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Full Length Research Paper

Role of summon of schemas on increasing new ideas in mathematical problem solving

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One of the mathematics education goals is increasing capacities of problem solving in students. In this research, summon of schemas had considered as one of the mathematics education goals for increasing new ideas in mathematical problem solving. 40 first grade girl students are selected in high school via quasi-experimental method and cluster sampling and we had shown thereby Leven and independent samples tests in meaningful level of 0.05 that summon of schemas are affective on increasing new ideas in mathematical problem solving and it made to increase of capacity of mathematical problem solving among high school students. Therefore, it seems that usage of schemas led to increase of new ideas in mathematical problem solving.

Keywords: Mathematics education, summon of schema, mathematical problem solving, new ideas.

INTRODUCTION

Mathematics is a very systematic and organized knowledge that its learning needs intelligent learning in higher level. Intelligent learning is not reminded of several definitions, skills and principles, but it necessary to construct of knowledge structures' various practical maps in essential moments (Alamolhodaei, 2002). Novice people have not comprehension of how organize limited information themselves and they have minus schemas for forcing to problems. Because novice people lack of meaningful information, then, they force to rely on configuration's problem. Mind organizing and coding concepts and mathematical knowledge make to decrease in their mind struggles and meaningful learning in mathematics field and will very effect on their mathematical behavior. In learning base on constructivism, it very is emphasized on organizing information and controlling mind process through structure of schemas via students. Mathematical knowledge include of structure of schemas that lead to set of skillful and component methods. These implementing methods are called algorithm in algebra and arithmetic especially direct essential operations for problem solving via learners (Alamolhodaei, 2002). In view's Piaget (1970), all people need comprehension of self-around global. Also when human attain new experiences, they effort to accommodate it with whatever known before. When they can do this operation, then, they get equilibrium, else they remain to inequilibrium and shall change their thoughts until attain to equilibrium. For equilibrium, they organize their experiences in integrated patterns which Piaget is called schema. Shoenfeld (1985) cited that purpose of schema is that people have mind patterns or designing of institutions that can benefit in new problem solving. Chenapan (1998) believes that schema is mass of knowledge which include of information about main principles, relation between concepts and posture knowledge and usage of time that act organized structures of knowledge. According to this view, when students learn mathematical concepts, principles and process, they organize it to schemas forms in mind which form the knowledge base for next action. In regard to organized mathematical structures, schemas have especial importance in leaning, mathematics education and its usage in problem solving process. Schemas which construct and organize well, capacity of problem solving increase to students. Acting schema is procedure that emphasize on relating new information to previous knowledge similar to instrument for supporting learning and play main role on doing mathematical tasks and it stable on thoughts that students have proper information in any age that can

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relate to new information to it. As instance, for teaching "Power" and before teaching it and acting concept of "Power", it asked students that review concepts and algorithms of multiplication and division. Maybe feasible method of attaining more capacity for problem solving is regular and continuous of persons' knowledge which forms through adding new information of previous schemas (Glaver et al, 1990). Whatever code in long term memory of students, it effect of persons' existent schema and it help them until new information modify and change. In fact, schema or conceptual structure is network of internal depended and regular relations of fundamental elements of a main concept and including of person's cognitive maps and mind models (Alamolhodaei, 2002). Mathematics education through schema have various advantages such as I) in addition to schema having separated features, single concepts and constitutive elements, experience and knowledge of students integrate and cooperate, II) schemas are grant and complicated structures of skills and concepts that direct better thinking method and how performance of students in mathematical problems in systematic institution, III) instructions base on schemas structures make increasing intelligent and meaningful learning of mathematical context that decrease tiresome factors of active memory normally and decrease memorial and algorithmic learning, IV) schemas as benefit and effective instrument in learning mathematical concepts, definitions and structures, ease next learning and contextual improvement's students, V) regular and rebuilding existent schema structures of students with adding essential information to these schemas, their capacity and ability increase in doing mathematical tasks and use as effective strategy in learning-teaching mathematics and mathematical problem solving.

Literature

Among of researches which had done in summon and rebuilding schemas in mathematics education fields, three researches are more considered; I) Hesam et al (2005) wrote article entitled "role of schemas in mathematical misconception structure of students" that how effect of mind schemas of students considered in their misconceptions structures. They attain to two new items (lack of needful schema and weak schema) of effects of schemas of students in creating misconception of students, II) Trigueros et al (2010) wrote article titled "study of geometry samples in learning two variables functions in aims, performance and schemas framework" that schemas have positive affective on comprehension of two variables functions and its relation to three dimension spaces and III) Oliver (1992) shown in research about "invention of previous schema in new learning" that errors were not random and it was based on valid schemas of students of their previous knowledge. In this research, students intend more absorb new idea in schema and accord it than rebuild their mind schemas. Shortage of studies in role and summon of schema in mathematics education fields especially in high school, necessity of implementing respected research appear more and more.

Hypothesis

Summon of schemas play positive role on increasing new ideas of students in mathematical problem solving.

METHODOLOGY

Research method is quasi-experimental. Independent variable was role of summon of schemas on increasing new ideas in mathematical problem solving. Among six first grades of high school which are selected randomly, two classes had considered that are divided to two control and experiment groups. Experiment group include of students who teach with use of schema and control group include of students who teach traditionally. First, pretest done in two groups and end of the instruction, posttest is done in same two groups.

Participants

Statistical society is all students in first grade of girly state high school in Tehran that six classes (120 students) are selected randomly. Through cluster sampling, two classes are selected among six classes which were included of 40 girl first grade students in high school.

Instrument

In research, it is used of constructed-researcher of math exam in two phases; pretest and posttest.

Constructed-researcher of math exam

Math exam include of pretest and posttest and are comprised of "linear equation" and "trigonometry". Ever two math exams were included of 6 questions and this exam has 10 marks generally in each pretest and posttest. Reliability of this exam had considered via mathematics education, mathematics teachers and psychologists. This exam has acceptable reliability and also, validity rate of this exam studied through split-half test that equaled to 0.72. This value demonstrates that this exam has acceptable validity.

Table 1. Descriptive statistic of marks of control and experiment groups

Control and Experiment groups	N	Mean	Std
Pretest Control	20	3.92	2.9
Posttest Control	20	3.93	2.92
Pretest Experiment	20	3.9	2.57
Posttest Experiment	20	5.87	2.92

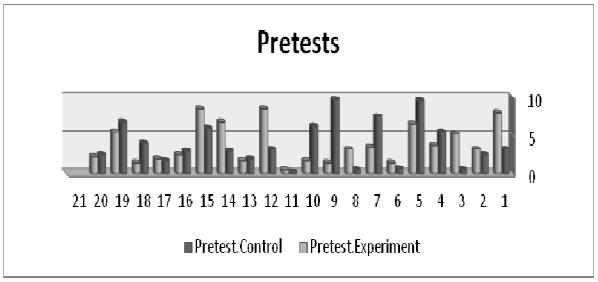

Figure 1. Marks of pretests of control and experiment groups

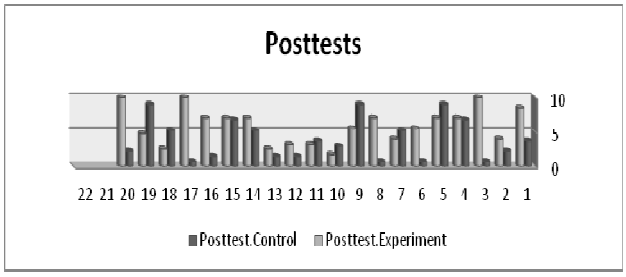

Figure 2. Marks of posttests of control and experiment groups

Table 2. Normality of marks of control and experiment groups

	Pretest control	Posttest control	Pretest Experiment	Posttest Experiment
N	20	20	20	20
Sig	0.45	0.62	0.58	0.62

Collecting Data

First, constructed-researcher of math exam had done in two classes as pretest simultaneity then present research is implemented on experiment group. Number of sessions was 8 sessions of 45 minutes and "linear equation" and "trigonometry" are provided as problem to students. In implementing of this method, researcher give two papers to students which one of the papers is used to response to problems and the other paper had been used to write how thinking process of students in problem solving moment and it is emphasized to them that self-thinking process noted in respected paper even if they mistake. In addition notes, researcher reviews and interferes in problem solving of students and in anywhere students could not summon and organize to proper their schemas, researcher guided them indirectly and after problem solving via students, ever two papers are given to researcher until discovered correct and incorrect schemas of students via their manuscripts. Then researcher instructed to summon of correct schemas in same session or other sessions and finally posttest is done in two groups.

Analysis Data

After implementing research and summon of schemas in mathematical problem solving, we considered mean and Std. deviation of control and experiment groups in pretest and posttest phases in descriptive statistics then in deductive statistics in meaningful level of 0.05, data are normality thereby One-Sample Kolmogorov-Smirnov test and then equality of variances of marks is considered through Leven's test and finally we compared mean of marks of posttests of control and experiment groups through independent samples test.

RESULTS

In descriptive statistic part, in Table 1, it shows that mean of marks in pretests have not meaningful difference in control and experiment groups respectively (M=3.92, 3.9) and in posttest's control and experiment groups, mean's marks of posttest in experiment group (M=5.87) are higher than mean's marks of posttest in control group (M=3.93).

In Table 4, it is used of Leven and independent tests in meaningful level of 0.05 for evaluating posttests. Results of Leven's test show that mark's variances are equal in posttests (F=0.46, P>0.05) and in independent test had denoted that there are meaningful difference between mean's marks of posttests in control and experiment groups (T= -2.21, P<0.05). That is, mean's marks of posttest of experiment group is higher that control group. In Figure 1, it shows that numbers of pretests of control and experiment groups' bars are equal and in Figure 2, posttests of experiment groups' bars are higher than posttest of control groups' bars.

In Table 2, we considered normality of marks' pretest and posttest of control and experiments groups and in respected to result of One-Sample Kolmogorov-Smirnov test in meaningful level of 0.05, it had been shown that marks of two groups are normal (P>0.05).

In Table 3, it is used of Leven and independent tests in meaningful level of 0.05 for evaluating pretests. Results of Leven's test show that mark's variances are equal in pretests (F=0.27, P>0.05) and in independent test had denoted that there are not meaningful difference between mean's marks of pretests in control

Table 3. Results of independent samples test in pretests of control and experiment groups

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	0.27	0.6	0.02	38	0.97	0.02	0.87
Equal Variances Not Assumed			0.02	37	0.97	0.02	0.87

Table 4. Results of independent samples test in posttests of control and experiment groups

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	0.46	0.49	-2.21	38	0.03	1.93	0.87
Equal Variances Not Assumed			-2.21	37	0.03	1.93	0.87

and experiment groups (T=0.02, P>0.05).

CONCLUSION

Since guidance of teacher is considerable in mathematical problem solving moment, therefore this research shows that with guiding and supervising teacher respect to mistakes' students in problem solving moment that has rooted in mind structures and weak schemas of students, Summon of schemas play positive role on increasing new ideas of students in mathematical problem solving. On the other hands, schemas which are constructed and organized well, creativity and capacity power of problem solving promote to students. Also, teacher often can able them with proper methods and interfering students in contextual activity until students make decision confidently in addition studying correct and incorrect of their responses. Correctly when student comprehend where reasons and roots of conceptual mistakes, then student can correct it through guidance of teacher and no doubt he or she have attain important experience in mathematical learning that will help other institution of learning and mathematical problem solving and in fact, it will be led to promote in his or her mathematical thinking. Suggestions provide to next researches; I) problem solving process via schema is modern instructional methods and shall set to main center in mathematics books, II) teachers shall try that more problems introduce to students until they consider to summon of proper schemas in problem solving and also consider to analysis of performances of students in problem solving moment and III) in respect to present research had done in high school, study in elementary and middle. Limitation of this research include of lack of time for implementing research and limitation of research to girly school and lack of generalization of this research to boy school.

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