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The creative thinking ability in anchored instructions (AI) learning reviewed from mathematical disposition

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Abstract

The purposes of this research were to test the learning process using Anchored Instructions (AI) model to reach the learning mastery and to describe the ability of creative thinking use Anchored Instructions (AI) reviewed from Mathematical disposition. This research was mix methods research with triangulation concurrent model. The population in this research was VII grade students of SMP N 3 Ungaran academic year 2017/2018. The sample was the students of VII-I class. Particularly, the subject of this research was the students of VII-I class who have high, medium, and low mathematical disposition category. This research used quantitative data to test the average of one group and the proportion of the other group. Further, the qualitative data were analyzed by Miles and Huberman model. In the process of the interview, there were two subjects in each mathematical disposition category. Eventually, the result of this research showed that the learning process by using Anchored Instructions (AI) model reached the learning mastery and described the ability of students' creative thinking with Anchored Instructions (AI) model reviewed from mathematical disposition. It was proven through the students with high mathematical disposition who had all of the aspects of mathematical disposition ability namely fluency, flexibility, and novelty. The students with medium mathematical disposition had fluency and flexibility aspect of mathematical disposition ability. The last, the students with low mathematical disposition only had one aspect of creative thinking ability that was fluency.

1. Introduction

Education is an important thing which every nation should have. It has an important character in the process of increasing the grade and quality of human intellectuality in a nation. One of the purpose of management and organization education is to be the base of students' potency development in order to be educated, skillful, critical, creative and innovative human. This case is in the same line with the purpose of mathematical learning given since elementary school up to college. The mathematics subject is given to the students as the equipment with logical thinking ability, analytical thinking ability, systematical thinking ability, critical thinking ability, creative thinking ability and teamwork ability (Depdiknas, 2006).

In the process of increasing the students' potential, the critical thinking ability is urgently needed. Solso as cited in Siswono (2004) explains that critical thinking is a cognitive activity which produces a way or a new thing in the view of a problem or situation. According to Silver as cited in Siswono, there are three key components in creative thinking. They are fluency, flexibility, and novelty.

The critical thinking ability is because it has been one of the determinants of national excellence. The competitive power of a nation is very determined by the creativity of human sources. Based on Mahmudi (2010), the development of creative thinking ability is very important in the work. Although it is important, it does not work very well by the Indonesian Students. It was proven by the result from Trends in International Mathematics and Science Study

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(TIMSS). TIMSS is an international study about mathematics and science achievement of the High School' Students. The result of TIMSS in 2011 in cognitive process domain is presented in table 1.

Table 1. The percentage of the average of students' right answer's in cognitive process domain in TIMSS 2011.

Aspect	The Average of Correct Answer (%)	
	Indo-nesia	Interna-sional
Knowledge	31	49
Application	23	39
Reasoning	17	30

Source: Mullis, et al. (2012:462)

Based on table 1.1, the average of Indonesian Students' right answer on all aspects are under the international standard. According to Krulik and Rudnick as cited in Siswono (2007), reasoning includes basic thinking (base), critical thinking (critical), and creative thinking (creative). Based on the statement above, the percentage of the average of the students' right answer in TIMSS 2011 is still low. It means that Indonesian students' creative thinking ability is also low.

Based on the interview result on March 5th, 2018 with a mathematics teacher in SMPN 3 Ungaran, the VII grade students creative thinking was in a low position since he did not train their creative thinking in mathematical yet. The students still memorize the formula and the steps which the teacher had explained or written in the book. The new idea or the relation making between the material and the real life was not delivered well. Based on the preview of the study on March 3rd, 2018 in 29 students of VII grade of SMPN 3 Ungaran, there were three students who did not reach all indicators of creative thinking, twenty-one students had fluency aspect, five students had flexibility aspect, and there was no student who had novelty aspect. Based on the result above, the researcher believes that the students' creative thinking is still low.

Thus, the effort to increase the students' creative thinking is needed for the right learning process. Munandar (2012:7) says that the optimal development of creative thinking ability has strong relationship with the way of teaching. Therefore, the teacher has an important role in the learning process. The teacher should choose the suitable learning method which can be implemented in the classroom and simply use an effective learning in the mathematics learning process. As Suherman et al (2017) argue that in mathematics learning process, the teacher should choose and use the strategy, approach, method, and technique which are able to attract the students to study actively, in the mental, physical, or social in order to increase students' creative thinking in the mathematics learning.

One of the models which can be implemented is Anchored Instructions (AI). According to Hasselbring as cited in Hoe (2007:23), Anchored Instructions (AI) learning can support the students' learning process because there is a story which has relation with the students with the original variation, complex variation, and contextual learning experience. Oliver as cited in Hafizah (2014) suggests that Anchored Instructions Learning model is almost the same with Problem Based Learning (PBL) learning. Yet in Anchored Instructions learning model, the students are given by a problem in a story, so they can understand the problem easily and find the solutions from their ideas.

Ariyanto explains that one of the Anchored Instructions (AI) principal is problem complexity, the problem given to the students is a complex problem. To increase the students' creative thinking, the nation-routine trial test which need so many steps of completion, so there is a relation between the creative thinking and the Anchored Instructions (AI) learning model.

The Mathematics not only develops the cognitive aspect, but also the effective aspect that is about students' attitude like mathematics disposition. According to Sumaemo (2013), the mathematical disposition is students' desire, awareness, dedication, and strong tendency to think about mathematics in positive ways and based on faith, piety and noble character. Based on Kaltz (1993), mathematical disposition has relation with how the students solve their mathematical problem, confidence, preserve, interested and flexible thinking to explore the alternative solving problem.

Moreover, mathematical disposition is one of the supporting factors for students learning success in mathematics, so they need mathematical disposition to solve their problem, taking the responsible and developing the good work in the mathematics learning process. Thus, the mathematical disposition development for children is very important and very needed (Mahmudi 2010:2).

The confidence, positive manners, students' curiosity in mathematics make the low learning result. According to Syaban (2009), he explains that for now, students' power and mathematical disposition are not reached well. As proven through the interview result on March 5th 2018 with a mathematics teacher in VII grade of SMPN 3 Ungaran. He explained that the mathematical disposition of the students is still low, especially in their confidence, perseverance, and curiosity. It goes without saying that students' mathematical disposition in SMPN 3 Ungaran still needs to be improved.

Based on the explanation above, there are several research problems, as follows (1) what is students' creative thinking ability in Anchored Instructions (AI) model achieve learning completeness? (2) how is the description of students' creative thinking in mathematics learning with Anchored Instructions model reviewed from mathematical disposition?

Regarding to those research problem, this research aims to test the completeness of students in the learning process with Anchored Instructions (AI) model in creative thinking ability aspect and to describe the creative thinking ability of the students with Anchored Instruction (AI) model reviewed from the mathematical disposition.

2. Method

This research was a mixed methods research with concurrent triangulation strategy. Based on Creswell (2014), in this strategy, the process of collecting the qualitative and quantitative data was conducted at the same time. Then the data were merged into one information to get the interpretation of the whole result.

The population in this research was VII grade students of SMPN 3 Ungaran academic year 2017/2018. VII-I class was chosen for analyzing the quantitative data. Meanwhile, the process of choosing the data was based on the teacher's recommendation. The quantitative data came from the result of students mathematical creative thinking ability. The data were used to test the truth of the research hypothesis.

The hypothesis test was used to test whether the Anchored Instruction (AI) model worked to reach the mastery learning in creative thinking ability aspect or not. The mastery learning referred to the class' average and the classical mastery. The result of the students' mathematics learning of SMPN 3 Ungaran was complete if the score's average of the test results in creative thinking was more or the same with 75. To test this hypothesis, the average's test was done with one party. The criteria of the test were rejected H_0 if $t_{count} \leq -t_{(1-\alpha)(n-1)}$, which $t_{(1-\alpha)(n-1)}$ got from basic normal distribution with $\alpha = 5\%$ and $dk = n - 1$ (Sudjana, 2005).. Although from classical completeness, the students got the classical completeness if they got more than or the same with 75% from all the students in the experiment class with Anchored Instructions (AI) learning got the score lower than 75. To test this hypothesis, proposition test was done by the other party. The test criteria were rejected H_0 if $z_{count} \leq -z_{0,5-\alpha}$, which $z_{0,5-\alpha}$, got from basic normal distribution with the opportunity $(0,5 - \alpha)$ with $\alpha = 5\%$ (Sudjana, 2005).

The subjects got the description of their creative thinking ability reviewed from mathematical disposition by using purposive sampling technique. It is a process of determining the subject with several considerations (Sugiyono, 2015). The subjects in this research are 6 students of VII-I grade in SMPN 3 Ungaran. There were 2 students for each mathematical disposition category, namely high, medium and low category. This classification was based on the result of filling the scale of mathematical disposition, the suggestion from the teacher, and the test result of creative thinking ability.

3. Result & Discussion

3.1. The Result of Determining The Research Subject

The subject in this research was the students of VII-I SMPN 3 Ungaran. The process of filling the scale of mathematical disposition was done on May, 8th 2018. The result of mathematical disposition classification of the students showed that there were 17 high category students, 13 medium students, and 2 low students.

After getting those data, the researcher chose the research subject for each category. The selected subjects are presented in the following table.

Table 2. The Selected Research Subjects

Number	Student's Code	Mathematics Disposition
1	T-24	High
2	T-01	High
3	T-05	Medium
4	T-30	Medium
5	T-12	Low
6	T-31	Low

The chosen subjects were based on the same things. The T-24 was a student who had a high mathematical disposition category. The researcher believed that he had good creative thinking based on the result of his work in the detail. The subject T-01 was also a high mathematical disposition students. He was an active student and had good communication. Both T-24 and T-01 were selected based on mathematics teacher suggestion.

The subject T-05 and T-30 had medium mathematical disposition category. This classification was based on his result of creative thinking ability written test. In addition, T-30 was an active student, he was able to complete the tets in front of class. They were chosen based on teacher's suggestion.

The subject T-12 and T-31 had low mathematical disposition category. The classification of T-12 was based on his test result of creative thinking ability. While T-31 was considered as low category since he was not too active in the classroom and also had a bad communication skill. They were also chosen based on teacher's recommendation.

3.2. The Realization of Research

This research was begun from May until June 2018. The learning process was conducted in the classroom which used Anchored Instructions (AI) as the model. There were 4 times meetings in the process of gaining the data by using Anchored Instructions (AI) model. In the first meeting, the researcher gave the perception related to the real life. After that, the researcher performed several steps based on the learning steps in Anchored Instruction (AI) model. In the last meeting, the researcher gave a quiz to the students in which the result of the quiz became the data. The quiz was about a board, around of flat, rectangular, square, parallelogram, and rhombus. After 2 meetings, the students should fill the scale of mathematical disposition on May 8th, 2018 which continued by the next material on the next meeting. Eventually, after 4 meetings, the researcher gave creative thinking ability test on June 6th, 2018. However, the interview was still needed to see the students' creative thinking ability in high, medium and low mathematic disposition category.

3.3. The Analysis of Research Data

The data of this research were taken from the score of creative thinking ability and normality test analysis, the average of one party test, and proportion of one party test. Based on the analysis of the normality test by using SPSS 16.0 , it showed that the data were distributed well. Then, there was mastery learning test with the average of one party test and proportion of one party test.

In this case, the mastery learning was the completeness of the average of one party and the classical completeness. The average of completeness test was counted by the other party (left party). Based on the result of counting, the result was $t_{count} = 5{,}43 > t_{table} = -1{,}69$. So, H_0 was accepted. It means that the average of the rest result of the students' creative thinking in the experiment class was more than or the same with 75 by using Anchored Instruction model. Besides, the classical completeness test was counted by using one party proportion test (lest party). The result showed that $z_{count} = 2{,}04 > z_{table} = -1{,}64$. So, H_0 was approved. In other words, the proportion of experimental class had more than or the same with 75 from creative thinking test result by using Anchored Instructions (AI) reached the classical completeness.

Based on the average test, the Anchored Instruction (AI) model in the students' creative thinking ability aspect was more than the minimal mastery learning criteria or called as *KKM* or more than or the same as 75 or 75% from all students who got score more than or the same with 75. The result was based on the average of critical thinking ability test that were 79,7 and 90,6% or 29 students from 32 students got the score more than or the same with 75. In brief, the implementation of this model in the research classroom can increase the students' critical thinking ability. Based on Pungkas (2016), Anchored Instructions (AI) learning is able to gain the completeness of the study.

The previous result explanation was caused by the Anchored Instructions (AI) is a model which demand the students to be active in the learning process. According to Hseelbring as cited in Heo (2007:23), Anchored Instructions (AI) learning supports the students' learning process because the

problem is a form of the real story, complex story and based on the contextual's learning experience.

Besides, in Anchored Instructions (AI) learning, the students learn in a study group and they should be active in the discussion and interaction. As Piaget's theory explains as cited by Anni and Rifa'i (2012:170), in the learning situation should be interacted with the study's subject. With the social's interaction, the children's cognitive development will go to so many views. So, the Anchored Instructions (AI) will be implemented in the mathematics study toward the students' creative thinking.

3.4. The Creative Thingking Ability Viewed from The Mathematical Disposition

The analysis of the students' creative thinking was conducted through written test dan comparing the interview's result to make the accurate result. The analysis of the creative thinking ability was based on the students' creative thinking ability test. The test result divided the students' creative thinking ability into high, medium and low category based on mathematic disposition include fluency, flexibility, and novelty. The creative thinking ability is described below.

3.4.1. Fluency Aspect

In this aspect, the subject had high, medium and low mathematical disposition who gave the correct answer with the right steps in the process of solving the problem. The subjects in all mathematical disposition category can eloquently write the correct answer along with the correct procedure. Apparently, they were accustomed to doing the practice questions when they were learning in the class. Of course it improved their skill and they became familiar with the problems. As Thomdike's theory suggests that the students who have the familiar problem will give the fast response based on all their experience. Ruseffendi, as cited in Choridah (2031) says that human creative attitude supports the exploration, inquiry, discovery, and breaking the problem activities.

As explained before, there are 4 subjects in every mathematical disposition categories, namely confidence, flexibility thinking, persevere and curiosity. The subjects who had all indicators make them gave the correct answer and counting procedure, so the researcher would be able to identify the subjects. In the end, they could solve the problem automatically. It is in line with Fatimah (2009:15) that a child who can count something right and correct, he can count smoothly.

3.4.2. Flexibility Aspect

In this aspect, the subjects of high and medium mathematical disposition category had the ability to answer the mathematical problem and knew the way to solve it in the different ways as explained before, in the end they will answer correctly. The subject with high and medium mathematical disposition can give more than one ways of doing the creative thinking ability test. This ability is one of the creative thinking's character. As Wilson as cited in Sudiarta (2007:1014) says that one of the characters in creative thinking ability is to produce or give the various idea in one problem. This characteristic was proven through the subjects who had medium creative thinking ability also had medium mathematical disposition. Sugilar (2013) argues that there is the association between creative thinking ability and the mathematical disposition.

Therefore, it is important to the students to be active in the learning process. It is in the same line with Ausubel's theory as cited in Suparno (2000:53) which told the important to the students to associated the experience and the facts in the understanding system and in the active learning process.

3.4.3. Novelty Aspect

In this aspect, the subject in high mathematical disposition had not common answer from the other subjects who had different ways in solving problem. Surprisingly, his uncommon answer was his own idea. The subject who had high mathematical disposition can give the different answer. It indicates that the students who have high mathematical disposition also had high creative thinking ability. Sugilar (2013) suggests that there is an association between the creative thinking ability and the mathematical disposition.

The subjects who had medium and low mathematical disposition did not have confidence and flexibility to solve the problem. They also could not explore their understanding of the concept, consequently, they only did the test in one way as the other students did as usual. It is in the line with Zulkarhadi (2003:7), he explains that mathematical is a subject which focuses on understanding the concept, it means that in the process of learning mathematics, the students should understand the concept first to go to the next steps in doing the tests.

4. Conclusion

Regarding to previous explanation, there are several conclusions which can be drawn, as follows (1) the learning process by using Anchored Instructions (AI) model reached the completeness study that is the average completeness based on KKM and classical completeness. The score average of creative thinking ability in an experiment class is 90,6% or 29 of 32 students who got more than or the same as 75; (2) based on the analysis of creative thinking ability with high, medium and low mathematical disposition, we can conclude that: (a) in fluency aspect, the subjects in high, medium and low category of mathematical disposition have an ability to give the correct answer and the correct procedure in doing the test, (b) in flexibility aspect, the subjects in high and medium category of mathematical disposition have different way in the process of solving the problem as before, but they still have an appropriate answer. The subjects in low category have no ability to answer in a different way, but they still have an appropriate answer, (c) in novelty aspect, the subjects in high category in mathematical disposition have no common way in the process of doing the test and it is their own ideas. The subject in medium and low category have a usual way in the process of doing the test and it is based on their own ideas.

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