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Improving 7th-grade junior high school mathematics achievement through numbered heads together

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Abstract: The purpose of this study was to improve the mathematics learning outcomes of class VII-A students with the Numbered Heads Together (NHT) cooperative learning model on the triangle material at SMP Taman Dewasa Ibu Pawiyatan Yogyakarta. This type of research is classroom action research, while the method in this research is quantitative by collecting data through documents and tests. The subjects of this study were 21 students of class VII-A. The test instruments used were the pretest and posttest (evaluation questions in cycle I and cycle II) consisting of 20 multiple-choice questions. The data analysis technique of the mathematics learning achievement test was carried out by calculating the class average score. The results showed that there was an increase in mathematics learning achievement. This is indicated by an increase in the average percentage of student mathematics learning outcomes which increased from an average initial value of 48.33 to 67.86 in the first cycle and in the second cycle to 75.93. So it can be concluded that the Numbered Heads Together (NHT) cooperative learning model can improve the mathematics learning outcomes of class VII-A students on triangle material.
Keywords: cooperative learning, mathematics achievement, NHT

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INTRODUCTION

Education as a fundamental part of life (Omeri, 2015). Education at this time is expected that students will have personality traits as a provision to face this increasingly complex development (Ghufron, 2018). Education in Indonesia is currently in the 21st century or commonly known as the industrial revolution 4.0, where the existing characters at this time require skills to support survival (Daryono et al., 2020; Zubaidah, 2016). Among these skills are skills in collaborating with others (Wijaya et al., 2016). It cannot be denied that by collaborating students will be able to convey their known ideas or ideas into their group, comment on the opinions of group members and provide clarification from the results of the responses to arrive at conclusions (Gillies, 2016). The results of this collaboration will certainly make learning more meaningful, because students will learn to understand and exchange ideas with other participants so that it will lead to the same understanding from several points of view. Collaborative learning will also be able to solve existing problems and will be easier to solve than to solve alone (Zubaidah, 2016).

Education is very important and cannot be separated from life. One of the ways students understand the material in the class, students must be active and creative during learning (Nur et al., 2016; Susanto & Suryadarma, 2019). The activeness of students in learning is an important and fundamental issue that must be understood, realized and developed by every teacher in the learning process. Active learning is characterized by optimal involvement, both intellectually, emotionally and physically. students are active learning people and always want to know. There are differences in mathematics learning achievement between students who have high activity and students who have low activity. Students who have high activity on average have high learning achievement compared to students who have low activity. One of the lessons that activate these students is cooperative learning. Cooperative learning is very important in improving the learning achievement of students (Lestari et

al., 2019). To find out the learning achievement of students, an assessment is needed to determine the success of learning. Assessment can also be used to find out how far students understand the material (Widodo, 2015).

The variety of activeness and mathematics learning outcomes of grade VII A students of SMP Taman Dewasa Ibu Pawiyatan Yogyakarta in particular made the math teacher who taught in this class difficult to determine the right strategy to use in the teaching and learning process. The role of the counselor is actually very strategic to help improve the learning conditions of these students. However, what the counselor has done has not helped students in improving learning outcomes. This is because the counselor does not understand and contribute to student academics (Handarini, 2019). So that researchers feel it is important to help teachers and conduct research on appropriate learning strategies used in the teaching and learning process in the classroom. At this time mathematics learning in class VII A tends to be monotonous, there is less collaboration between teachers and students, the learning used is still conventional, so that the average mathematics learning achievement of class VII A students is said to be still below the average achievement of minimal learning completeness. This is if the appropriate learning strategy is not sought, it can result in low mathematics learning achievement. Judging from the problems in class VII A in mathematics, the researcher felt that it was appropriate to use classroom action research to find solutions to these problems.

The right action against this problem is to use the cooperative learning method type Numbered Heads Together (NHT) because of the existing problems, the researcher is very sure if to solve the problem the action used by the researcher is very appropriate. There are several theories and research conducted by several researchers on this problem. The Numbered Heads Together (NHT) Learning Model or numbering thinking together is a variant of group discussion, where the technical implementation is almost the same as group discussion (Fanolong et al., 2016; Halim et al., 2019).

According to Agustin et al. (2013) cooperative learning model type Numbered Heads Together (NHT) is a type of cooperative learning that requires students to be active in groups. According to (Yenni, 2016) the stages in the NHT type of learning are first the teacher groups students into several groups with each group consisting of 3-5 students, provided that each group has diverse abilities (heterogeneous). Second, the teacher distributes numbers to each student according to the number of all students. Third, the teacher asks questions. Fourth, the teacher randomly picks the lottery number and asks the number drawn to answer the question and the other groups to understand and correct the answer.

Through the Numbered Heads Together (NHT) cooperative learning model, students are trained to discuss and work together in groups to solve problems together. In the NHT type of cooperative learning there are no students who dominate the work while the other members only see because in this learning each student must be active in his group, those who can master the material must provide explanations to those who still cannot master the material and they must exchange each other opinions of each other in the group to obtain one main opinion or answer as a joint answer or group work answer (Leasa & Corebima, 2017).

The application of the NHT type cooperative learning method will be able to improve mathematics learning achievement in the triangular material of class VII A students because with this learning method students feel they do not think alone but think together to solve a common problem. So that if there are students who do not like mathematics, they can be assisted by friends in their group who are more capable in mathematics. In addition, students will feel more happy learning mathematics because they feel more appreciated by giving awards to the best groups so that each student and group will compete to be the best group and for students can get high scores.

So this study aims to determine the increase in mathematics learning achievement of class VIIA students with the Numbered Heads Together (NHT) cooperative learning model at SMP Taman Dewasa, Ibu Pawiyatan Yogyakarta.

METHODS

This research is action research (classroom action research) so that the procedures and steps for implementing this research follow the basic principles that apply in action research according to Fitria et al. (2019) there are 4 stages in the CAR as follows: Planning, Implementation, Observation, and Reflection. The implementation of this research is carried out at least 2 cycles on triangle material.

Cycle I, sub-material recognizes the definition, type & angle of the triangle, while the second cycle sub-material is the relationship between the inner and outer angles of the triangle, the perimeter & area of the triangle.

Research Subjects

The subjects of this study were students of class VIIA SMP Taman Dewasa Ibu Pawiyatan Yogyakarta, totaling 21 students, namely 10 male students and 11 female students. While the object of this research is mathematics learning achievement obtained from the learning process of mathematics using cooperative learning type Numbered Heads Together (NHT).

Data collection technique

Data collection in this research is in the form of observation, documentation and tests as follows.

Observation

Observations were made by the researcher to determine the feasibility of learning before the research was carried out, and also direct observation in each cycle, where the researcher made direct observations in the classroom. These observations were made by seeing and observing the learning process with the Numbered Heads Together (NHT) cooperative learning model.

Documents

The documents used are in the form of lesson plans, worksheets, a list of group names, a list of students' scores (used as an initial ability test) and photos of classroom learning.

Test

Tests are a series of questions or exercises and other tools used to measure skills, intelligence knowledge, abilities or talents possessed by individuals or groups (Arikunto, 2010). The test in this study was an evaluation test given to students that was done individually, this evaluation test was used to collect data on students' mathematics learning achievement after the application of the Numbered Heads Together (NHT) cooperative learning model.

Instrument Trial

Instrument testing is carried out to test the reliability of the instrument and to test its technical accuracy. A test that can be said to be good as a measuring tool must meet the requirements of the test, which has validity and reliability (Arikunto, 2016). Meanwhile, to determine the ability of students used trials of difficulty levels and differences in power. Whether or not the measuring instrument used must be analyzed after being tested. The instrument used to measure a particular aspect which might not provide a precise and accurate measurement will certainly lead to variance errors. The error might be overesti-mated or underestimated. A valid instrument has a small variance error because the error on measurement is low. Thus, the number can be trusted as an actual number or a number close to the actual state. As previously mentioned, the notion of validity is closely related to the problem of measurement objectivity. Therefore, no validity is generally accepted for all measurement purposes. A measuring instrument is usually only valid in measuring a specific purpose (Kartowagiran et al., 2019; Setiawan et al., 2020).

To find out the validity, difference power, data difficulty level, and reliability. Then each test is described as follows.

Item Validity

According to Sugiyono (2015), valid means that it can be used to measure what should be measured. Item validity means that an item is said to be valid if it has great support for the total score. The score on the item causes the total score to be high or low. In other words, an item has high validity if the score on the item is parallel to the total score (Arikunto, 2010).

Validity indicates that a test is essentially valid as long as it detects and measures what it alleges to measure and not something else (Thorndike & Thorndike-Christ, 2010). According to Anastasi and Urbina (2007), the validity of an instrument indicates how the measured thing is closely related to the instrument and how well the instrument can be used in measuring something from the designed

measurement. Therefore, validity can be defined as the agree-ment between test scores or measurement and the quality it is believed to measure (Kaplan & Saccuzzo, 2017). In other words, validity has been defined as the extent to which a test meas-ures what it was designed to measure (Aiken, 1980). Validity bears an aspect of precision in measurement (Azwar, 2014). Accuracy becomes important in measurement because it will produce accurate data. Based on the previous definitions, this study recognises validity inter-prets comprises "accuracy" and "precision," that is the extent to which an instrument can or is able to measure what it was designed to measure, or how far an instrument fit its measuring function.

The technique used to determine parallels is the product moment correlation Formula 1.

$$r_{xy} = \frac{N\sum xy - \sum x \sum y}{\sqrt{\left(N\sum x^2 - \left(\sum x\right)^2\right)\left(N\sum y^2 - \left(\sum y\right)^2\right)}} \quad \text{.....(1)}$$

Information:
r_{xy} = coefficient of item validity
x = score of each item / item
y = total score of all students
N = number of students

After obtaining the price with the product moment correlation formula above then consulted with the r_{xy} product moment critical price table by determining the significance level first, if $r_{xy} \geq r_{table}$, then the item is said to be valid otherwise if $r_{xy} < r_{table}$, then the item is said to be invalid. The r_{table} value for the number of students 21 is 0.433.

Distinction

Differentiation power is used to distinguish between smart students and students who are less intelligent, according to Arikunto (2016). Students are grouped into 2 groups, namely the upper 50% group, the lower 50% group (Formula 2).

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B} = P_A - P_B \quad \text{.....(2)}$$

Information:
D = distinguishing power
JA = number of participants in the top group
JB = number of participants in the lower group
BA = the number of participants in the upper group who are answer right
BB = number of participants in the lower group who answered correctly
$TK = \frac{BA}{JA}$ = proportion of group participants above who answered correctly
$JB = \frac{BB}{IS}$ = the proportion of the lower group who answered correctly

Different power classifications, among others Problem is very bad if $D < 0.00$; Bad problem if $0.00 \leq D < 0.20$; Enough questions if $0.20 \leq D < 0.40$; Problem is good if $0.40 \leq D < 0.70$; and Very good question $0.70 \leq D < 1.00$

Level of difficulty

The level of difficulty is the ratio between the participant's ability to answer correctly and the number of participants. To determine the level of difficulty of a test according to Arikunto (2016) the Formula 3 can be used.

$$TK = \frac{B}{JS} \quad \text{.....(3)}$$

Information:
TK = difficulty index
B = the number of students who answered the question correctly,
JS = the total number of students taking the test

Meanwhile, to interpret the difficulty level of the test items, the following criteria are used. $0.00 \leq TK \leq 0.30$ is called a difficult problem; $0.30 < TK < 0.70$ is called medium problem; and $0.70 \leq TK \leq 1.00$ is called an easy problem.

Test Reliability Test

Reliability testing can be done using the KR-20 formula. The calculation of the reliability coefficient uses the Formula 4 (Arikunto, 2016).

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum pq}{\sigma_t^2}\right) \quad \text{.....(4)}$$

Information:
r_{11} = reliability coefficient
n = number of valid items
σ_t^2 = total variance
p = proportion of students who answered correctly
q = the proportion of students who answered incorrectly

The test is said to be reliable if $r_{count} \geq r_{table}$. Based on the calculation of reliability using the KR-20 formula, with a significance level of 5% and the number of items (N) = 16, then r_{table} (5%, 16) = 0.497. For this reason, it can be stated that $r_{count} > r_{table}$, namely 0.850> 0.497, this means that the first cycle evaluation test is reliable with very high reliability classifications.

Based on the calculation of reliability using the KR-20 formula, with a significance level of 5% and the number of items (N) = 18, then r_{table} (5%, 18) = 0.468. For this reason, it can be stated that $r_{count} > r_{table}$, namely 0.834 > 0.468, this means that the second cycle evaluation test is reliable with very high reliability classifications.

Data Analysis Techniques

The stages of data analysis in this study were the analysis of student achievement by knowing the average value of the test.

Average value, calculated by the Formula 5:

$$R = \sum_{i=1}^{i=n} \frac{Xi}{n} \quad \text{.....(5)}$$

Information:
R = average value,
n = number of students,
X_i = value of each student,

1. Group Award Value Calculation

The steps for determining the value of appreciation to the group are as follows. (1) Determine the basic value (initial value) of each student. The basic value (initial value) is in the form of odd semester final exam (UAS) scores. (2) Determine the value of the test / quiz that has been carried out after students work in groups. And (3) Determine the value of the increase in learning outcomes whose amount is determined based on the difference between the cycle test scores (recent tests) and the previous test scores (initial scores). The criteria for assessing the value of group awards according to (Ibrahim, 2000) can be stated as in Table 1.

Table 1. Group Award Value Scoring Criteria Table

Score Criteria	Enhancement
The most recent test fell more than 10 points below the initial score	0
The most recent test fell 1 to 10 points below the initial score	10
The current test is equal to the initial score up to 10 points above the initial score	20
The most recent test was more than 10 points above the initial value	30
Perfect job (regardless of base value)	30

Group awards are given based on the average value of improvement obtained from each group by giving the title Fair Team, Good Team, Great Team, and Super Team. The criteria for qualifying group status can be stated as in Table 2.

Table 2. Table of Group Award Score Predicate

Information	Predicate
Mean group improvement score < 15	Fair Team
15 ≤ Average group improvement score < 20	Good Team
20 ≤ Average group improvement score < 25	Great team
Mean group improvement score ≥ 25	Super Team

RESULTS AND DISCUSSION

In this study, the learning carried out at SMP Taman Dewasas, Ibu Pawiyatan Yogyakarta, is learning with the Numbered Heads Together (NHT) cooperative method as an effort to improve mathematics learning achievement. This learning process was carried out 7 meetings in two cycles. The subjects in this study were students of class VII A SMP Taman Dewasa Ibu Pawiyatan Yogyakarta consisting of 10 male students and 11 female students. The initial action taken in this study was to provide learning objectives or basic competencies to be achieved. After that the researcher explained about the steps of the NHT method including numbering where each group consisted of 4-5 heterogeneous students seen based on the initial ranking of the odd semester exam scores. Then the researcher asked a question (Questioning) by giving worksheets. Furthermore, students think together (Heads Together) in groups that have been divided according to the initial rank, while the researcher helps groups who are experiencing difficulties.

At the first meeting after the numbering stage (Numbering). The researcher then motivated the students and conveyed the learning objectives at today's meeting, namely the triangle. Next, the researcher divides LKS 1 and instructs students to discuss and work on it, this is what is called the stage of thinking together (Head Together).

Students start working on LKS 1 quietly. Researchers and research partners went around to guide groups that had difficulties when working on LKS 1. In most groups, it was seen that many students were willing to work together in completing LKS 1. In the red group, there was one student who was reluctant to do so the researchers tried to persuade them to want to hurry to join in completing LKS 1. Next, the researcher observed the yellow group and the purple group. The discussion went well in this group. All members of the yellow group and purple group were active in group discussions.

In the green group, the researcher saw that not all students in the group did the LKS. The researcher came to them and reiterated that they had to work together in studying the worksheets. If only a few did, then the students who did not work when the number was assigned were not ready to present the results of their group discussion, because they did not master the material in LKS 1. Unlike the blue group, all students in the blue group were active in working on the LKS.

From the observations of researchers; the Yellow, Blue, and Purple groups were the first to take the initiative to ask the researchers. While the other group waited until the researcher asked whether they had difficulty or not.

After 40 minutes of completing LKS 1, the researcher asked the group representatives to present or answer (Answering) the results of the group discussion. The researcher appointed students with number 2 from the yellow group to present the results of group discussions and asked students with number 2 from other groups to prepare to respond. The last stage, the researcher provides conclusions from the material that has been presented. The group presentation on that day was finished and the researcher told the students that the next meeting would still work together in groups to work on LKS 2.

After the evaluation tests were held in cycle I and cycle II, the researchers also gave awards to each group. The award is based on the test evaluation scores in the first cycle and the evaluation test scores in the second cycle. The group awards in the first cycle, namely the Yellow, Blue and Purple groups, received the Super Team predicate. The Red Group received the title of Great Team. Furthermore, the Green group received the title of Good Team. This shows that the increase in the value of students is quite significant. Awards are given by giving prizes to each group. This award is expected to motivate students to study hard and be more active in learning in class. While the group awards in cycle II, namely the Red and Green groups, received the Super Team predicate. Meanwhile, the Yellow, Blue and Purple groups received the title of Great Team. The decline in the group award

predicate in cycle II was not due to decreased student cohesiveness but because the student's score in the first cycle was high enough so that the score in the second cycle was quite difficult to increase.

Students' mathematics learning achievement is given after the action cycle I and cycle II. The pre-action (pre-cycle) achievement scores are taken from the Odd Semester Final Exam scores. The following is a graph of the students 'initial ability values and the students' scores after the actions of cycle I and cycle II which can be seen in Figure 1.

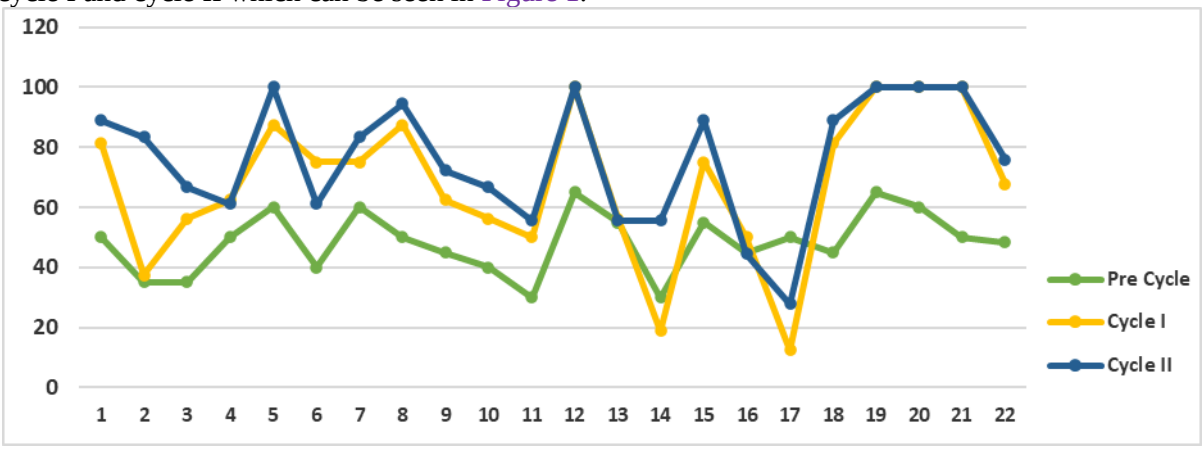

Figure 1.Graph of Initial Ability Values, Test Scores for Cycle I and II

From the Figure 1, it can be seen that most of the students experienced an increase in value from pre cycle to cycle I and II. Even though most of them have gone up, there are still some student scores that have decreased. The decline in the value of these students is not because the NHT method is not suitable for use in mathematics learning, but the decrease in the value of some students is due to when learning takes place students do not defect the material provided by the researcher and also partly pay less attention to the researcher's analysis. This is where the researcher can conclude that taking notes on the material and paying attention to the results of the researcher's analysis is very necessary in increasing learning achievement in mathematics subjects.

In addition, Table 3 and graphs in Figure 2 are presented in relation to Mathematics learning achievement as follows.

Table 3. Student Average Score Achievement Data

Aspect	Score		
	Pre Cycle	Cycle I	Cycle II
Average value	48,33	67,86	75,93

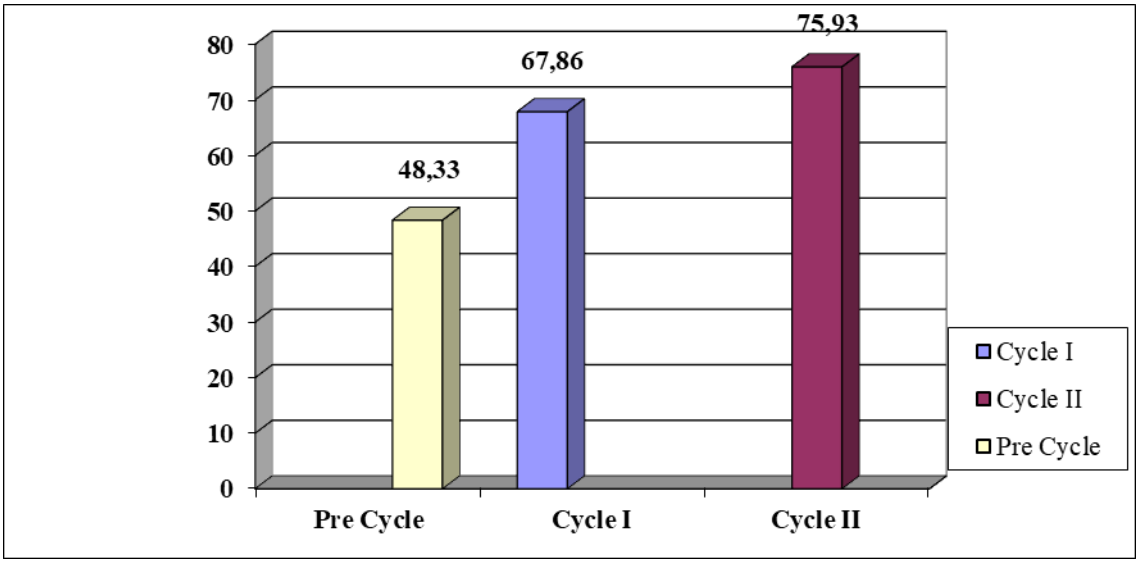

Figure 2. Student Average Score Achievement Diagram

From Table 3 and Figure 2, we can see a significant increase from the initial test data, cycle I and cycle II. In the preliminary test (Pre Cycle) get an average learning achievement result of 48.33; Cycle I got an average learning achievement of 67.86 so that it got an increase of 19.53 and in cycle II got an average learning achievement of 75.93 so there was an increase in learning achievement between cycle I and cycle II of 8.07. From the explanation above we can conclude that the cooperative learning method type Numbered Heads Together (NHT) can improve the mathematics learning achievement of class VII A students of SMP Taman Dewasa Ibu Pawiyatan Yogyakarta. Based on these results, it can be said that cooperative learning is more effective than other learning (Rabgay, 2018; Rattanatumma & Puncreobutr, 2016). NHT type cooperative learning can improve student achievement (Rahayu & Suningsih, 2018).

CONCLUSION

Based on data analysis and discussion of research results using the Numbered Heads Together (NHT) cooperative learning model in class VII A students of SMP Taman Dewasa Ibu Pawiyatan Yogyakarta, it can be concluded that the mathematics learning process uses Numbered Heads Together (NHT) with the following steps: The initial actions taken in this study were to provide learning objectives or basic competencies to be achieved. After that the researcher explained about the steps of the NHT method including numbering in which each group consisted of 4-5 heterogeneous students seen based on the initial ranking of the odd semester exam scores. Then the researcher asked a question (Questioning) by giving worksheets. Furthermore, students think together (Heads Together) in groups that have been divided according to the initial rank, while the researcher helps groups who are experiencing difficulties. After finishing working on the worksheets, students present or answer (Answering). The researcher points to one of the numbers to come to the fore to present the results of his group's work while the other numbers respond. The last stage, the researcher provides a conclusion from the material that has been presented. After the evaluation test in cycle I and cycle II was held, the researcher also gave awards to each group. The award is based on the evaluation test score in cycle I and the evaluation test score in cycle II. Thus the cooperative learning method can improve mathematics learning. This is shown by comparing the results of the final cycle test data which shows a significant increase in value, meaning that mathematics learning with the Numbered Heads Together (NHT) cooperative learning model has increased the class average score with the following results, namely pre-cycle. 48.33, the first cycle 67.86, while the second cycle 75.93.

For researchers who intend to carry out similar research, it should be planned carefully so that the expected results are obtained. In delivering the material it must also be more interesting. In addition, we also have to be good at measuring the time of the learning process.

REFERENCES

Agustin, S., Ariyanto, S., & Sukmaantara, I. P. (2013). The effect of using numbered head together technique on the eighth grade students' reading comprehension achievement at SMPN 2 Tanggul Jember. *Pancaran Pendidikan, 2*(3), 201–210. https://jurnal.unej.ac.id/index.php/pancaran/article/view/715

Aiken, L. R. (1980). Content validity and reliability of single items or questionnaires. *Educational and Psychological Measurement*, *40*(4), 955–959. https://doi.org/10.1177/001316448004000419

Anastasi, A., & Urbina, S. (2007). *Tes psikologi= Psychological testing* (B. Molan (ed.); (trans) Im). PT Prehanllindo.

Arikunto, S. (2010). *Prosedur penelitian: Suatu pendekatan praktik*. Rineka Cipta.

Arikunto, S. (2016). *Dasar-dasar evaluasi pendidikan* (5th ed.). Bumi Aksara.

Azwar, S. (2014). *Reliabilitas dan validitas*. Pustaka Pelajar.

Daryono, R. W., Yolando, A. P., Jaedun, A., & Hidayat, N. (2020). Competency of vocational schools required by construction industry in consultants' supervisor. *Journal of Physics: Conference Series*, *1456*(012057), 012057. https://doi.org/10.1088/1742-6596/1456/1/012057

Fanolong, T., Bugis, R., Azwan, A., Hanapi, H., & Handayani, N. (2016). The students' reading ability improvement through numbered head together (NHT) technique. *Jurnal Jupiter*, *14*(2), 67–78.

Fitria, H., Kristiawan, M., & Rahmat, N. (2019). Upaya meningkatkan kompetensi guru melalui pelatihan penelitian tindakan kelas. *Abdimas Unwahas*, *4*(1), 14–25. https://doi.org/10.31942/abd.v4i1.2690

Ghufron, M. A. (2018). Revolusi industri 4.0: tantangan, peluang dan solusi bagi dunia pendidikan. *In Seminar Nasional Dan Diskusi Panel Multidisiplin Hasil Penelitian Dan Pengabdian Kepada Masyarakat*, *1*(1), 332–337.

Gillies, R. M. (2016). Cooperative learning: Review of research and practice. *Australian Journal of Teacher Education*, *41*(3), 39–54. https://doi.org/10.14221/ajte.2016v41n3.3

Halim, S., Boleng, D. T., & Labulan, P. (2019). Pengaruh model pembelajaran discovery learning dan number head together terhadap aktivitas, motivasi dan hasil belajar siswa. *Jurnal Pijar MIPA*, *14*(1), 55–61. https://doi.org/10.29303/ jpm.v14.i1.569

Handarini, D. M. (2019). Kontribusi faktor-faktor non-kognitif pada prestasi belajar siswa sekolah menengah pertama. *Psychology, Evaluation, and Technology in Educational Research*, *1*(2), 62. https://doi.org/10.33292/petier.v1i2.22

Ibrahim, M. (2000). *Pembelajaran kooperatif*. Universitas Negeri Surabaya.

Kaplan, R. M., & Saccuzzo, D. P. (2017). *Psychological testing: Principles, applications, and issues*. Nelson Education.

Kartowagiran, B., Hadi, S., Wahyumiani, N., Alfarisa, F., & Pusporini, W. (2019). Effectiveness of the AA "4C" authentic assessment model: A single-case-research (SCR). *New Educational Review*, *57*(2011), 200–209. https://doi.org/10.15804/tner.2019.57.3.16

Leasa, M., & Corebima, A. D. (2017). The effect of numbered heads together (NHT) cooperative learning model on the cognitive achievement of students with different academic ability. *Journal of Physics: Conference Series*, *795*(1), 012071. https://doi.org/10.1088/1742-6596/795/1/012071

Lestari, F., Saryantono, B., Syazali, M., Saregar, A., Madiyo, M., Jauhariyah, D., & Umam, R. (2019). Cooperative learning application with the method of "network tree concept map" : Based on japanese learning system approach. *Journal for the Education of Gifted Young Scientists*, *7*(1), 15–32. https://doi.org/10.17478/jegys.471466

Nur, M. I., Salam, M., & Hasnawati, H. (2016). Pengaruh model pembelajaran kooperatif tipe number heads together terhadap hasil belajar matematika siswa kelas VII SMP Negeri 1 Tongkuno. *Jurnal Penelitian Pendidikan Matematika*, *4*(1), 99–112. https://doi.org/http://dx.doi.org/10.36709/jppm.v4i1.3055

Omeri, N. (2015). Pentingnya pendidikan karakter dalam dunia pendidikan. *Manajer Pendidikan*, *9*(3), 464–468. https://ejournal.unib.ac.id/index.php/manajerpendidikan/article/view/1145

Rabgay, T. (2018). The effect of using cooperative learning method on tenth grade students' learning achievement and attitude towards biology. *International Journal of Instruction*, *11*(2), 265–280. https://doi.org/10.12973/iji.2018.11218a

Rahayu, S., & Suningsih, A. (2018). The effects of type learning model numbered head together and think pair share. *International Journal of Trends in Mathematics Education Research*, *1*(1), 19. https://doi.org/10.33122/ijtmer.v1i1.27

Rattanatumma, T., & Puncreobutr, V. (2016). Assessing the effectiveness of STAD model and problem based learning in mathematics learning achievement and problem solving ability. *Journal of Education and Practice*, *7*(12), 194–199.

Setiawan, A., Pusporini, W., & Dardjito, H. (2020). Observation instrument for student social attitude in primary schools: Validity and reliability. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *24*(1), 76–87. https://doi.org/10.21831/pep.v24i1.31868

Sugiyono. (2015). *Metode penelitian pendidikan:(pendekatan kuantitatif, kualitatif dan R & D)*. Alfabeta.

Susanto, R., & Suryadarma, I. G. P. (2019). Thinking actively in social contexts for improving the creating thinking skills. *Psychology, Evaluation, and Technology in Educational Research*, *2*(1), 51. https://doi.org/10.33292/petier.v2i1.14

Thorndike, R. M., & Thorndike-Christ, T. M. (2010). *Measurement and evaluation in psychology and education* (7th ed.). Pearson.

Widodo, S. A. (2015). Keefektivan team accelerated instruction terhadap kemampuan pemecahan masalah dan prestasi belajar matematika siswa kelas VIII. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *6*(2), 127. https://doi.org/10.15294/kreano.v6i2.4388

Wijaya, E. Y., Sudjimat, D. A., & Nyoto, A. (2016). Transformasi pendidikan abad 21 sebagai tuntutan pengembangan sumber daya manusia di era global. *In Prosiding Seminar Nasional Pendidikan Matematika*, *1*(26), 263–278.

Yenni, R. F. (2016). Penggunaan metode numbered head together (NHT) dalam pembelajaran matematika. *Jurnal Penelitian Dan Pembelajaran Matematika*, *9*(2), 263–267. https://doi.org/10.30870/jppm.v9i2.1006

Zubaidah, S. (2016). Keterampilan abad ke-21: Keterampilan yang diajarkan melalui pembelajaran. *Seminar Nasional Pendidikan*, *2*(2), 1–17.