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Creative thinking is increased by means of problem posing instruction in mathematics education

Mathematician and educators recognizes mathematical creativity as a major element of mathematical ability and have tried to define it. After searching and over viewing literature and research on mathematical creativity Aiken (1973) concluded that mathematical creativity is always defined on the basis of process and various products. Judging from literature and studies on mathematical creativity, the nature of creativity can be classified into two perspectives: Firstly, mathematical creativity is regarded as cognitive ability that leads to emphasize creative

Thinking. Secondly, mathematical creativity is essentially defined with focus on products. Generally mathematical creativity is based on fluency, flexibility and novelty (originality). Fluency refers to the number of ideas produced in responses to prompt; flexibility refers to the different approaches to the prompt ; and the novelty is the originality of the ideas produced in response to a prompt.

Brown and Walter (2005) stated that one of the important consequences in mathematics education is to provide opportunities to students in mathematics lessons for developing their problem posing skills. Because problem posing is not only to generate new problems from given situations but also reformulate given problem and generalize for the solution.

Silver (1994) proposed that problem posing has too much interest because of Its effect in creativity and mathematical ability, improving student problem solving, a large window into understanding of mathematics.

Problem posing in contrast to traditional problem solving methods reduces anxiety and common fears about mathematics and increases positive attitudes toward mathematics .(Philippou, Nicolaou 2004).

Problem posing improves not only students but also teachers attitudes, alleviate misunderstanding about the nature of mathematics.

Problem posing activities gives more responsibility to the students who are motivated for the problems during the mathematics class

Problem posing grows up the students for the future as social individuals that meets the expectation of modern society.

Silver (1997) argued that inquiry-oriented mathematics instruction which includes problem-solving and problem-posing tasks and activities can help the students to develop more creative approaches to mathematics. It is claimed that through the use of such tasks and activities, teachers can increase their students' capacity with respect to the core dimensions of creativity, namely, fluency, flexibility, and originality (e.g., Presmeg, 1981; Torrance, 1988).

English (1997) claimed that in her study of a problem posing program, the activities had a strong emphasis on children being creative, divergent, and flexible in their thinking and students were encouraged to look beyond the basic meanings of mathematics with those activities.

Balka (1974) applied mathematical creativity that has three components as fluency, flexibility and novelty. He asked the questions to subjects to pose mathematical problems that could be answered on the basis of information provided in many stories taken from real world situations.

Getzels and Jackson (1962) asked problem posing tasks to the students to identify creative individuals. Mathematical creativity can be used as measuring factors. Fluency is used as measuring factor (Foster 1970; Baur 1971; Maxwell 1974; Dunn 1976). Second, flexibility is used (Krutetskii 1976). Third, fluency and originality are used (Mainville 1972). Fourth, fluency, flexibility and originality are used . (Evans 1964; Zosa 1978; Balka 1974; Kim 1997; Song 1998).

Problem posing, or problem finding, has long been viewed as a characteristic of creative activity or exceptional talent in many fields of human endeavor. For them, creativity is similar to problem posing in its multiplicity in nature for example, Getzels & Csikszentmihalyi (1976) studied artistic creativity and characterized problem finding as a center of creative artistic experience. Problem posing, along with problem solving, is central to the 166 Lee, Kang Sup; Hwang, Dong-jou & Seo, Jong Jin discipline of mathematics and the nature of mathematical thinking (Silver 1994).

Guilford and his associates hypothesized that fluency, flexibility, and originality would be three important aspects of creativity (Guilford, 1959). Such traits were found in Guilford's well-known structure of intellect model. Guilford claimed that the intellectual factors fall into two major groups–thinking and memory factors—and the great majority of them can be regarded as thinking factors. Guilford defined divergent production as the generation of information from given information that is nearly similar definition of problem posing.

For all educators, especially for us ,to evaluate the intelligence of any kinds of mathematical ability for the students, we use word problems to understand the level of them because we prepare the students for the future and we direct them for coming occupational positions. by teaching the students word problems we extend their minds to think them creatively, to develop their problem solving abilities .By doing this ,the students race themselves by solving many problems and result of making more cognitive practice.

The development of creative mathematical ability by problem posing is very common in literature also. Ill structured, open enden problems that are stated in a manner that permits the generation of multiple specific goals and possibly multiple correct solutions as a result of the students interpretation. For example Schoenfeld (1985) asked "The Fermi style" problem of "how many cells are there in the body of an average adult male human?". Silver (1994) states that this kinds of open ended problems give a rich source of experience in interpreting problems and perhaps generating different interpretations.

METHODOLOGY

Participants: The participants of the research is from the university of Suleyman Demirel mathematics education department. The participants are prospective mathematics teachers who are chosen randomly from fourth class students.

Research methodology: The problem posing activities are introduced to students by using Brown and Walter (1983) approach that is called Another example of instructional approach that is "What-if-not?"stages to motivate the students to generate new problems. This is more probably develop the creative flexibility and to increase creative approach toward mathematical activity.

FINDINGS

Table 1:The average of pretest results

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
pretest	15	2.1333	.99043	.25573

Table 2: The average of posttest results

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
posttest	15	3.6000	.82808	.21381

Table 3:t distribution of pretest.

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
pretest	8.342	14	.000	2.13333	1.5849	2.6818

Table 4:t distribution of posttest

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
posttest	16.837	14	.000	3.60000	3.1414	4.0586

Conclusions

The results of the study are statically significant. The mean of pre test for prospective mathematics teachers is 2.1 and that of post test is 3.6. This refers that problem posing activities during problem posing sections and instruction with problem posing empowers the mathematical creativity at a high level. The students show high performances on two points first the number of questions that students generate is increased along with the activities this refers to flexibility and second the students' questions is really original that is the another component of the creativity. As a result problem posing activities is a very useful method in which the creativity of the prospective teachers is increased at a high percentage.

References

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Түйін

Бұл мақалада математикалық педагогтар мен теоретиктердің тарапынан логикалық шығармашылықтың бұл салада өте жоғары қабілет екендігі жөнінде сөз қозғалған. Зерттеу жұмысы математикалық ойлау қабілеттін арттыру жөніндегі ізденістер мен тәжірибелерге негізделген. Тәжірибе Сүлеймен Демирел атындағы университеттің математика пәнінің мұғалімдеріне өткізілді. Тәжірибеде мұғалімдерге өзекті деген 15 сұрақ беріліп, олардың осы сұраққа берген жауаптарының негізінде зерттеу жұмысы қорытыланды.

Resume

Creativity is recognized as an important mathematical ability by mathematicians, educators and theorists. The study aimed that how that problem posing instruction has positive effects on the development of mathematical creative thinking. 10 participants are selected randomly among prospective teachers from Suleyman Demirel University Mathematics Education Department. In the study, 15 word problems was prepared by using problem posing approach and how problem posing activities that is especially open ended word problems increased the verbal ability that is one component of the creativity is affected by studying the problem posing approach as a classroom activities.

Özet

Bu makalede, mantıki yaratıcılık matematikçiler, eğitimciler ve teorisyenler tarafından önemli bir matematiksel yetenek olarak kabul edildiği dile getirilmiştir. Çalışmamız, matematik düşünme yeteneğini geliştirme üzerinde kurulmuştur. Deneyime Süleyman Demirel Üniversitesi. matematik öğretim üyeleri katılmıştır. Deneyim esnasında öğretim üyelerine günümüzde aktüel 15 soru sorularak, alınan cevaplar neticesinde konu özetlenmiştir.