the teaching process and non-active, non-use of mathematical applications in textbooks and teachers' teaching, lack of attention to the pre-requirements of new courses, the high volume of mathematical textbooks, negative visibility and attitudes toward math in students, lack of attention to individual differences and lack of proper assessments (Kohzadi, 2015).

Math generally is difficult for students and even, it is along with fear and horror. This is despite the fact that, mathematics is one of the few courses, which has the first and foremost role in opening the mind of students and teaching how to think. Many educated teachers, who are interested in teaching math and are eager to teach it to children, are always looking for ways to make this lesson sweet and understanding and in fact, they want to reconcile the children with mathematics. On the other hand, it can be said, one of the causal factors in mathematics disorder, which most specialists emphasize, is poor, improper or inadequate training. In addition, improper teachers, who did not benefit from adequate training and not using proper training tools, or long and

frequent absences of the child at school and the like, can be considered as factors for the inadequacy of learning. Lack of presenting the content, in the correct order and improper use of educational materials, about some children is prized examples of improper training (Salehpour, 2013). One of the fundamental issues of education and teaching is correct identifying and implementing teaching methods. Appropriate teaching methods play a crucial role in making the character and the mental, emotional, educational and training process of students (Joyce et al., 2015).

Process-oriented teaching is one of the new methods in the teaching that teachers use today as a new method. In the process-oriented teaching, fundamental objectives are considered. In this method, developing skills and abilities are emphasized. Therefore, in the short term, increasing learning is not considered, but abilities and skills that can strengthen and enhance these learnings are emphasized. Some of these skills include developing thinking skills, developing social, emotional and physical skills (NematiNejad and Kazemi, 2011). Even though the result is important in this method, but what are most important are kind of learning and not the result. In other words, the method of learning is important and not just learning. In the teaching process methodology, students are the axis of education and the type of problems, solution methods, timing and other issues form according to their ideas and proportional with them (Clements, M.A; Ellerton, N. F, 2006). Teachers consider students' activity and comprehensive growth and use learning materials and knowledge transfer for their education. In this method of teaching, it is necessary that teachers have a lot of information and knowledge, and they do not consider the transfer them all to the students important, but they focus most of their activities on education of students (NematiNejad and Kazemi, 2011).

Several studies have pointed to the effects of process teaching methodology on the students' learning (NematiNejad, Kazemi, 2011, Abdollahi and Lotfi, 2010; Salehi, 2010). One of the lessons that this method has the most applications in its mathematics. Mathematics is a science with abstract and intellectual concepts, which means many math concepts are visions of things that it is not possible to translate them to the same mental way in the real world. Abstract concepts of mathematics make the possibility of feeling its concepts difficult and therefore it has hardened the teaching and learning, so that it needs specific teaching methods. Teaching methods must first be practical also that the primary school students can create necessary ability to understand them (Keramati, 2002). Therefore, using a process-teaching methodology can affect the performance of math in primary school. Therefore, given the importance of teaching methods in learning different texts and a wide range of teaching methods, the main question of the research is answering to the question, whether the process teaching method has an impact on the performance of math.

## **II. RESEARCH METHODOLOGY**

This research is practical and in terms of data collection method, it is including quasi-experimental designs. Participants in two classes were divided at random, and one class was considered as an experimental group and the other was a control group. In this group, mathematics was taught in the traditional way (volume and area topics) and in the other group, mathematics was taught (volume and area topics) by using process teaching methods and based on the pattern of George Pólya. Pre-test and post-test was taken from both groups and the results were compared.

The statistical population of the research is all the sixth grade students in Primary Education District 2 of Karaj. This population is equal to 2400 students in the academic year of 2015-2016. The math performance pretest was done on experimental and control groups, then, the teaching was done with the process teaching methodology of the experimental group, and in the end, both groups were exposed to the math test, and finally, the effect of education was calculated. The process was in the way that, after the execution of each step, the test was taken from students in control and experimental groups. The experimental group was students who were taught Math lessons with process method and in George Pólya four steps, while students in the control group were used the process teaching method of mathematics to learn math. After performing each step in the pattern of George Pólya, the progress of students was examined with the test, compared to the past to determine the level of students' achievement in mathematics after running four steps. Analysis of covariance and paired t-test were used to analyze the data.

## **III. FINDINGS**

### **First hypothesis:**

#### **Process teaching method is effective on the math performance of students.**

The analysis of variance test was used in order to evaluate the effect of the process teaching methodology on the math performance of students and in order to maintain the effect of pre-test scores in both experimental and control groups. The results are presented in Table 1.

**Table 1:** Analysis of covariance results for the math test scores in the experimental and control groups

Change Resource	Sum of squares	Degrees of freedom	The mean squares	F	Significant
Pretest	29.53	1	25.53	3.70	0.060
Group	304.71	1	304.71	38.25	0.000
Error	374.36	49	7.96		
Total	9962	50			

**Table 2:** Paired t-test to examine the pre-test and post-test differences in students' math scores

Variable	Step	Average	The standard deviation	t	p-value
Math test	Pretest	8.96	3.39	7.71	0.000
	Posttest	13.54	4.01		

According to the results, the value of F for math test scores in the experimental and control groups is significant after maintaining the effect of pre-test math scores ( $P=0.000$  and  $F(49,1)38.25$ ). As a result, there is a significant difference between the average of posttest math scores in the experimental and control groups by stabilizing the effect of pre-test math scores. Comparing the adjusted average of two groups in Table 2 show that the average math test in the experimental group (13.54) is greater than the control group (8.96), which is statistically significant ( $p =0.000$ ). Thus, mathematical teaching with process teaching method leads to increase math performance of students in the experimental group compared with the control group students.

**First hypothesis:**

**Process teaching method is effective on the math performance of students in area dimension.**

**Table 3:** Analysis of covariance results for the area dimension test scores in both experimental and control groups

Change Resource	Sum of squares	Degrees of freedom	The mean squares	F	Significant
Pretest	121.99	1	13.78	15.80	0.001
Group	139.90	1	139.90	13.78	0.000
Error	415.92	49	8.84		
Total	9994	50			

**Table 4:** Paired t-test to examine the pre-test and post-test differences of area dimension, math scores in students

Variable	Step	Average	The standard deviation	t	p-value
Area Dimension	Pretest	8.84	4.29	8.22	0.000
	Posttest	13.60	3.90		

According to the results, the value of F for math test scores in the area dimension in the experimental and control groups is significant after maintaining the effect of pre-test math scores of area dimension ( $P=0.000$  and  $F(49,1)13.78$ ). As a result, there is a significant difference between the posttest scores average of area dimension in the experimental and control groups by stabilizing the pre-test scores effect of area dimension. Comparing the adjusted average of two groups in Table 4 shows that the average of area dimension test in the experimental group (13.60) is greater than the control group (8.84), which is statistically significant ( $p =0.000$ ). Thus, mathematical teaching in area concept with process teaching method leads to increase math performance of students in the experimental group compared with the control group students.

**Second hypothesis:**

**Process teaching method is effective on the math performance of students in volume dimension.**

**Table 5:** Analysis of covariance results for the volume dimension scores in both experimental and control groups

Change Resource	Sum of squares	Degrees of freedom	The mean squares	F	Significant
Pretest	0.584	1	0.584	0.051	0.823
Group	592.72	1	592.72	51.53	0.000
Error	540.61	49	11.50		
Total	10263	50			

**Table 6:** Paired t-test to examine the pre-test and post-test differences of volume dimension, math scores in students

Variable	Step	Average	The standard deviation	t	p-value
Area Dimension	Pretest	9.08	3.84	5.47	0.000
	Posttest	13.49	4.87		

According to the results, the value of F for math test scores in the volume dimension in the experimental and control groups is significant after maintaining the effect of pre-test math scores of volume dimension ( $P=0.000$  and  $F(49,1)51.53$ ). As a result, there is a significant difference between the posttest scores average of area dimension in the experimental and control groups by stabilizing the pre-test scores effect of volume dimension. Comparing the adjusted average of two groups in Table 6 shows that the average of volume dimension test in the experimental group (13.49) is greater than the control group (9.08), which is statistically significant ( $p=0.000$ ). Thus, mathematical teaching in volumedimension with process teaching method leads to increase math performance of students in the experimental group compared with the control group students.

#### **IV. DISCUSSION AND CONCLUSION**

The results of the first hypothesis showed a significant difference between the average scores of the group that was taught math with process teaching method (13.54) and a group that was taught math with traditional methods (8.96). In other words, the first hypothesis is confirmed, and the null hypothesis is rejected. The results obtained by analysis of covariance and paired t test, with 99% confidence, showed a statistical difference between the two methods of teaching, in both experimental and control groups. The second hypothesis of the study predicted that teaching through the process teaching method has an impact on the mathematical performance of students in the area dimension. Compared to adjusted averages of the two groups showed that the average performance of students in the area dimension of experimental group (13.60) is higher than the control group (8.84). Therefore, the process teaching method has increased the scores of students in the area dimension in the control group. In other words, the second hypothesis is confirmed and the null hypothesis is rejected. The results obtained by analysis of covariance and paired t test, with 99% confidence, showed a statistical difference between the two methods of teaching, in both experimental and control groups.

The third hypothesis of the study predicted that teaching through the process teaching method has an impact on the mathematical performance of students in the volume dimension. Compared to adjusted averages of the two groups showed that the average performance of students in the volume dimension of experimental group (13.49) is higher than the control group (9.08). Therefore, the process teaching method has increased the scores of students in the volume dimension in the control group. In other words, the third hypothesis is confirmed and the null hypothesis is rejected. The results obtained by analysis of covariance and paired t test, with 99% confidence, showed a statistical difference between the two methods of teaching, in both experimental and control groups. The results of this study are consistent with the results of Pakdel (2014), Chahsetareh (2014), KhusheCharkh (2013), Salehpour (2013), Salehi (2009), Davidson (2014) and Klaynts (2011).

In explaining the results, given that, process-oriented approach is considered more as a process and activities that the learner does for learning. In process teaching methods that are known as active, exploratory and organic methods, in the learning and teaching process, the main role is given to the learner. The students are involved in learning process with physical, emotional, and intellectual effort. In these methods, the teacher appears more in facilitating and creating role to create appropriate opportunities for learning. He attempts to organize and direct the activities and teaches the students, and provides conditions so that they gradually acquire a set of self-learning and self-assessment skills. In this perspective, it is believed that in the process of teaching, learning and how to learn is more important than the result and learning outcomes.

#### **V. SUGGESTIONS**

- It is suggested to examine the effectiveness of process teaching methods in other cognitive areas such as creativity, motivation, self-esteem etc.;
- It is suggested to compare the impact of process teaching method on the math performance of other grades and even other courses;
- It is suggested to examine teachers and parents and child's knowledge of teaching methods.
- Designing and making educational software in a game format to teach basic subjects such as reading, writing, math and language is recommended;
- It is recommended to conduct a similar research with this research in other areas to increase the generalizability of the results.

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