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The differences of students learning outcome with numbered head together (NHT) and think pair share (TPS) in atomic structure

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Abstract:

This study determine the differences between student learning outcomes using model of the NHT and TPS type of cooperative teaching on the subject of atomic structure. The population in this study were all grade X at SMA Negeri 1 Percut Sei Tuan. There were 9 classes. The samples were 2 classes with 68 students. The first class was used cooperative teaching model of NHT while the second class was used cooperative teaching model of TPS. The result of the study shows that the application of these two types give influence to the result of student learning outcome in chemistry. The average point of post test for first class is (73.82 ± 11.20) and the second class is (77.41 ± 10.77).The result is $t_{count}<t_{tab}$ ($-1.34<1.998$) with $\alpha=0.05$, this value conclude that there are no significant differences between student learning outcome by using cooperative teaching model with NHT type and TPS on the subject of atomic structure.

Keywords:

atomic structure; learning outcome; NHT; TPS

Introduction

Education is one of the important factortoimprove human resources. Considering the importance of education for life of nation and state, almost all countries in the world deal directly with issues related to education. The advancement of a nation is determined by the advancement of its education. Wasonowati (2014) said that improvement in terms of fixing the educational problem becomes something that must be prioritized. One level of education that should become prioritizedis in Senior High School (Silaban & Simangunsong, 2015). Furthermore, as one of a subject which has lot of concepts in Senior High School level is Chemistry. Based on the observation, students of SMA N 1 Percut Seituan assume that chemistry teaching and learning activities in the classroom are so tedious and uninteresting. This is related to the previous research which states that students assume teaching and learning process is monotonous then caused boredom (Susanti, 2010). Based on observations at the school, there are still many students who feel learning difficulties in chemistry, especially in the material of atomic structure. This is due to some abstract concepts from the material of the X class students and moreover, chemistry as a subject which also still new to study. This reasons require certain time or conditions that can make students more comfortable when studying in class (Sari, 2014; Manalu et al., 2016). Uncomfortable conditions during the learning process and learning problems which is less attractive and tedious can be influenced by one of the methods or learning models that are applied (Simarmata et al., 2016).

According to Adi et al. (2014) cooperative learning is one kind of a learning which is able to activate students and present certain material to be more interesting. The process is students work in small groups to help each other and work together to solve learning problems. Cooperative learning with several principles, is felt to be able to strengthen the interaction between students and students, as well as students with teachers (Yulianti, 2015).

In this case, the researcher is interested to conduct a research on Cooperative learning type numbered head together (NHT) and think pair share (TPS), to affect students interaction, give students plenty time of thinking and provoke

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students awareness. NHT learning model in the process, students are conditioned to contribute thoughts and responsibilities to the achievement of individual and group learning outcomes (Yostanti & Azizah, 2016). Likewise with the TPS learning model, according to Emda (2014) the TPS model can develop the ability to express ideas verbally and compare them with other people's ideas, helping students care about other students and accept all the differences. So that the interactions that occur during learning can increase motivation and cooperation among students (Silaban, 2013).

The characteristics of atomic structure material that tends to be abstract so that more time is needed for students to discuss with each other, and the conditions of students are bored because they have to work alone, then the selection of cooperative models especially NHT and TPS types is the initial assumption in solving the problem. These both types of cooperative learning has been studied by several researchers previously Retnani et al. (2014), states that there was an increase in students learning outcomes applied with the model of cooperative learning type NHT by 29.17%. Another study by Julinuddin (2015) by applying the same learning model, there wasan increase of students learning outcomes by 27.27% and based on the research of Nasution & Nurmalis (2014) also has an increase in learning outcomes. Furthermore the model of cooperative learning type TPS conducted byFajaryanti (2014) also shows an increase and in Jannah et al. (2013) study results increased by 16.7% based on the research of Juniar at al. (2013) also has an increase in learning outcomes (Panggabean & Silaban, 2015).

Materials and Methods

This research was conducted in SMA Negeri 1 Percut Seituan in June-August 2011. The population of this research is the first grade students of SMAN 1 Percut Seituan, amounted to 9 classes with an average number of students is 40 people. Class sampling method of this research was by random sampling of two classes. The first class used as an experimental class 1 which used model of cooperative learning type HNT. The second class used as an experimental class 11 which used model of cooperative learning type TPS. Students sample are taken by purposive which is relatively homogenous. The homogeneity of sample is seen from two factors, they are the similarity of pretest result, and student participation in learning process.The research design is presented in the Table 1.

Table 1
Research design

Class	Pretest	Applications	Posttest
Exp 1	T_1	X_1	T_2
Exp 2	T_1	X_2	T_2

Data collection is done by using objective test to measure student learning outcomes. It deals with the validity test, reliability test, level of difficulty and discrimination power. These tests then continued with a normality test, homogeneity test, hypothesis test and linear regression test.

Results

Instrument data analysis

After an experiment test was done, the researcher obtained 30 valid questions from 40 questions. Test reliability test using Kuder and Richardson-20 (KR-20) was obtained r_{count} of 0.916 and the r_{tab} value α = 0.05 of 0.312 indicates that the test is reliable. The difficulty level of test from 30 valid questions obtained 7 easy question category, 29 medium questions category, and 4 difficult questions category. Discrimination power of test obtained 17 good questions category, 18 modest questions category and 5 poor questions category.

Normality test

The data is tested with normality at the real level (α) = 0.05 with the test criteria, if Chi Square value (X^2_{count}) < Chi Square (X^2_{tab}), then the data is normally distributed. The test results are presented in Table 2.

Table 2
Student's exam marks for 6 topic in general chemistry course.

Class	Data	X^2_{count}	X^2_{tab}	A	Exp.
Exp 1	Pre-Test	7.42	11.07	0.05	normally distributed
	Post-Test	6.36	11.07	0.05	normally distributed
Exp 2	Pre-Test	7.05	11.07	0.05	normally distributed
	Post-Test	5.38	11.07	0.05	normally distributed

Based on Table 2, the normality test obtained, (1) the pretest data of an experimental class 1 shows that the student's chemistry learning

outcomes data is normally distributed. While for experiment class 2 shows that the students' chemistry learning outcomes are also normally distributed; and (2) the pos test data of an experimental class 1 shows that the student's chemistry learning outcomes data is normally distributed. While for experiment class 11 shows that the students' chemistry learning outcomes are also normally distributed.

Homogeneity test

Homogeneity test is done by comparing the largest variance to the smallest variance with the test criterion, if the value $F_{count}<F_{tab}$, then the data is homogeneous. The test results are presented in Table 3.

Table 3
Homogeneity test

Data	Class	S^2	F_{count}	F_{tab}	Exp
Pre-test	Exp 1	106.99	1.10	1.77	Homogen
	Exp 2	68.64			
Post-test	Exp 1	125.50	1.08	1.77	Homogen
	Exp 2	116.10			

From Table 3, data obtained the value F_{count} Pre-test = 1.10 while the value of F_{count} Post-test = 1.08. Based on the table value for the distribution of F with the real level α = 0.05 obtainedF_{tab} = 1.776. Since the value is $F_{count}<F_{tab}$, then conclude that the Pre-test and post-test of both classes are homogeneous.

Student learning outcomes

The data obtained from the research is about the student's chemistry learning which is obtained from the objective tests in the form of multiple choice. Data from the first experiment class is obtained by applying NHT and the second experiment class by applying TPS. Data of student learning outcomes is presented in the Table 4.

Table 4
Student learning outcomes.

Class	Pretest	Postest
Exp1	37.73 ± 10.34	73.82 ± 11.20
Exp2	35.29 ± 8.28	77.41 ± 10.77

In the hypothesis test, the data were analyzed statistically using a two-t test. The data of hypothesis test result can be seen in Table 5.

Table 5
Hypothesis results

Data	Class	$\bar{X}$	S^2	t_{count}	t_{tab}
Post-test	Exp1	73.82	125.5	-1.35	1.998
	Exp 2	77.41	116.1		

Discussion

In general, the application of NHT and TPS models in classes is not much different. Students are required to discuss with each other in solving problems. But in the NHT model, students will be more preoccupied with changing groups while TPS is only responsible in smaller groups. However, student learning outcomes obtained from the two models are relatively not much different. Based on Table 4, the average value of pretest experiment class 1 is 37.73 with deviation standard of 10.34, while for pretest data of experiment class 2, the average pretest score is 35.29 with standard deviation of 8.28. For the posttest data of the students' learning outcomes of the experimental class 1 the average class posttes value of 73.82 with the standard deviation of 11.20, whereas for the posttes data of experimental class 2 obtained the average postes value of 77.41 with the standard deviation of 10.77.

The initial hypothesis is assumed that there are significant differences in learning outcomes obtained through the application of NHT and TPS models. This is because the characteristics of the two models are relatively unequal. NHT types will require more time for students to alternate groups, but more are required to be responsible for understanding a material. While in the TPS type, students will tend to focus more on understanding the material, this is because group discussions are only in pairs (Muatami & Syafitri, 2018). Based on the results of the calculation of learning outcomes from Table 5, obtained $t_{count}<t_{tab}$ is -1.35<1.998 with significance level (α = 0.05). Means that there is no difference in student learning outcomes either by applying NHT or by applying TPS.

Previous NHT studies by Retnani et al. (2014), Julinuddin (2015), and Nasution & Nurmalis (2014) show an increase in learning outcomes less than 30%, while in this study the percentage shows 36.09%. Likewise, for TPS research, in a previous study by Fajaryanti (2014), Jannah et al. (2013) and Juniar et al. (2013) show an increase in learning outcomes of less than 20%, while in this study the percentage shows 42.12%. However, when compared between the two models, the statistical

results shows that there is no significant difference. As can be seen from the data, the difference of learning outcomes in experimental class 1 and 11 has not much different, because generally, the condition of students in SMAN 1 Percut Seituan have not much different in terms of level of intelligence. In addition, although both of these learning models NHT and TPS have unequalcharacteristics, but they also have similar terms, specifically in discussion process, whereas students are required to discuss certain issues with several other students. This situation makes students more active in learning process (Manalu et al., 2017).

Conclusion

The average learning outcomes of chemistry taught by NHT type cooperative learning model in experimental class 1 is (73.82 ± 11.20) with improvement of learning outcomes equal to 36.09%, while chemistry learning outcomes which is taught by cooperative learning model the type of TPS in the experimental class 2 was (77.41 ± 10.77) with the increase of learning outcomes by 42.12%. The results of the analysis of hypothesis formulation states that there is no difference in student learning outcomes taught by using cooperative learning model of NHT and TPS type.

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