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Differences in Students' Mathematics Learning Outcomes between the STAD and NHT Methods on Probability Material

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Abstract

The usefulness of the results of this research is especially for improving the quality of education at MTs. Sullamul Istiqomah and the realization of meaningful mathematics learning and making it easier for students to understand mathematics subject matter on probability material in grade VIII. The purpose of this research is achieved through a Research The use of Learning models such as Student Team Achievement Division (STAD) and Numbered Heads Together (NHT) can be used as an alternative to these variations. Thus, it is expected that teachers can make the STAD or NHT learning model as one of the learning models in learning Mathematics. The study was conducted with 3 classes, 1 class as a trial class and 2 classes as a research class. The results of data analysis showed a significant difference in learning outcomes using STAD methods. Based on calculations, data were obtained that the average learning outcomes through the STAD method had an average of 67 standard deviations of 7.15, a median of 67.5, and a mode of 60.25. Furthermore, the learning outcomes through the NHT method have an average of 83.50 standard deviations of 6.26, a median of 85.5, and a mode of 84.25.

Keywords: Learning outcomes, Mathematics, Probability material.

1 INTRODUCTION

Education is a process to make humans better in terms of knowledge, the process of developing potential, maturing themselves or characteristics, in order to become humans who believe and are devoted to Allah SWT.

One of the problems faced by our education world is the problem of weak learning process (Syahrir & Susilawati, 2015; Qonaah, Pujiastuti, & Fatah, 2019). In the learning process, children are less encouraged to develop thinking skills (Nasution & Surya, 2017). The learning process in the classroom is directed to the child's ability to memorize information, the child's brain is forced to remember and hoard various information without being required to understand the information he remembers to relate it to everyday life (Priyanti & Nurhayati, 2023).

Therefore, teachers must create a learning atmosphere that allows learning experiences to occur in students, by mobilizing all learning resources and using learning methods as the right learning strategy. In addition, teachers must also have a plan about what can lead students to the goals to be achieved. That way it can be said that the learning method as one component in the learning process has an important position, because the method can function to improve student learning outcomes.

Methods in the series of learning systems play an important role, the success of learning depends on teachers using student-centered learning methods and models. So that learning becomes fun and not boring in the classroom (Siregar, 2015). Learning model STAD and NHT students will be challenged to develop their creativity in the teaching and learning process, in learning STAD students are invited to work in teams/groups and compete in a learning design that is expected by students to be active in learning groups because of competition and responsibility in each group, while in the learning model NHT

is a group learning model that requires learners to share ideas with each other and consider the most appropriate answers in the learning group.

Based on this description, the researcher conducted research on learning methods that are effective in improving mathematics learning outcomes, with research on differences in student mathematics learning outcomes on probability material taught using STAD method with NHT method in class VIII MTs Sullamul Istiqomah Bekasi City

1.1 Mathematics Learning Outcomes

The word or term learning is not something new, it is very widely known, but in this learning discussion each expert has different understandings and definitions, although practically each of us already understands what learning means. Therefore, to avoid such diverse understandings, the following will be put forward various definitions of learning according to experts. According to Gagne, learning can be defined as a process by which an organism changes its behavior as a result of experience. Learning and teaching are two concepts that cannot be separated from each other. These two concepts become integrated in one activity where there is interaction between teachers and students, as well as students with students during learning.

According to Bloom, learning outcomes include cognitive, affective, and psychomotor abilities. The cognitive domains are knowledge (knowledge, memory), comprehension (understanding, explaining, summarizing, examples), application (applying), analysis (deciphering, determining relationships), synthesis (organizing, planning, forming new buildings), and evaluation (judging). Affective domains are receiving, responding, valuing, organization, characterization, and rountinized. Psychomotor also includes productive, technical, physical, social, managerial, and intellectual skills. Meanwhile, according to Lindgren, learning outcomes include skills, information, understanding, and attitudes. What must be remembered, learning outcomes are changes in behavior as a whole, not just one aspect of human potential. That is, the learning outcomes categorized by education experts as mentioned above are not seen fragmentarily or separately, but comprehensively.

1.2 STAD and NHT Learning Methods

By taking into account the opinions about learning outcomes and mathematics above, in essence mathematics learning outcomes are a number of abilities obtained and possessed by students after going through the mathematics learning process at a certain period of time including mastery of basic competencies using STAD and NHT learning methods to show that whether there are differences in student learning outcomes using the STAD method with the NHT method on probability material

2 RESEARCH METHODS

This research is in the form of experimental research, which is research conducted by comparing student learning outcomes with 2 STAD learning models with NHT. The research used is experimental research. An action and observation made to check the hypothesis or recognize the causal relationship between symptoms., In this experimental study, the cause of all symptoms will be tested to find out the cause or independent variable that will affect the effect or dependent variable.

In carrying out experimental research, it is necessary to understand all things related to each component of the experiment, both components related to the types of variables, the nature of the experiment, characteristics, objectives, experimental conditions, experimental research steps to the form of experimental research design. This research was conducted at MTs Sullamul Istiqomah Bekasi City, West Java. The population in this study includes class VIII of the 2022/2023 School Year which amounts to 80 students on probability material. The learning models used are the STAD and NHT learning models. Data collection techniques use observation, testing and documentation. The instruments

used in this study were pre-test and post-test sheets. Data analysis techniques use prerequisite tests, namely normality and homogeneity tests, while hypothesis tests use the *t*-test. Research data were collected using written test instruments, calculating instrument validity, interpreting valid and invalid test instruments, calculating the reliability of valid instruments, calculating the distinguishing power of question items, finding and calculating the level of difficulty, and searching for research test results data with normality tests, homogeneity tests and *t*-tests.

3 RESULT AND DISCUSSION

In this study, the author acts as an observer. Activities carried out at the planning stage of this research are preparing syllabi, Lesson Plans, making assessment guidelines, preparing material in accordance with the competencies to be taught, making learning media and student's work sheets.

In this quasi-experimental research, learning was used with NHT and STAD learning models in grade VIII.1 and VIII.2 Bekasi City students totaling 40 students which was carried out for two lesson hours with an allocation of 2×40 minutes (80 minutes).

This section describes and analyzes the test results. Test questions are given to students in class VIII.1 using the STAD model and class VIII.2 using the NHT model. Pre-test question instruments are given to students before the research is conducted, and post-test is given to students at the end of the study.

3.1 Data Description of the STAD Learning Group

From the data obtained through the distribution of instruments filled in by respondents, the mathematics scores of students taught using the STAD method were obtained at least 57 and a maximum of 81. With an average value of 67, a median of 67.5, a mode of 60.25, a variance of 51.05, and a standard deviation of 7.15. The frequency distribution is presented in Table 1.

Table 1. Frequency Distribution of STAD Method

Class	Frequency	Midpoint	Real Limits
57-61	6	59	56.5–61.5
62-66	4	64	61.5–66.5
67-71	5	69	66.5–71.5
72-76	2	74	71.5–76.5
77-81	3	79	76.5–81.5

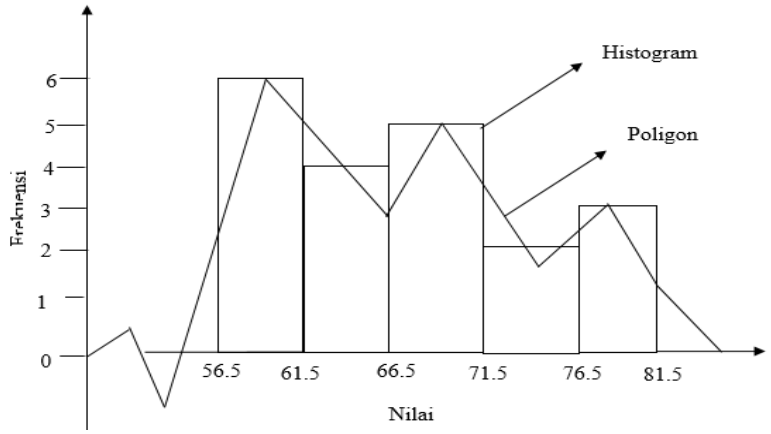


Figure 1. Histogram and Polygon of Students' Learning Outcome by STAD Method

In accordance with Figure 1, it can be seen that as many as 6 respondents have an interval of 57–61, 4 respondents have an interval of 62–66, 5 respondents have an interval of 67–71, 2 respondents have an interval of 72–76, and 3 respondents have an interval of 77–81. From the description above, it can be concluded that the interval 57–61 is the highest interval with 6 respondents.

3.2 Data Description of the NHT Learning Group

From the final ability data of students given the NHT method in mathematics subjects, a range of values between 7.1 to 9.5 was obtained with a sample of 20. The average score was 8, 3.50, the median was 85.5, the mode was 84.2, 5 variants were 39.21, and the standard deviation was 6.26. The frequency of this class is as follows:

Table 2. Frequency Distribution of NHT Method

Class	Frequency	Midpoint	Real Limits
71-75	3	73	70.5–75.5
76-80	2	78	75.5–80.5
81-85	8	83	80.5–85.5
86-90	4	88	85.5–90.5
91-95	3	93	90.5–95.5

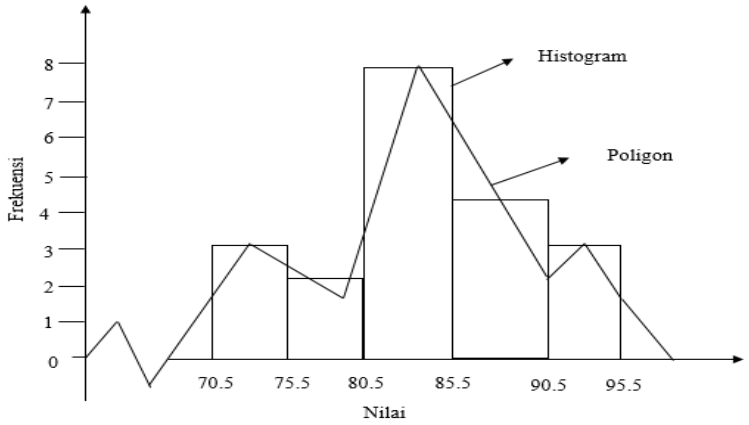


Figure 2. Histogram and Polygon of Students' Learning Outcome by NHT Method

In accordance with Figure 2, it can be seen that as many as 3 respondents have an interval of 71–75, 2 respondents have an interval between 76–80, 8 respondents have an interval between 81–85, 4 respondents have an interval of 86–90, and 3 respondents who have an interval of 91–95. From the description above, it can be concluded that the interval 82–86 is the highest interval with 8 respondents.

3.3 Normality Test

To be used as a means of decision making, the research data is first tested for normality, data normality test using χ^2 (chi squared) with a significant level of 5%.

The results of the normality test calculation on the learning outcomes of students who were given learning using the NHT method obtained a value of $\chi^2_{count}=3.156$ while $\chi^2_{table}=5.991$ so that it was concluded that the research data for students who were given learning through the application of the method NHT comes from a normally distributed population.

Furthermore, the learning outcomes of students who were given learning using the STAD method obtained a value of $\chi^2_{count}=5.632$ while $\chi^2_{table}=5.991$ so that it was concluded that the research data for students who were given learning through the application of

the STAD method comes from a normally distributed population. The overall calculation results are presented in Table 3.

Table 3. Results of Research Data Normality Test

Group	Sample Size	χ^2_{count}	χ^2_{table}
NHT method	20	3.156	5.991
STAD method	20	5.632	5.991

3.4 Homogeneity Test

The homogeneity test of both groups was performed with the Fisher test. From the calculation results, F_{count}=1.30 and F_{table}=2.15 at a significant level a = 0.05, with $dk_{numerator}$=19 and $dk_{denominator}$=19. Since F_{table}=2.15>1.30=F_{count}, it can be concluded that the samples of both groups have homogeneous conditions.

Table 4. Data Variance Homogeneity Test

$(n_1-1);(n_2-1)$	α	F_{count}	F_{table}	Decision
(20–1);(20–1)	0.05	1.30	2.15	Homogeneous

3.5 Hypothesis Testing

To obtain conclusions on the hypotheses that have been formulated in the previous section, the existing data are analyzed through *t*-test, from the calculations carried out obtained the value of t_{count}=8.39 while the value of t_{table}=1.68. At a significant level of 0.05 with 38 degrees of freedom. Based on this value, the value of t_{count}>t_{table}. This concludes that reject$_{H0}$ and subsequently accept H_1. This statement informs that "There is a significant difference between the learning outcomes of students using the STAD method and the NHT method".

Table 5. Research Hypothesis Test Results

n_1+n_B-2	α	t_{count}	t_{table}	Decision
20+20-2	0.05	9.54	1.68	H_1 accepted

3.6 Interpretation of Hypothesis Test Results

With the rejection of H 0 from the results of testing the t-test hypothesis at the level of significance $\alpha=_{0.05}$, it can be concluded that the mathematics learning outcomes of students who use the STAD method are smaller than the mathematics learning outcomes of students who use the NHT method . The test results also prove that there are differences in student learning outcomes not a coincidence, but because of the differences in treatment given to each group of students, so it can be concluded that the provision of the NHT method can have a positive effect on students' mathematics learning outcomes. The effectiveness and efficiency of the mathematics teaching and learning process can be increased by providing the NHT method in the teaching process.

4 DISCUSSION

The existence of pretest and posttest is used to determine changes in student learning outcomes after using the NHT model with the STAD model. Based on the data analyzed above, it can be seen that there are differences in student learning outcomes using the NHT model with the STAD model in mathematics subjects probability material at MTs Sullamul Istiqomah Bekasi City. Where from these results prove that the use of the NHT learning model is better than the use of the STAD learning model in improving student learning outcomes. This is in accordance with the results of research by Halimah (2017) and Kusumawati and Mawardi (2016), that the group of students who learn with NHT learning has better learning outcomes compared to STAD model learning.

To further prove this difference, it can be seen from the results of the hypothesis using *t*-test, which is obtained the results of $t_{count} > t_{table}$ (9.54>1.68) which means that the working hypothesis (H_1) in this study is accepted, namely there are differences in student learning outcomes using the NHT model with the STAD model in mathematics subjects probability material at MTs Sullamul Istiqomah Bekasi City.

5 CONCLUSION

In this case, the learning outcomes of mathematics taught using the NHT method tend to be better than students taught using the STAD method. This can be seen from H_0 is rejected and H_1 is accepted. Since $t_{counts} > t_{table}$ or 9.54>1.68, H_0 is rejected at a significant level α=0.05 and degrees of freedom is 38. Based on the results of research on the effectiveness of the NHT method and the STAD method on the mathematics learning outcomes of students on the subject of opportunities in MTs Sullamul Istiqomah, it was concluded that there were significant differences in the mathematics learning outcomes of students taught using NHT method and STAD method.

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