

The Effect of Thinking Empowerment by Questioning (TEQ) through Team-Assisted Individualization (TAI) Learning Model to Metacognitive and Learning Achievement

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Abstract. Mathematics learning achievement was still the main measure of a student's success in learning mathematics. The important thing in learning mathematics was the metacognitive ability. This study aimed to know the effect of Thinking Empowerment by Questioning (TEQ) through Team-Assisted Individualization (TAI) learning model to metacognitive ability and learning achievement. The subjects of this study were the junior high school students in Bantul, Indonesia. The data obtained by using the test to determine student achievement and questionnaire to know the metacognitive ability. The result of the study showed that the TEQ-TAI learning model effect on metacognitive ability and learning achievement.

1. Introduction

Permendikbud No 54 year of 2013 on Graduate Competency Standards mentions that on knowledge dimension is having factual, conceptual, procedural and metacognitive knowledge in science, technology, art and culture with humanitarian, national, and civilization-related causes and effects of phenomena and events. Metacognitive explicitly achieves learners at the senior school level. This indicates that metacognition is indispensable as a provision in living the future life.

Metacognition deals with the ability to control oneself. According Kardi [1] broad learning objectives in addition to equip science, also helps students are able to think to control their own learning process/self-regulated learning. Learning how to learn today is a vital need. When a person learns how to learn, then trust and confidence will increase. In this case the student first and foremost must learn how to learn, and learn how to think. According to Eggen and Kauchak [2] metacognitive is the consciousness and control of cognitive processes, whereas according to Peters metacognitive refers to the skills of the conscious students and monitors the learning process. Furthermore, according to Rivers [3] metacognitive leads to the cognitive ability and the ability to manage its own cognitive development, in other words control their own learning process. Understanding about metacognitive, according to Slavin [3] is currently urging teachers to deal directly with the metacognitive skills of learners.

Thinking Empowerment by Questioning (TEQ) is a learning strategy that seeks to empower thinking skills. TEQ is able to trigger the development of students' thinking skills to improve understanding skills [3]. The learning steps of TEQ are to provide, do, think, evaluate, and direct. According to Pujiastuti [4] TEQ learning model able to improve the ability of critical thinking and learning outcomes in junior high school students in Jember. In addition, according to Kristiani [5] learning TEQ can improve students' metacognitive ability. Application of TEQ learning will show more optimal results if implemented through cooperative learning model.

Thinking Empowerment by Questioning (TEQ) is a learning strategy that seeks to empower thinking skills. TEQ is able to trigger the development of students' thinking skills to improve understanding skills [3]. This strategy comes from Crown [6] which explains that learning should be an activity of thinking. The focus of thinking activities in learning is to think high level. TEQ is one of

the learning strategies developed by Aloysius Duran Corebima since 1985. TEQ is developed based on Diane M. Bunce's thinking that is still related to teaching science the way student learn. According to Bunce [7] "the principle of TEQ strategy is to help students think, formulate questions, and seek answers to questions. In this case the student must be a participant in the lesson.

The learning steps of TEQ are to provide, do, think, evaluate, and direct. Do is an extension or deepening of the discussion / group work. Think is a summary of the entire student sheets. The learning step requires students to think deeply about the questions provided on the TEQ sheet. Provide contains instructions for preparing study materials on the composition of population by age and sex in their respective areas). Do contain commands to draw the shape of the population pyramid from the data provided, calculate the sex ratio and dependency ratio. In the thinking section contains questions that are the conclusions of the subject matter of population. Evaluation contains questions with the aim of consolidating materials obtained by students. In the direction section contains the points of what students do to complete the activities or questions on the TEQ sheet. Students learn more effectively with the TEQ strategy because they are actively involved in organizing and discovering the relationship between the information they are learning rather than passively accepting the knowledge provided by the teacher. Eggen and Kauck [2] explain that "effective learning will lead the students to the attainment of material understanding".

The advantage of learning with TEQ is the composition of the question helps students learn the material systematically. Systematic in learning appears in the demands of the TEQ sheet questions students answered and the results of answers were presented by group representatives. The TEQ sheet contains the questions in accordance with TEQ strategy activities: provide, do, think, evaluate, and lead. The advantages in the TEQ sheet can keep students focused, systematic, and noisy when learning Djamarah [8] explains that "structured questioning has the advantage of developing thinking power and memory and can focus students' attention away from learning ". The demands of questions given by teachers on the TEQ sheet help students to focus their attention on the material.

The learning model of TAI is one of TAI learning model which gives space for knowledge building. In searching for solutions, students are enabled to carry out cooperation and communicate with other students in a cooperating group. Finally, students try to transfer the knowledge gained during the learning process to a new knowledge context or to solve other more complex problems (transferring). The TAI learning model described above illustrates that this model is able to empower students' learning independence.

2. Method

This type of research is quasi experiment (quasi experiment). The study was conducted at Aisyiyah Bantul Junior High School, Yogyakarta in the even-prestigious term of 2016/2017. The sample technique used is Positive Sampling which is based on consideration of related class condition during learning and cognitive ability. Samples were taken as many as 2 classes of each population. The technique of collecting data which is used in this study is a test and questionnaire techniques. Test techniques to obtain data on mathematics learning results while the questionnaire technique to obtain data on metacognition Traffic. The instrument used in this research is the test of mathematics learning and Questionnaire metacognition ability. The data that have been obtained tested the prerequisite that is normality test and homogeneity test. Test data and questionnaires before treatment are intended to find out the initial description of the two groups (classes). Furthermore, test data and questionnaires after treatment were used to describe the effectiveness of TEQ through cooperative learning model of TS-TS and TAI types in terms of mathematics learning, metacognitive ability.

3. Result and Discussion

The research was conducted at Aisyiyah Junior High School Bantul in year of 2017. The subjects were 19 students of grade VII Aisyah. The data were collected by using metacognitive ability

questionnaire and learning achievement test which consisted of instruments for pretest and posttest. Table 1 presents descriptive data of pretest and posttest results.

Table 1.
Descriptive Statistics of Pretest and Posttest of Learning Achievement and Metacognitive Ability

	N	Minimum	Maximum	Mean	Std. Deviation
Meta_Pre	19	8.00	14.00	11.3684	2.11373
Meta_Post	19	17.00	29.00	23.1053	3.78439
HB_Pre	19	10.00	50.00	28.4211	12.13954
HB_Post	19	20.00	60.00	35.2632	13.06753

The comparison of the pretest and posttest of learning achievement and metacognitive ability shown on the figure 1 below:

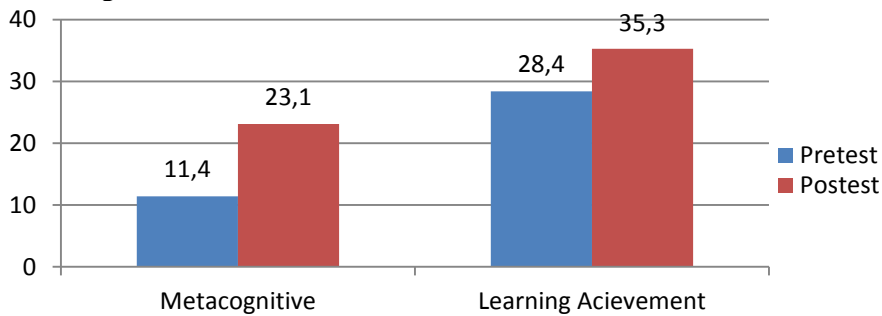


Figure 1. The comparison of pretest and posttest of learning achievement and metacognitive ability

The result of the study shows that there is effect of Thinking Empowerment by Questioning (TEQ) through Team-Assisted Individualization (TAI) learning model to Metacognitive. That can be shown by the Table 2. The significant is lower than 0.05, that show the null hypothesis (the mean of the pretest and the post test is same) is rejected. That means the mean of the pretest and the posttest is not same, in the other word there is effect of TEQ-TAI to metacognitive.

Table 2. The Paired Samples Test between Pretest and Posttest of Metacognitive

Pair		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	Df	Sig. (2-tailed)
					Lower	Upper			
1	Meta_Pre - Meta_Post	-1.17368E1	3.19448	.73286	-13.27653	-10.19715	-16.015	18	.000

The result of the study shows that there is effect of Thinking Empowerment by Questioning (TEQ) through Team-Assisted Individualization (TAI) learning model to learning achievement. That can be shown by the Table 3. The significant is lower than 0.05, that show the null hypothesis (the mean of the pretest and the post test is same) is accepted. That means the mean of the pretest and the posttest is same, in the other word there is no effect of TEQ-TAI to learning achievement.

Referring to the result above, teachers need consider the implementation of TEQI learning strategy with the setting of TAI. This learning strategy does not only concern the academic achievements, but also empower students' metacognitive ability.

Table 3. The Paired Samples Test between Pretest and Posttest of Learning Achivement

		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	HB_Pre - HB_Pos t	-6.84211	16.34783	3.75045	-14.72151	1.03730	-1.824	18	.085

The results obtained are not relevant research of Tarim & Akdeniz [9] and Zakaria [10] where the application of TAI method influences in improving student learning outcomes. The research results are also in line with the research of Nneji [11] where the method of TAI method is effective in improving student learning achievement. TEQ-TAI learning does not affect student learning outcomes. Some research results of TAI learning results have an influence on student learning outcomes [12-13]. There are still students who are afraid to express their opinions because they feel less confidence and pressure from their friends of one group, if the student's answer is wrong. There is still the nature of interdependence among students in doing group tasks, so that not too maximally the ability of students to understand the material, the stacking of this research successfully proves the method of learning Assisted Individualization Team to the results of learning mathematics.

4. Conclusion

Thinking Empowerment by Question (TEQ) combined with Team Assitted Individualization (TAI) learning has an effect on metacognition ability. This is shown from the results of the hypothesis test showed that the significance less than 0.05 from the test with SPSS. Thinking Empowerment by Question (TEQ) learning combined with Team Assitted Individualization (TAI) learning has no effect on student learning outcomes. This is shown from the results of the hypothesis test showed that the significance more than 0.05 of the test with SPSS.

5. Acknowledgments

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