

Comparison of TAPPS Strategy on Student Achievement of Senior Secondary School Students in Sukoharjo

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Abstract. This paper is a part of the researcher's thesis. The purpose of this study are to determine the differences in the effect of the each model of learning toward student achievement in mathematics study on circle matter. This study was quasi-experimental research with factorial design 2x3. The population of this study was all of students grade XI odd semester academic year 2016/2017 SMA Negeri Sukoharjo regency which is using KTSP Curriculum. Sampling process was done by stratified cluster random sampling technique. Technique of data collection with documentation and test, then be analyzed using Lilliefors method, Bartlett method, and ANAVA. The results of this study is TAPPS give a better student achievement than direct learning model.

INTRODUCTION

The developed nation is a goal that want to achieve by each country in the world. The development of nation is influenced education factor. The education is capable of creating the high quality human resources in terms of spiritual, intelligence, and skill. The education has an important role so that a country can be measured whether the country develops or not from the education factor. Therefore, to achieve an improvement, education improvement needs to be constantly carried out as anticipation of future.

Mathematics as one of national education matters that has an important role. Mathematics has an important role in the development of science and technology. Mathematics as one of the basic sciences, both application aspect and reasoning aspect, has an important role in mastering science and technology. Therefore, mastering and understanding of mathematical sciences in every level of education in Indonesia needs to be repaired.

Although mathematics has been studied in every level of education, it does not mean that the students can master master mathematics well. According trianto [1] the main problem in formal education learning (schools) is low absorptive capacity of learners. It can be seen from the average of the mathematics national exam at SMA Sukoharjo regency in the academic year of 2014/2015 based on the data of PAMER is 52.70. Mathematics achievement is low because of the low level in mastering some competencies tested. The absorptive capacity of students to the circle material is still relatively low based on the data of PAMER in 2015 is 42.97%.

TABLE 1. The Absorptive Capacity Percentage of Mastering Mathematics Material in National Exam of SMA/MA In the Academic Year of 2014/2015 at Sukoharjo Regency

The Competencies Tested	Regency	Province	National
Determine the equation of circle if some elements are known	45,90	41,74	64,04
Determine the equation of tangent circle with certain requirement.	40,03	38,12	54,58

Source: PAMER UN of 2014/2015

Based on the data above, it needs to be concerned about the factors that make the students' achievement in Sukoharjo regency low. The Success or failure of a person in the study is caused by several factors that influence the learning achievement. Slameto [2] states that the factors that influence the learning are divided into two factors: internal factor and external factor. Both have more explanations in several other factors. The internal factors are factors that exist within the individual including physical factor, psychological factor, and fatigue factor. The external factors are factors that are outside the individual including family factor, school factor, and environment factor.

Based on the interview with mathematics teachers in Sukoharjo regency, most of schools have been using direct learning model. In the direct learning model, the teacher is as an information center in demonstrating their skills and knowledge. It causes the teachers dominate class and the students are less active in the learning process. Being active in the learning process gives significant role to make the students success in the learning process. This problem is commonly faced in the learning process in the classroom. Therefore, it is necessary an effort to enhance the students more active and to help the students in understanding the teaching materials.

Handayani [3] states that the students need new innovation in the learning process that is able to facilitate in recognizing their potentials namely: reasoning ability, problem solving, and mathematical communication skills as the most important mathematical output that should be had by the students. This is supported with the research of Laal [4], he states that students who learning in collaboration are significantly more successful in academic achievement than the students in the control group working alone. One interesting innovation to solve the problems above is the implementation of cooperative learning model. The researcher is interested in applying cooperative learning model Thinking Aloud Pair Problem Solving (Tapps). Pate and Miler research results [5] shows that the use TAPPS learning model gives better result compared to the class that are not applied TAPPS learning model.

Johnson, et al. [6] states that this TAPPS cooperative learning gives the students a chance to discuss with the other students that are in the process of problem solving, each group consisted of two children, one of them is as a problem solver and the other is a listener. Within the pair, one student takes on the role of problem solver while the other student has the role of listener. The problem solver talks, verbalizes each step of his or her thought process, starts with a statement of the problem to be solved. As the problem solver works on the problem, they explain what they are doing and why. The listener role is the more difficult role. The listener must keep the problem solver taking. Short silence requires the listener to prompt the problem solver for what they are thinking. The listener needs to understand in detail every step by the problem solver, including the diversions and errors. And the listener is not supposed to help solve the problem. TAPPS has a role division of problem solver and listener alternately done so that each student has the ability in problem solving.

TAPPS process can help the students in solving complex problems. The students have output of problem solving skills, decision making, critical thinking, and creative thinking. The mathematical skills are very important part of metacognition that are owned by the student in understanding the teaching materials. In line with the statement above, Pate & Miler [5] states that, "The metacognitive learning strategy such as TAPPS, can help the students in organizing and regulating information to improve performance of problem solving". Conceptually, the focus of this learning on improving the performance of the students' problem solving is to develop metacognitive thinking.

Johnson, et al. [6] explain that corporative learning type TAPPS gives chances for student to discuss with other students that is on problem s solving process every group consist of two person being problem solver and two person being listener. TAPPS has role division problem solver and listener which is done as well as replacement so every student have ability on solving problem. Beside it, Pate adn Miller [5] explain that, "learning strategy of meta-cognitive such as TAPPS can help student in organizing and regulating on information process to increase solving problem ability". As well as conceptual, focus of this learning on the increasing student ability in complex problem solving process to develop meta-cognitive thought.

Goleman [7] declares that emotional intelligence also has influences which is significant on the successing of life, so one of the internal factors which is affecting toward students' learning achievement is level of emotional intelligence. Each student has emotional intelligence which is different. The differences of that enable there are differences of learning achievement also. The following opinion of experts concerning the excellence of emotional intelligence.

According to Goleman [6]. The skill of emotional intelligence works as synergy with cognitive skill. Person whose high achievement has both. Without emotional intelligence, someone can not use their cognitive abilities tune with maximum potention. This matter in line with Nwadinigwe & Obieke [8] in the result of study that there is possitive relation between emotional intelligence and academic achievement so the developing of emotional intelligence will increase academic achievement. Emotional intelligence can help student in solving psychological obstacles that is found on learning. Therefore, emotional intelligence who is student have is very affecting to the learning results because emotion raising action to someone's facing off.

The learning model applied in the classroom can influence the students' liveliness, so that the selection of learning model is as a factor to be considered. Based on the explanation above, the implementation of TAPPS makes the students more active so that they can improve their mathematics achievement. The researcher is interested in knowing the effectiveness of TAPPS in improving learning achievement significantly based on emotional intelligence.

EXPERIMENTAL

Research Design

The research is a quasi-experimental research that aims to know the difference effect of each learning model toward the students' achievement. The population of this research is all students in the XI class on first period of 2016/2017 academic year at SMA Sukoharjo regency used KTSP curriculum. On this study focusing on the school that applied KTSP because 8 out of 10 school in SMA Negeri Sukoharjo Regency applying KTSP. SMA Negeri se-Sukoharjo Regency consists of 10 schools and a population considered does not have the same characteristics or heterogeneous. Sampling was conducted with stratified cluster random sampling techniques. Steps in sampling was from the entire SMA Negeri se-Sukoharjo Regency are grouped into three categories, namely high, medium, dan low that based on the average of mathematics at national exam (UN) in the academic year of 2014/2015.

TABLE 1. The Result of Grouping School Calculation

No	Name of School	The Average of Mathematics Score in UN	Category
1	SMAN 1 Sukoharjo	67.92	High
2	SMAN 3 Sukoharjo	65.66	High
3	SMAN 1 Weru	64.32	High
4	SMAN 1 Tawangarsi	60.12	Medium
5	SMAN 1 Polokarto	57.51	Medium
6	SMAN 1 Kartasura	52.44	Medium
7	SMAN 1 Nguter	48.67	Low
8	SMAN 2 Sukoharjo	48.51	Low
9	SMAN 1 Mojolaban	42.03	Low
10	SMAN 1 Bulu	38.88	Low
	Average	54.60	

Based on the results of calculation, it shows that the mean (μ) of 54.60 and standard deviation (σ) of 10.08 so that high category if the average of mathematics national exam is more than 59.65 and medium category if the average of mathematics national exam is more than or equal with 49.56 and less than or equal to 59.65, while the low category if the average of mathematics national exam is less than 49.56. Then from each category selected a random school. As for the school selected from the categories high was SMAN 3 Sukoharjo, medium category was SMAN 1 Kartasura, and low categories was SMAN 1 Nguter.

From each school were then taken 2 class to serve as random samples from each school. Each of these classes, one class as experimental class I with TAPPS learning model and 1 class again as directly learning model.

Technique of Collecting the Data

Techniques of collecting the data of this research are: 1) documentation, used to determine whether experimental class, control class, and try out class are balance or not., 2) test, used to obtain the data of students' achievement in circle material taught using TAPPS learning model and direct learning model 3) questionnaire which used to knowing emotional intelligence which student had.

Research Instrument

Instrument in this research is the mathematics achievement test on the circle material. The test instrument of this research is in the form of multiple choice consisting of 25 items, but the items tested as many as 40 items. Before it is used to obtain the research data, the instrument is tested with validity test and reliability test. While for testing the instrument item, it is used discrimination test, difficulty level, and the detractors. Beside it, this research was also used emotional intelligence questionnaire which is consist of 50 numbers of statements, but

questionnaire which tested was 68 numbers to anticipate bad number. Before be used to take research datas, instrument of questionnaire was tested by validity and reliability tests. Where as to test instrument item was used internal consistents test.

Technique of Analysis the Data

Budiyono [9] the techniques of analysis the data used in this research are: 1) pre-requisite test involving normality test with Lilliefors and homogeneity test with Bartlett method, 2) balance test using one way ANOVA with different cell, 3) hypothesis test using one way ANOVA with different cell.

RESULTS AND DISCUSSION

Before the research was conducted, the first one conducted is balance test between experimental group and control group to determine the initial abilities between the experimental group and the control group in position that is balance or not. Before the balancetest performed, it needs to do normality test and homogeneity test as pre-requisite for balance test. By using Liliefors with 5% significance level for the normality test, the results are TAPPS group $L_{obs} = 0,0914$, $DK = \{L | L > L_{0,05;80}\}$ with $L_{table} = 0,0991$ and direct learning model group $L_{obs} = 0,0919$, $DK = \{L | L > L_{0,05;78}\}$ with $L_{table} = 0,1003$. Because $L_{obs} \notin DK$, H_0 is accepted. It means that the sample is in normal distribution.

By using the Bartlet method with 5% significance level for homogeneity test, the results are TAPPS group $\chi^2_{obs} = 1,3024$ dan $DK = \{\chi^2 | \chi^2 > \chi^2_{0,05,1}\}$ with $\chi^2_{table} = 5,991$. Because $\chi^2_{obs} \notin DK$, H_0 is accepted. Hence, it can be concluded that the population is homogeneous. After knowing the population is normal and homogeneous, the next test is the balance test between two groups with one way ANOVA with different cell then the results are $F_{obs} = 2,4091$ dan $DK = \{L | L > L_{0,05;1;156}\}$, with $F_{table} = 3,034$. Because $F_{obs} \notin DK$, H_0 is accepted, it can be concluded that two group have the balanced initial abilities.

After learning process in experimental class used TAPPS and control class used direct learning model, the result as in the following table:

TABLE 2. The Data of Mathematics Achievement

Learning Model	Marginal Average	n
TAPPS	69,55	80
Direct Learning Model	58,97	78

After the data is obtained, the pre-requisite test must be done with normality test and homogeneity test. Test for normality in this research carried out two times, that is for the students taught using TAPPS and using direct learning model. By using Lilliefors and 5% significance level and the results are in the following table:

TABLE 3. The Result Summary of Normality Test

Group	L_{obs}	L_{tabel}	Result
TAPPS	0,0907	0,0991	H_0 is rejected
Direct Learning Model	0,0717	0,1003	H_0 is rejected

Based on the result above, it can be concluded TAPPS group and direct learning method group are in normal distribution.

Homogeneity test in this research was done in the students' population among learning. By using Bartlet method with 5% significance level, the result are $\chi^2_{obs} = 3,2859$ and $DK = \{\chi^2 | \chi^2 > \chi^2_{0,05,1}\}$ with $\chi^2_{table} = 5,991$. Because $\chi^2_{obs} \notin DK$, H_0 accepted. Based on the result, it can be concluded that the students' population among learning is homogeneous.

After the population is expressed in normal distribution and homogeneous, then proceed to hypothesis test with one way ANOVA with different cell with 5% significance level and the results are as in the following table.

TABLE 4. The Result Summary of Hypothesis Test

Source	dk	JK	RK	F _{obs}	F _{tabel}	Result
Learning Model (A)	1	1098,3727	1098,3927	7,7368	3,84	H _{0A} is rejected
Emotional Intelligence (B)	2	4148,6520	2092,3260	14,7378	3	H _{0B} is rejected
Interaction (AB)	2	3391,4946	1695,7473	11,9444	3	H _{0AB} is rejected
Galat	174	24702,8214	141,9702	-	-	-
Total	179	33377,3606	-	-	-	-

Based on the results in the test, because $F_{obs} < F_{tabel}$ then H_{0A} is rejected, it means that there is difference effect in mathematics achievement between the students taught using TAPPS learning model and direct learning model. Based on the marginal average, TAPPS learning model gives better learning achievement than direct learning model.

According to Benham (2009) in his studies of the process of TAPPS troubleshooting. Arthur Whimbey and John Lochhead (1987), TAPPS to improve problem-solving in teaching physics and mathematics. Thinking Aloud Pair Problem Solving (TAPPS) refers to the technique of hard thinking in pairs in resolving the problem. This learning model is more emphasis on the ability of solving problems (problem solving).

Pate, Wardlow, and Johnson (2004:5) confirmed that, "*The thinking aloud pair problem solving (TAPPS) technique is a strategy for improving problem solving performance through verbal probing and elaboration*", that means TAPPS is a learning model in increasing the ability of problem solving through investigation and expansion of verbal. This model helps students in problem-solving strategies monitor through the division of the roles. Each group member has a role in observing and understanding their own thought processes and his friend.

According to Lochhead & Whimbey, as quoted by Pate, Wardlow, and Johnson (2004:5), "*TAPPS requires two students, the problem solver and the listener, to work cooperatively in solving a problem, following strict role protocols*". TAPPS divide students into several groups, where each group consists of two students that acts as a listener and problem solver to cooperate in solving problems by following certain rules. Students in pairs to solve a problem where one party acts as a troubleshooter and other parties as a listener.

Based on the description, TAPPS has learning focus on selected issues so that the students understand with the concept related to the problem and the scientific method to solve the problem that is the decision making steps. Furthermore, the students have roles in the group consisting of the problem solver and listener that support one each other in solving the problem. Through listener, the problem solver can convey all the thoughts and ideas to solve the problem. This is in line with the research of Robbins [10], he states that the students becoming problem solver and listener in TAPPS will correct each other on their understanding. All members of the group understand the steps to solve the problem and why the use of these steps. Thus, TAPPS supports the students in bringing all problem solving ideas, correcting each other, and understanding the steps to solve the problem. More meaningful lessons learned so that the TAPPS learning model gives better learning achievement than direct learning model. This is in accordance with previous study of Benham [11] he states that TAPPS gives better mathematics achievement than direct learning model.

CONCLUSION

Based on the underlying theory supported by empirical evidence from the ANOVA presented and referred to the problem statements, for XI class students of SMAN in Sukoharjo regency, it can be concluded that the students taught using TAPPS have better academic achievement than those taught using direct learning model. In TAPPS, the students work in pair to solve mathematical problem. The students participating in the TAPPS group is assigned listen to the partner and deliver their thought processes in solving the problem. They are significantly more successful in academic achievement than the students in the control group working alone. Hence, TAPPS is able to enhance the liveliness of the students and help the students understand the material so that the achievement can be improved significantly.

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