Analysis of the Ability to Understand Mathematical Concepts in Terms of Curiosity Using the Geoboard Assisted Numbered Head Together (NHT) Learning Model

Reza Frastica Dewi[1*], Zulmi Roestika Rini[2]
Primary Teacher Education Study Program, Faculty of Computer and Education Ngudi Waluyo University, Semarang
Corresponding Author: Reza Frastica Dewi rezafrasticadewi@gmail.com

A R T I C L E I N F O

A B S T R A C T

The study aims analyze the learning quality of the numbered head together (NHT) model in improving students' ability to understand mathematical consepts and to describe students' ability to understand mathematical consepts in terms of curiosity in learning matehmatical with the numbered head together (NHT) model. This type of research uses a combination method (mix method) with a concurrent embedded combination type. The population in this study were all study of SD N Blotongan 02, the sample in this study was grade IV of SD N Blotongan 02. The results showed that the quality of learning using the numbered head together (NHT) model was in a good category as indicated by: (1) at the planninh stage, the learning tools that have been prepared are valid, (2) at the implemntation stage, the implementation of learning is categorized as good and gets a positive response from students, and (3) at the ravluation stage, it has fulfilled the test of effectivieness influence, and increased ability to understand mathematical concepts. In addition, students with every high and high curiosity have been able to achieve the seven indicators of ability to understand mathematical concepts, while students with moderate and low curiosity have not been able to achieve the seven indicators of ability to understand mathematical concepts

INTRODUCTION

The study in patterns in space, change and structure is generally referred to as mathematical. Therefore, the informal terms for mathematics is the science of numbers an numbers. In tmathematics lessons, several abilities are developed incuding life. The process of learning mathematics, especially in elementary school, requires more than just facts or memorizing activities, but also requires action and understanding in learning.

Nana Sudjana (2005:240), characteristic of higher learning outcomes is called conceptual understanding. For example, using self-formulated sentence structures to explain something read or heard, developing illustrations that are different from what was read or heard before, and providing clues to other cases or problems. A child is said to be able to understand concepts if he is able to interpret concepts, determine and distinguish examples or non-examples of concepts, relate mathematical relationships between various ideas, master how mathematical concepts relate to one another to gain mastery or comprehensive understanding, and utilize mathematics lessons in anything other than math. While students are said to master the tecnique with the assumption that they can distinguish methods taht incorporate precise calculation intructions or determination processes. In leaening mathematics, the most important things is to understand the concept. To help solve problems encountered in everyday life, mathematical concepts are an important basis for learning.

Indicators of understanding mathematical concepts according to Heruman (Noviyana, 2017), namely: (1) Restate a convepts that has ben studied, (2) Classify objects based on whether or not the requirements that make up the concept are met, (3) Give examples and non-examples of the concepts they have learned, (4) Presenting concepts in various from of mathematical reprenstentation, (5) Developing necessary and sufficient condition is a concepts, (6) Developing, utilizing, and selecting certain provedures or operations, (7) Applying concepts in problem solving. Based on observations made by researchers who tested students in grades IVA and IVB at Blotongan 02 public Elementary School regarding the ability to understand mathematical concepts, the average grade IVA grade was 57,05 while the average grade IVB was 55,55. While the results of the presentage of 7 items can be seen in the table below.

Table 1. Analysis of Indicators of Ability or Understand Mathematical Concepts

Class	Indicators							Average
	Indicators (1)	Indicators (2)	Indicators (3)	Indicators (4)	Indicators (5)	Indicators (6)	Indicators (7)	
IVA	56,25	53,12	81,25	65,62	23,43	65,62	54,06	57,05
IVB	72,22	50	83,33	51,85	18,51	50	62,96	55,55
Percentage	**64,23%**	**51,56%**	**82,92%**	**58,73%**	**20,97%**	**57,81%**	**58,51%**	**56,3%**

Based on the table above, the results of the analysis of the seven indicators of ability to understand mathematical concepts show that inicators number 5, that is, students to change from one from of representation to another has the lowest precentage of 20,97%. The highest inidcator is found in indicator 3, with a percentage of 82,92%. While other indicators are still considered low below the KKM.

If you look at the results of the presentation indicators and the aberage value of the anility to understand mathematical convepts at SD Negeri Blotongan 002 wich is still low, increasing students' conceptual understanding and curiosity can be done by improving the course of learning from teacher-centered, to students (student-centered) supported by media or visual aids to present a more meaningful learning process and arouse thoughts, fellings, and attention and the willingness of students to play a role during the learning process takes place.

The importance of learning mathematics cannot lbe separated from other aspect of life, incluiding giving students a role in character building. Lack of attention related to student character is also a problem that occurs in SD Negeri Blotongan 02, one of wich is the student curiosity in learning mathematics. According to Bandu (2006: 141), one of the dimensions of scientific attitude is curiosity, wich has indicators of enthuiasm for the process, attention to the object being observed, and asking for each step of the activity. In addition, Bandu stated that curiosity can encourage students to discover something new (inventiveness) by strengthening attitudes (perseverance) and expressing opinions.

The student's curiosity cannot be formed instantly but must be developed over time so that it becomes a habit. To achieve this goal, it is necessary to create learning enviroment condotions that are able to educate students, attract students to learn, provide opportunities for students to actively construct knowledge in learning concepts, train student's analytical thinking skills, and foster student curiosity.

One cooperative learning model that is expected to help improve students' conceptual understandinga and curiosity is the Numbered Head Together (NHT) cooperative type. According to isjoni (2018: 68) Number Head Together (NHT) is a learning model technique that provides opportunities for students to share ideas an consider the most appropriate answer. According to Suprijono (2015: 69) the syntax of the number head together (NHT) learning model, stage 1: Delivering goals and preparing students, stage 2: Demonstrating knowledge or skills, stage 3: Guiding training, stage 4: Checking understanding and providing feedback, stage 5: Providing opportunities for training and implementation, stage 6: Evaluation, and stage 7: Rewarding.

The effectiveness of the NHtT model is supported by Budi Marwoto's statement (2021) that the application of the NHT type cooperative learning mode in learning mathematics can improve student learning outcomes in mathematics. In the application of the NHT model, it will be combined with geoborad or nail board media. Geoboard itself is a tool in teachinh geometry, such as the concept of flat shapes, the voncept of peimeter of flat shapes, and calculating and determining the area of a flat shape.

Based on the previous description, the purpose of this study was to determine the success of student learning, the effect of curiosity on the ability to understand mathematical comcepts with the NHT leaening model, and to increase students' ability to understand mathematical concepts.

Cooperative learning has a meaning has a meaning as an attitude or behaviro together in workinh or helping among athers in an organized cooperative structure in a grpup consisting of two pr more peiple whre work success is strongly influenced by the involvement of each member of the grpup itself

LITERATURE REVIEW
Learning Model
According to joyce, Weil, and Calhoun (in warsono and Hariyanto, 2013:172) the leaening model is a desciption of the learning enviromrnt, wich incudes teacher behavior in implementating learning. Meanwhile, cooperative learning is has a an attitude or behavior together in working or helping among others in a regular cooperative structure in a group consisting of two more people where work success is strobgly influenced by the involvement of each member of the grpup itself.

One of the cooperative learning models is the numbered head together (NHT). According isjoni (2018:68) Number Head Together (NHT) is a learning model technique that provides opportunities for students to share ideas and consider the most appropriate answer. This technique encourages theor cooperative spirit. According to apriliana (2015:23) , whilenthe carateristic of the number head together (NHT) learning model are as follows:
1. Heteregenous groups
2. Each group has a different head number
3. Think Together (Heads Together)

According to suprijono (2015: 69) the phases of the number head together (NHT) learning model include:
1. Estabilishing set
2. Demontrating
3. Guded practice
4. Feedback
5. Extended practice

There are several benefits or advantages to the Numbered Heads Together (NHT) cooperative learning model for students as follows:
1. Every student becomes all ready
2. Can carry out discussions seriously
3. Student who are clever teach students who are less smart.

Learning Media
Media in learning fuctions as a companion object serves to translate abstract theory so thaht it is easy to understand.

Concept Understanding Ability

Purwanti, K,Y, dan Khoriyah, I,S,A (2020) Concept understanding is a skill in understanding a concept, operation and rell in understanding a coation inmathematis. Understanding the concept referred to in this study is an understanding in which students can understand, understand and master the facts behind mathematical ideas are able to formulate or apply evidence in understanding mathematical concepts and are able to apply it in solving problems in everyday life. Indicator understanding oft mathematical concepts according to Heruman (Noviyana:2017), namely:

1. Restate a concept that has been learned
2. Classify objects based on wheter or not the requirements that make up the concepts are met
3. Give example and non-examples of the concepts they have learned
4. Presenting concepts in various froms of representative mathematics
5. Fevelop necessary and sufficient conditions in a concept
6. Develop, administer, and select specific procedure or operations
7. Applying convepts in problem solving.

Curiosity Character

According to Surya (2006: 39) curiosity is the part that initiates the will to feom creativity. Sensitivity in observinh objects is a thinkinh process based on curiosity. Curiosity is a great desire within someone who is lookinh for an answer to a given problem. One of them is by asking, investigating, and reading sources that help answer the problems given. The indicators of curiosity according to Hopkins and Craig (2015:1) in this study are:

1. Desire to explore information (explore)
2. Willingness to explore information(discover)
3. Adventure with information (adventurous)
4. Dare to ask questions (questioning).

METHODOLOGY

The mixed method is also known as the combination method used in this study, concurrent embedded is a type of combined disgn used in this study. According to Sugiyono (2013), the combined model method or also called the concurrent embedded design (umbalanced) is a research strategy that uses an unbalanced combination of qualitative research methods.

The research was caried out at SD Negeri Blotongan 02 Salatiga with the material being presented in a flat shape. In quantitative data, using 2 classes with one class as the experimental class and one class as the control class. For qualitative data, 8 sample students were selected from the experimental class with 2 students each with a very high level of curiosity, 2 students with a high level curiosity, 2 students with a medium level of curiosity, and 2 low levels of curiosity.

The research design in the experimental class used a quasi-experimental design with a non-equivalent type. In this case the experimental class applied the numbered heads together (NHT) model assited by geoborads wgile the control class used the numbered heada together (NHT) model.

Qualittaive data analysis was devided into two, namely the initial data analysis obtained from the test results of students' while the final data analysis was obtained from the final test result for students' ability to understand mathematical concepts used. as an individual and classical aptutude teat, the average difference test. From qualitative data analysis using three main steps, namely, data reduction, data presentation, and drawing conclusions.

RESULTS AND DISCUSSIONS

The quality of learning consists of there stages, namely the planning stage, the implemntation stage, and evaluation stage showing the results that the effectiveness can be met. The planning stage in this study was carried out by preparing research instruments, namley syllabus, lesson plans, teaching materials, test questions, students observation sheets, implementation observation sheets, interview guidelines and curiosity questionnaires. The isntrument has been validated by the suprvisor with validation results showing valid criteria, so it can be used in research. The results of instrument balidation can be seen in table 2. Following:

Table 2. Research Instrument Validation Results

Instrument	Validator Score	Average Score	Category
syllabus	3,37	3,37	Good
Lesson plans,	3,33	3,33	Good
Teaching materials	3,14	3,14	Good
Test questions	3,71	3,71	Good
Students observation sheets	3,42	3,42	Good
Implementation observation sheets	3,42	3,42	Good
interview guidelines	3,5	3,5	Good
curiosity questionnaires	3,37	3,37	Good

The stages of learning implementation are shown on the observation sheet of the implementation of the learning process witch shows the results at the first meeting an average of 3,13 in the good category, the second meeting is 3, 34 in the good category, and the third meeting is an average of 3,52 in the good category. This inplementation is also supported by the results of the desire to explore information (explorer) shows the highest percentage of 37,03% mixed frequently. Willingness to disclose information (discover) show the highest percentage of 62,96% frequent mix, Adventure with information (adventures) show the highest percentage of 40,74% often frequent mix, questions (questioning) show the highest percentage of 44,44% frequent mix. This shows the nature of the participants in the learning process with geoboard-assisted

NHT to be more active both in exploring information, adventurous by foing experiments, active in studying mathematics, and active in asking questions.

At the evaluation stage or the ability to test the ability to understand mathematical conceots, effectiveness tests are carried out, namely the completeness test (one sample test) and the avearagr difference test (independent sample t test).

At the evaluation stage or the ability to test the ability to understand mathematical concepts, effectiveness tests are carried out, namely the completeness test (one sample test) and the average difference test (independent sample t test). Based on the results of the individual completeness test from this calculation, it is obtained that the value So $t_{(table)} < t_{count}$, (1.7081 <2.759) then $H_{(o)}$ is accepted. It can be concluded that the highest student success of 70% is not proven, but has a higher value or success rate of 8.95. In the second hypothesis obtained $t_{(table)} < t_{count}$, (1.7081 <2.759) then $H_{(a)}$ is accepted. It can be concluded that student success below 70% as expected in the second hypothesis is acceptable.

The last or third hypothesis, shows a sig number of 0.010 <0.05, so that Ha is accepted while Ho is rejected, where the success rate of students is ≠ 70 as desired, From the results of this analysis, the proportion of experimental class students has fulfilled the KKM.

The results of the completeness test in the control class are $t_{(table)} < t_{count}$,(2.145<2.359) then $H_{(o)}$ is accepted, the highest student success rate is 70% cannot be proven, but has a higher score or success rate of 7 ,38. In the second hypothesis obtained $t_{(table)} < t_{count}$, (2.145 <2.359) then $H_{(a)}$ is accepted. It can be concluded that student success is below 70% as expected in the second hypothesis can be accepted.

In the third hypothesis, the sig. of 0.032 <0.05, so that Ho is rejected & Ha is accepted, where the success rate of students ≠ 70 as desired, can be accepted. Then to analyze the average difference test (independent sample t test) using SPSS, the results of the average difference test can be seen in table 2 below:

Table 3. Average Different Test Results

No	Class	Mean	sig. coun
1.	Control	73, 25	0,045
2.	Experiment	78, 33	0,048

Table 2 shows that the sig count value of the control group is 0.045 <0.05, while the sig. calculate the experimental group 0.048 <0.05, based on the decision so that H0 is rejected and H1 is accepted. Which means there is an average difference between the experimental group and the control group. The difference between the two is 4.45. So it can be concluded that the students' conceptual understanding abilities in the experimental class with the geoboard numbered head together (NHT) model were higher than the control group students who only received the numbered head together model.

Based on the results of the effectiveness test that has been carried out, the effectiveness criteria at the evaluation stage of the conceptual understanding ability test activity can be fulfilled. The results of this study are in line with the results of research conducted by Nur Hidayah (2010) stating that mathematics learning achievement in the area of squares and rectangles increases with the NHT type cooperative learning model. This can be seen from the cognitive, affective, and psychomotor aspects. The average value in cycles I and II has increased.

Model (NHT) encourages students to work together in groups to complete and master a learning concept to achieve success together in each group. The application of the NHT model is believed to be able to improve the ability to understand mathematical concepts, this is in accordance with research that has been conducted by Budi Marwoto (2021). To improve student mathematics learning outcomes, the application of the NHT model is one of the solutions that can help.

For the next problem, namely the effect of student curiosity on the learning process with the geoborad-assisted NHT model, based on the results of a simple linear regression test it shows that every 1% increase in the level of student curiosity (X) has an effect on the ability to understand mathematical concepts (Y) increases of 0.869. There is a good influence as evidenced by a positive coefficient value of 10.501, so the regression equation can be written Y=10.501+0.869X.

The curiosity referred to in this research is curiosity about learning mathematics at school. The indicators of curiosity in this study are (1) desire to explore information (explorer), (2) willingness to explore information (discover), (3) adventure with information (adventurous), and (4) dare to ask questions questions (questions). Students' curiosity is divided into four categories, namely very high, high, medium, and low curiosity.

The character of high and very high curiosity possessed by students can produce high conceptual understanding abilities as well. High conceptual understanding ability means that students are able to complete the seven indicators contained in the five items.

The character of moderate curiosity The character of moderate curiosity possessed by students makes students not fully able to master the seven indicators contained in the five questions on the ability to understand mathematical concepts. Students with moderate curiosity have not been able to master two of the seven indicators, the two indicators they have not mastered include presenting concepts in various forms of mathematical representations, and giving examples and non-examples of the concepts they have learned. So that students are only able to master the five indicators of ability to understand mathematical concepts.

The character of low curiosity possessed by students is shown by the inability of students to complete the four indicators of conceptual understanding ability from the seven indicators, which means that students in the low curiosity category are only able to master 3 indicators of understanding concepts, including restating a concept, classifying objects according to certain traits. according to the concept, and develop necessary or sufficient requirements

of a concept. This is in accordance with research conducted by LV Putra, AM Hawa, and ZR Rini (2020) stating that students have difficulty understanding advanced concepts from previous concepts, because students have not arrived at a relational understanding that can explain relationships between concepts.

The last problem is increasing the ability to understand mathematical concepts in the treated class (experimental), based on the results of the paired sample t test showing the sig. (2-tailed) of 0.000 <0.05, then H_0 is rejected and H_1 is accepted. Based on the decision making, it can be stated that there is a difference in the average value of student learning outcomes in the pre-test conditions and in the post-test conditions. The average scores in the pre-test and post-test conditions in the experimental class group were 64.44 and 85.56. The difference in the average value of the pre-test and post-test is 21.111. From these results it can be concluded that the use of the geoboard-assisted NHT model increases the ability to understand students' mathematical concepts.

CONCLUSIONS AND RECOMMENDATIONS
Conclusion

Based on the analysis and discussion, it is concluded that the quality of the geoboard-assisted numbered head together (NHT) learning model on the ability to understand mathematical concepts in class IV SD Negeri Blotongan 02 Salatiga is indicated by: (1) In the pre-field stage, the preparation of learning tools and instruments has met the requirements for conducting research, (2) Field work stage, research has been carried out coherently. At the evaluation stage, the results of the effectiveness test are proven by the completeness of the student test results, and there is a difference in the average. There is a positive (+) curiosity effect on the learning process with the geoboard-assisted NHT model and is supported by the relationship of each student's curiosity to the results of the ability to understand mathematical concepts, and there is an increase in conceptual understanding skills after carrying out learning activities with the geoboard-assisted NHT model.

Recommendations

Be an input to teachers in developing learning models and media for increasing the ability to understand concepts in mathematics subject matter. And it is hoped that enthusiasm or desire during the learning process both at home and at school will result in high learning outcomes. As well as being a source of reference for further researchers in subsequent studies.

FURTHER STUDY

The media in this study requires innovation in its application, educators are expected to apply geoboard media to the learning process in order to increase the ability to understand mathematical concepts. Students are expected to actively contribute to the learning process through question and answer activities, group discussions, asking questions, and practicing learning media. The activeness of students in the learning process can be done by applying an interesting learning model that can help improve their ability to understand concepts. One model that can be a solution is the number head together (NHT) cooperative learning model in collaboration with geoboard media. To achieve the goal of increasing the ability to understand the concept of researchers are expected to prepare the instrument properly.

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