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Mathematical representation ability and confident character assisted by Schoology with the NHT method and thematic approach

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Abstract

This study aims to determine the students' mathematical representation ability and confidence character assisted by Schoology with the Numbered Heads Together (NHT) method and thematic approach and describe the mathematical representation ability based on the character of self-confidence. The subjects of this study were students of class VIIF and VIIH, one of Junior High School in Semarang. The method used is a mixed method. The results of the study show that: (1) The students' mathematical representations ability and confident character assisted by Schoology with the NHT method and thematic approaches are better than learning without Schoology; (2) the mathematical representation ability based on the character of self-confidence is (a) students with high self-confidence implement indicators visual and symbolic representations; (b) students with medium self-confidence implement indicator symbolic representation; and (c) students with low self-confidence not implementing of indicators visual, symbolic, and verbal representation abilities.

1. Introduction

One of the subjects that students must take is mathematics. According to Lince (2016), mathematics is a subject given to all students starting from Elementary School to equip students with the ability to think logically, analytically, systematically, critically and creatively, and the ability to work together. Therefore, mathematics has an important role in the field of education, as evidenced by the existence of mathematics in elementary, junior high and senior high school.

Based on the 2015 National Examination Results in one of junior high school in Semarang, the absorption of material numbers only reached 66.05%. Based on observations, there are still many students who have not been able to express their ideas in the form of representation in solving mathematical problems. There are still many students who have not dared to ask the teacher especially if the teacher is a new teacher. But there are also many students who have dared to ask questions and express their opinions even enthusiastically in every math lesson. Also found were students who were not confident in working on the test questions and still cheating on their friends. This shows that the mathematical representation in one of junior high school in Semarang needs to be improved and analysis of these abilities can be viewed from the students' confidence character.

Students in one of junior high school in Semarang have a smartphone so that the use of e-learning can be done, where learning is not only in school but learning can take place anywhere, anytime, and from any learning source. According to Murtiyasa (2015), the progress of Information, Communication, and Technology (ICT) is expected to be used by teachers to improve the quality and efficiency of the learning.

According to National Council of Teacher of Mathematics (NCTM) (2000), there are five standard mathematics learning processes that must be mastered by students, namely (1) Learning to solve problems

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(mathematical problem solving), (2) Learning for reasoning and proof (mathematical reasoning and proof), (3) Learning to communicate (mathematical communication), (4) Learning to associate ideas (mathematical connection), and (5) Learning to present (mathematical representation). Mathematical representation is the ability of students to represent or make shapes from an idea or problem, for example drawing a graph of an equation.

According to Muhammad (2017), the low self-confidence in junior high school students is a problem that is often overlooked by teachers, but if these conditions continue to be ignored, this will have a negative impact on students, namely the learning outcomes that are less than optimal. Students who lack self-confidence, are unsure of their own opinions and answers so students are afraid and ashamed if the opinions or answers are wrong (Sapto *et al*., 2015).

One of the cooperative learning methods is Numbered Heads Together (NHT). According to Huda (2017), Numbered Heads Together is a method developed by Russ Frank where students are given the opportunity to share ideas and consider the most appropriate answers. This method can also enhance the spirit of student cooperation and can be used for all subjects and grade levels.

Thematic approaches are given with the intention of uniting curriculum content in whole unit units so that learning is full of value, meaningful, and easily understood by students (Rusman, 2015). This approach can be applied in one subject so that it can be applied to mathematics subjects.

According to Kelly, as quoted by Hidayah & Sugiarto (2015), learning mathematics by using manipulative aid or concrete objects in the process of exploration or problem solving is an important factor in the success of mathematics learning. According to Hidayah *et al* (2018), in mathematics learning the use of teaching aids is accompanied by a series of productive questions from the teacher, namely questions that require students to answer, questions that guide students to lead to the discovery of concepts or principles so that students construct learning knowledge.

Based on the description above, the author conducted a study with the title "Mathematical Representation Ability and Confident Character Assisted by Schoology with the NHT Method and Thematic Approach."

The aims of this study are: (1) To find out whether the mathematical representation ability of students assisted by Schoology with the NHT method and thematic approach is better than the ability of mathematical representation with the NHT method and thematic approach; (2) find out whether the confident character of students assisted by Schoology with the NHT method and thematic approach is better than the character of students' confidence with the NHT method and thematic approach; (3) Describe the mathematical representation ability based on the character of self-confidence of high, medium and low level students assisted by Schoology using the NHT method and thematic approach.

2. Methods

The method used in this study is a mixed method. Mixed method is a systematic method that uses two or more research methods to answer a research question, including using two qualitative or quantitative methods or both (Morse, 2016).

The research method used in this study is concurrent tringulation design. Concurrent tringulation design, involves collecting and analyzing quantitative and qualitative data simultaneously, combining two data sets, and using combinations to understand research problems well (Clark & Creswell, 2008).

The subjects of this study were class VIIH as the experimental class and VIIF as the control class. The experimental class assisted by Schoology with the NHT method and thematic approach while the control class uses the NHT method with a thematic approach without the help of Schoology. The researcher took 6 people from the experimental class with high, medium, and low confident character categories to describe the mathematical representation ability based on the level of self-confidence.

In this study, to obtain quantitative data used data collection techniques with tests and questionnaires while qualitative data obtained by data collection techniques with documentation and interviews. Quantitative research uses true experimental design with the form of posttest only control design. According to Sugiyono (2016), in this design there were two groups selected randomly, the first group was treated and the other group was not. The first group was assisted by Schoology with the NHT method and thematic approach which was then called the experimental group. The second group was treated with the NHT model with a thematic approach without the help of Schoology which was then called the control group. The results of the mathematical representation ability test and interview were analyzed referring to the mathematical representation indicators as given by Table 1.

Tabel 1. Mathematical Representation Indicators

No	Indicators	Sub Indicator
1.	Visual Representation (Graphs, diagrams, or tables)	Use visual representations to solve problems
2.	Symbolic Representation (Equations or mathematical expressions)	Solving problems by involving mathematical expressions
3.	Verbal representation (Words or written text)	- Write down the steps to solve mathematical problems with words - Compile stories according to the representation presented

(Yudhanegara & Lestari, 2015)

3. Results & Discussions

Based on the data obtained, the average test score of students 'mathematical representation ability in the class assisted by Schoology with the NHT method and thematic approach is 73.84 while the average test score of students' mathematical representation ability in the class uses NHT method and thematic approach is 59.17. Student confidence questionnaire scores in the class assisted by Schoology with the NHT method and thematic approach were 99.06 while the character questionnaire scores of students' confidence in the class uses NHT method and thematic approach were 93.77.

Based on the calculation obtained t_{count} = 4,82 while with α=5% and dk = 32 + 30-2 = 60 obtained t_{table} = 1,67. Because $t_{count} \geq t_{table}$ then H_0 is rejected which means that the mathematical representation ability of students assisted by e-learning Schoology with the Numbered Heads Together method and thematic approach is better than the students' mathematical representation ability with the Numbered Heads Together method and thematic approach without e-learning Schoology.

Based on the calculation obtaine t_{count} = 2.59, while with α=5% and dk = 32 + 30-2 = 60 obtained t_{table} = 1.67. Because $t_{count} \geq t_{table}$ then H_0 is rejected which means that the confident character of students assisted with e-learning Schoology with the Numbered Heads Together method and thematic approach is better than students' confident character with Numbered Heads Together method and thematic approach without e-learning Schoology .

From the results of the analysis, there are various things that cause differences in the results of students' mathematical representation ability between the class assisted by Schoology with the NHT method and thematic approach and the class uses NHT method and thematic approach. In Schoology assisted learning with the NHT method and thematic approach, before learning students can already download teaching material on Schoology so students know what they will learn in class. In classroom learning, students are given the opportunity to focus on certain themes and work together to get maximum results. At the numbering stage, students are divided into several heterogeneous groups that allow it to interact with group members. Students also provide head numbers to use during learning. At the stage of asking questions, the teacher distributes the worksheet in each group. At the stage of thinking together, each group starts a discussion to find the most appropriate answer and all group members must understand the answer so that when the teacher calls one number, each group member must be ready to come to the front of the class. This makes students have responsibility and foster a character of confidence. Students must be able to understand the problem and its solution so as not to become a burden on the group because the success of one student in the group is group success and the failure of one student in the group is the failure of the group. At the answer stage, the teacher calls one number randomly. Students who are called will present the results of their group discussions. The teacher also gives awards to groups that answer correctly. Once learning is complete, students can also download the answer key from the worksheet, key answers from the quiz, and work on the questions on Schoology. Students practice more questions and can learn more outside of class hours. In the class uses NHT method and thematic approach, as soon as learning is over, students are not given homework so there are not many student training questions. worksheet and qiuz have been discussed and discussed during learning but students do not have e-learning facilities to study worksheet outside of school hours.

However, the teacher found several obstacles when using Schoology. Such as students have difficulty making a Schoology account if done in their homes. The teacher has provided guidance on how to create an Schoology account, often asks students about the difficulties when using Schoology, and makes every

effort so that each student has a Schoology account in order to maximize the use of Schoology. As a result there are some students who are late in making Schoology accounts and some do not have a Schoology account until the end of the study. Students who do not have an account Schoology and late have an account Schoology works on tasks through the requested files from other students. From this also, discussions on Schoology did not run smoothly. Of the 32 students in the class assisted by Schoology with the NHT method and thematic approach, 17 students had Schoology accounts and only 3 students worked directly on Schoology. The use of Schoology was not in line with expectations because of the 17 students who managed to create an account, only 3 students who worked on the problem on their Schoology account, and the discussion group did not work optimally.

This is in accordance with Aminoto & Pathoni's (2014) study that student activity media Schoology outside school hours or at home is not as good as when Schoology is applied in the school environment because of the unavailability of internet access. Although only 17 students have successfully created an Schoology account, these students benefit from the use of Schoology. Among them were students getting a full discussion of the material, worksheet, and quizzes, getting to understand fraction material, and getting more enthusiastic and motivated to learn. For students who have created an Schoology account, learning through Schoology is easier and more practical because the content from Schoology is so complete that files that have been stored at any time can be reopened. The use of e-learning Schoology also makes students reduce smartphone use from things that are not useful like playing games.

Of the 17 students who had created a Schoology account, 6 students were allowed by their parents to use their smartphones privately by remaining under parental supervision while 11 other students used their parents' smartphones. These students have high motivation and enthusiasm for learning so parents also support the use of smartphones as a means to study outside of school hours.

This is in accordance with Kusmana (2017) research that students who do not have high learning motivation tend to fail in implementing Schoology. The unavailability of internet access also influences the use of Schoology. Students must be able to learn independently which means students can determine when, where, and how they can learn. According to Wijaya (2015), for e-learning to be successfully implemented, students must have the willingness to study independently and provide internet access to support the use of e-learning.

In the class uses NHT method and thematic approach, as soon as learning is over, students are not given homework so there are not many student training questions. worksheet and Quiz Questions have been discussed and discussed during learning but students do not have e-learning facilities to study worksheet outside of class hours.

So, the conclusion that students 'mathematical representation ability after learning through School-based e-learning with the Numbered Heads Together method and thematic approach is better than students' mathematical representation ability with Numbered Heads Together method and thematic approach because of e-learning assisted learning Schoology with Numbered method Heads Together and the thematic approach of students were given additional questions through Schoology e-learning while learning with the Numbered Heads Together method and the thematic approach students were not given additional questions.

There are various things that cause differences in the results of students' confident characters between the class assisted by Schoology with the NHT method and thematic approach and the class uses NHT method and thematic approach. In Schoology assisted learning with the NHT method and thematic approach, students look more prepared to accept mathematics because they have previously studied teaching materials that can be downloaded on Schoology. The second meeting onwards students were also more prepared to accept because they had studied the worksheet answers and quizzes at the previous meeting. In classroom learning, students are given the opportunity to be responsible for their group so that they must give their group the best, especially at the stage of thinking together. If students do not dare to ask or do not know the answer to the problem, students will not dare to show up to come to the front of the class. Students must be able to understand the problem and its solution so as not to become a burden on the group because the success of one student in the group is group success and the failure of one student in the group is the failure of the group. At the answer stage, the teacher calls one number randomly. Students who are called will present the results of their group discussions. The teacher also gives awards to groups that answer correctly. This also increases the confidence of students who have answered correctly.

In learning with the NHT method and thematic approach, students get the same treatment with the class assisted by Schoology with the NHT method and thematic approach during classroom learning. But because sometimes students are not ready to accept learning, this makes students not optimal in learning. Students are more dependent on group friends who understand more about the material being taught so that the discussion stage takes place quite slowly because they have to teach their friends to be able to answer

questions and be able to present the results of the discussion if the number is called by the teacher. This has an impact if students are not ready to be called the number so students do not dare to raise their hands.

To describe the ability of mathematical representation based on the level of character confidence, researchers took 2 subjects from each category. The research subjects chosen to analyze the ability of mathematical representation can be seen in Table 2.

Table 2. Selected Research Subjects

Confident Character		
High	**Medium**	**Low**
E-12	E-30	E-08
E-15	E-32	E-20

The following is an analysis of the ability of mathematical representation of students who have high self-confidence characters. The researcher analyzed the results of E-12 and E-15 work and conducted interviews.

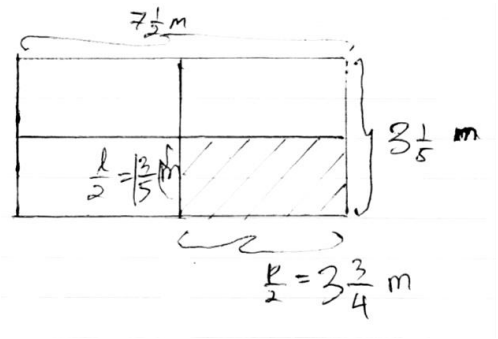

Figure 1. E-12 Test Results Number 4

Based on Figure 1, Subject E-12 was able to use visual representation to solve problems. E-12 is able to draw in accordance with the problem, E-12 also gives information to clarify the image presented.

On another question, Subject E-12 is able to solve problems by involving mathematical expressions. Subject E-12 was also able to write steps in mathematical completion with words. However E-12 subjects have difficulty compiling stories when a representation is presented.

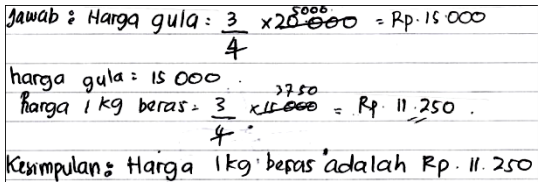

Figure 2. E-15 Test Results Number 2

Based on Figure 2, Subject E-15 is able to solve problems by involving mathematical expressions. On another question, Subject E-15 is able to use visual representation to solve problems. The E-15 subject was also able to write down the steps of mathematical completion with words. However E-15 subjects have difficulty compiling stories when a representation is presented.

Based on the results of the analysis, it can be seen that subjects who have a high character of confidence are able to implement several indicators of mathematical representation, namely visual and symbolic representations, but rather capable of implementing verbal representation indicators. Students with high confidence characters can solve problems perfectly. Based on the results of the study, students with high self-confidence characters can use visual representations to solve problems, students with high confidence characters can express their ideas in full picture. When resolving the problem of symbolic representation, students with high self-confidence characters are able to solve problems by involving mathematical expressions. And when solving problems, students with high self-confidence characters can write down the steps to solve mathematical problems with words. But students with high self-confidence characters are less able to arrange stories according to the representation presented.

When learning in class, students with high self-confidence characters do not give up and are optimistic when facing difficult problems. In addition, students with high self-confidence characters dare to advance

in front of the class and express their opinions. Students with high self-confidence characters were very enthusiastic during learning, paying attention as long as the teacher taught, and were enthusiastic when discussing. However, students with high confidence characters are less able to make a story. Students with high self-confidence characters prefer solving problems in a calculation rather than making a story.

The following is an analysis of the ability of mathematical representation of students who have moderate self-confidence characters. The researcher analyzed the E-30 and E-32 test results and conducted interviews.

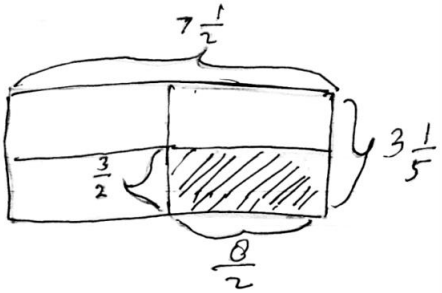

Figure 3. E-30 Test Results Number 4

Based on Figure 3, E-30 is less able to use visual representation to solve problems. E-30 is able to draw drawing paper and write down its length and width. However, the E-30 does not accurately calculate the length and width of the pieces of paper, so it is not appropriate to give information on the image.

On another matter, E-30 is able to solve problems by involving mathematical expressions. E-30 is able to compile stories from the representations presented. But the E-30 does not write down the steps for completing mathematics on the answer sheet.

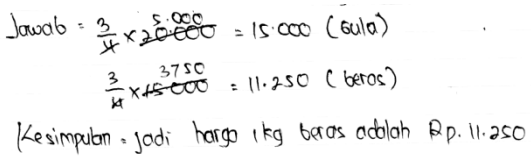

Figure 4. E-32 Test Results Number 2

Based on Figure 4, Subject E-32 is able to solve problems by involving mathematical expressions. On other questions, E-32 have difficulty in using visual representations to solve problems. The E-32 is able to draw paper and write down its length and width. However, the E-32 does not accurately calculate the length and width of pieces of paper, so it is not appropriate to give information on the image. E-32 is able to write steps for solving mathematical problems with words but not complete. E-32 subjects were able to compile stories from the representations presented.

Based on the results of the analysis, it can be seen that the subject who has a medium confident character is able to indicator the symbolic representation but rather able to fulfill the indicators of visual representation and verbal representation. Based on the results of the study, students with medium confident characters were able to solve problems by involving mathematical expressions and were able to compile stories according to the representation presented. But students with medium confident characters are not fully able to use visual representations to solve problems and have difficulty writing the steps to solving mathematical problems with words.

When observed during classroom learning, students with medium self-confident characters are sometimes embarrassed when they want to ask questions or raise their hands. Students sometimes despair when finding difficult questions. This results in students giving up drawing according to problems if they find difficult questions. Because they give up easily when faced with difficult problems, students with medium confident characters are not perfect in writing the steps to solving mathematical problems with words.

However, when solving problems involving mathematical expressions, students with medium confident characters are able to solve the problem. Students with medium confident characters are able to answer correctly the problems given. Students with moderate self-confidence characters are also able to organize stories that are in accordance with the representation presented because students with medium confident characters are more able to compile stories than drawing problems.

The following is an analysis of the ability of mathematical representation of students who have low self-confidence characters. The researcher analyzed the E-08 and E-20 test results and conducted interviews.

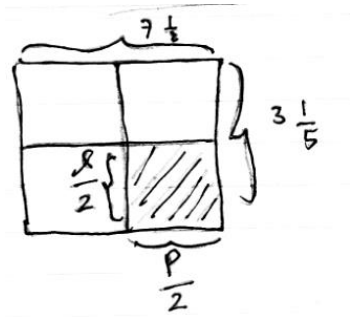

Figure 5. E-08 Test Result Number 4

Based on Figure 5, Subject E-08 has difficulty in using visual representation to solve problems. Subject E-08 is able to draw drawing paper and write down its length and width. But the subject of the E-08 does not write down the results of the length and width of the pieces of paper so that it is not precise in giving information on the image.

On another question, Subject E-08 was less able to solve problems by involving mathematical representations, did not write down the steps of mathematical solutions, and was less able to compile stories based on the representation presented.

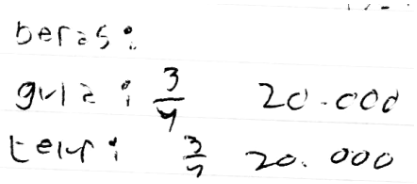

Figure 6. E-20 Test Results Number 2

Based on Figure 6, E-20 is less able to solve problems by involving mathematical expressions. On the other questions, E-20 has difficulty in using visual representations to solve problems, does not write down steps for mathematical solutions, and is less able to compile stories based on the representation presented

Based on the results of the analysis it can be seen that students with low self-confidence characters are unable to fulfill mathematical representation indicators, including indicators of visual representation, symbolic representation, and verbal representation. Students with low self-confidence characters are not able to use visual representations to solve problems, solve problems by involving mathematical representations, write down mathematical problem solving with words, and compile stories according to the representation presented.

When learning in class, students with low self-confidence characters do not dare to ask the teacher or raise their hands to argue and advance in front of the class. During group discussions, students with low self-confidence characters do not dare to express their opinions and prefer to rely on their group mates. Students with low self-confidence characters are less enthusiastic while participating in class learning and giving up easily face difficult problems.

4. Conclusion

Based on the results and discussion, conclusions were obtained: (1) the students 'mathematical representation ability through learning assisted by Schoology with the NHT method and thematic approach was better than the students' mathematical representation ability with the NHT method and thematic approach; (2) the character of students 'confidence through learning assisted by Schoology with the NHT method and thematic approaches are better than students' self-confidence characters with the NHT method and thematic approach; and (3) Descriptions of students' mathematical representation abilities in terms of the character of self-confidence are as follows: (a) students who have high self-confidence characters are

able to implement indicators of visual representation and symbolic representation but are not maximal in indicators of verbal representation. They are able to use visual representations to solve problems, solve problems by involving mathematical expressions, and write steps for solving mathematics with words (b) students who have medium confident characters are able to fulfill indicators of symbolic representation but do not fully meet visual representation indicators and verbal. They are able to solve problems by involving mathematical expressions and composing stories according to the representation presented; and (c) students who have low self-confidence character are not maximal in fulfilling indicators of visual, symbolic, and verbal representation. They still have difficulty in expressing mathematical ideas in the form of mathematical representation to find solutions to a problem presented.

Based on the results and discussion also conclusions, it is suggested to the mathematics teacher to: (1) make learning mathematics assisted by Schoology with the NHT method and thematic approach as an alternative for teachers on fraction material in order to improve students' mathematical representation skills, with the following considerations. (a) Ensure all students to be studied have a smartphone/laptop/computer and internet access; (b) Students have high motivation and enthusiasm for learning; (c) Students are able to learn independently; (d) Students get full support from parents in using Schoology; and (2) the teacher needs to guide students intensively to foster the character of students' confidence so students can recognize their potential so that they are more confident in solving a mathematical problem using mathematical representation.

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