Mathematical Representation Ability and Student Confidence through Auditory Intellectually Repetition

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Abstract

The purpose of this study is to determine the difference in the ability of mathematical representation of students students' confidence who use the auditory intellectually repetition learning model with students who use the usual learning model. This research is used quantitative analysis with the Quasi-Experimental Design method. The research design used is a nonequivalent control group design. This study's population was grade VII students academic year 2018/2019. The samples in this study were selected using a purposive sampling technique with grade VII-1 as an experimental class of 30 students and grade VII-2 as a Control class with 30 students. Experimental classes follow learning with auditory Intellectually Repetition models, and control classes follow conventional learning. The research analysis results showed that (1) there were differences in the ability of mathematical representation of students using auditory intellectual repetition learning models with students using ordinary learning models. (2) There is a difference in the confidence of students who use Auditory Intellectually Repetition learning with students who use the usual learning model.

***Keywords**: auditory intellectual repetition, mathematical representation, confidence*

INTRODUCTION

Mathematics is one of the fields of study that occupies an important role in the world of education, therefore in the implementation of mathematics lessons given at all levels of education. This is following the Law of the Republic of Indonesia number 20 of 2003 article 37 of the National Education System which states that one of the subjects that must be given at the level of primary and secondary education is mathematics subjects. The content standard for elementary and secondary education units also

mentions that mathematics is one of the compulsory subjects taught in formal educational institutions since primary education.

The purpose of mathematics subjects for all levels of primary and secondary education is so that students can: understand mathematical concepts, explain the interrelationships between concepts, and apply concepts or algorithms flexibly, accurately, efficiently, and precisely in representation; using reasoning on patterns and traits, performing mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements; solve problems that include the ability to understand problems, design mathematical models, solve models, and interpret acquired solutions; communicate ideas with symbols, tables, diagrams, or other media to clarify circumstances or problems; and have an attitude of appreciating the usefulness of mathematics in life, namely curiosity, attention, and interest in studying mathematics, as well as a tenacious and confident attitude in representation (Depdiknas, 2006).

Similarly, the goal is in learning mathematics by the National Council of Teachers of Mathematics (NCTM). NCTM (2000) sets five standards of mathematical ability that must be owned by students, namely representation ability, communication ability (communication), connection ability (connection), reasoning, and representation ability (representation).

Based on the description, the ability to represent is one of the abilities that must be developed in students. The ability to represent has an important role in learning mathematics because it can train students to improve the ability to solve problems with various forms including images, diagrams, mathematical expressions, and written words or text. Hudiono (2005) states that the ability to represent can support students in understanding the mathematical concepts studied and their interrelationships; to communicate students' mathematical ideas; to better recognize the interrelationships between mathematical concepts, or apply mathematics to realistic mathematical problems through modeling. Hutagaol (2013) mentions mathematical representations that are presented by students are expressions of mathematical ideas or ideas that students display in an effort to understand a mathematical concept or in an effort to find a solution to the problem he is facing. Thus representations can be used as a means for students to understand certain concepts as well as to communicate mathematical ideas to solve

problems. A teacher must think about how students can learn abstract mathematics and explore their mathematical abilities According to Halat and Peker (2011) that teachers can provide learning by teaching abstract mathematical concepts, although basically, students are easier to understand concrete concepts using mathematical symbols and notations students can represent their understanding. This explains that learning mathematics requires the ability of mathematical representation.

Handayani's research results (2018) of 145 students who were given a test of representational ability in solving math problems showed students' verbal representation ability reached 30.3% with very low categories, students' symbolic representation ability reached 25.2% with very low categories, and students' visual representation abilities reached 19.3% with very low categories overall students' mathematical representation abilities reached 24.9% in very low categories.. The results of the study showed that students who have high representation abilities are still low.

In addition to the importance of building students' cognitive abilities, affective abilities must also gain an adequate portion of attention. Moma (2013) says that one of the affective aspects that are important soft skills attributes possessed by students is self-confidence. Related to self-confidence in learning mathematics Yates (2000) states that self-confidence is very important for students to succeed in learning mathematics. Thus, it is clear that self-confidence is an important ability that must be owned and developed by students. But in reality, the self-confidence of students in general in the world is still low. Low self-confidence is also shown by the 2012 TIMSS study. According to a study conducted by TIMSS (2012) related to self-confidence (self-confidence), it is explained that only 14% of students in the world are confident in their mathematical abilities. While 41% of students feel insecure about their math skills and 45% are in the middle between confident and insecure. Low self-confidence also occurs in Indonesian students. According to TIMSS (2012), only 3% of students have high self-confidence in mathematics, 52% fall into the category of students with moderate self-confidence, and 45% of students fall into the category of students with low self-confidence. The study pointed out that the level of confidence in learning mathematics is still very low.

Given the importance of mathematical representation skills and these abilities can develop with the learning process, it is necessary to apply learning that can develop those abilities well. One solution or effort that can be done by teachers in overcoming the above

problems is to conduct learning that is in accordance with the character of students, and the goals to be achieved related to the ability to be measured. The learning model must also be able to facilitate shiva in building his confidence. One alternative learning model that is thought to facilitate the ability of mathematical representation and confidence of students is the Auditory Intellectually Repetition (AIR) learning model. Auditory, meaning the sense of the ear, intellectually means thinking, and repetition means repetition.

Data test results of mathematics learning in research conducted Fitriana (2016) obtained the average score of experimental classes or in students who were given auditory intellectual repetition learning model is 91.27 with the highest score of 100 and the lowest score is 80. While the average control class or in students who were given a conventional learning model was 78.08 with the highest score of 85 and the lowest score of 58. This shows the results of learning mathematics students who follow math learning with auditory intellectually repetition learning model better than the results of learning mathematics students who follow learning with conventional learning models on the subject of building flat side rooms of students class VIII semester II MTS Negeri 1 Kota Bekasi school year 2015/2016. For the Auditory Intellectually Repetition learning model. The results showed that students who gained learning with the Auditory Intellectually Repetition model were higher than students who gained learning with the conventional model.

According to Fauji, et al (2015:2), "The AIR learning model is one of learning with a constructivist approach that emphasizes that learning must utilize the sensory tools possessed by students". Furthermore, Suherman in (Azizah, et al, 2016: 308) revealed that "Auditory Intellectually Repetition learning model is a learning model that assumes a learning will be effective if you pay attention to three things namely Auditory (listening, speaking, presentation, argumentation), Intellectually (reasoning, creating, solving problems), and Repetition (working on problems, quizzes)". Then according to Shoimin (2014: 29), "Air learning model stands for Auditory, Intellectually, and Repetition".

Based on the presentation, research is needed to find out learning using the Auditory Intellectually Repetition model of the ability of mathematical representation and student confidence. The purpose of this study was to find out the difference in mathematical representation ability and the confident attitude of students who use auditory

intellectually repetition learning model with students who use the convention learning model.

METHOD

This research used quantitative research with the Quasi Experimental Design method. The population in this study was grade VII junior high school students. Samples were taken as many as two classes at the consideration of the school and math teachers at the school. The research sample consisted of 23 students in the experimental class and 27 students in the control class. The sampling technique used in this study purposive sampling which is a technique of determining samples with certain considerations (Sugiyono, 2014). The study took a sample with purposive sampling, because the students who had low self-confidence due to seeing differences in self-confidence attitudes ushered in the two learning treatments given. Before the study, the authors made initial observations and provided a simple questionnaire to find out the level of confidence of students in math learning.

The instruments used are questions of mathematical representation tests used in pretest and posttest, and non-test instruments in the form of confidence questionnaires. Test instruments are given to determine the difference in the ability of mathematical representation of students in both classes, while the questionnaire instruction is used to determine the difference in confidence attitude in both classes. The data analysis used in this study is quantitative data analysis (pretest and posttest data analysis) to see differences in the ability of mathematical representation and qualitative data analysis (attitude questionnaire) to analyze differences in students' confident attitudes delivered by two learnings. Quantitative data processing in this study uses IBM SPSS statistics Version 24 software. Analysis of research data using a prerequisite test i.e. a normality test. Normality test results obtained abnormal data, then it is not continued on the homogeneity test.. Furthermore, because the data is not normal, then to prove the hypothesis of the study using the Mann Whitney U test.

RESULTS AND DISCUSSIONS

In the results of this study will be presented regarding the analysis of pretest results data, analysis of posttest results data, the ability of mathematical representation of students and the confidence of students.

Pretest Mathematical Representation Ability

The data used to analyze the ability of these students' initial mathematical representations used the results of pretest acquisition of control classes and experiments. Pretests are given to students before learning to be used, with the aim of knowing which control classes and experimental classes have the same initial mathematical representation abilities or not. Here are presented the results of statistical decryption of mathematical representation capabilities in both classes.

Table 1. Statistical Description of Pretest Data

Kelas	N	Mean	Std. Deviation	Minimum	Maksimum
Pretest Eksperimen	23	37,17	8,021	22	50
Pretest Kontrol	27	36,19	8,531	22	50

Based on Table 1 it can be seen that the average pretest score of the experimental class is 37.17 with a standard deviation of 8.021. As for the control class obtained an average of 36.19 with a standard deviation of 8,531. The lowest pretest value of the experimental class is 22 and the highest value is 50, and the lowest pretest value of the control class is 22 and the highest value is 50. From the description of the data it appears that the average score of the experimental class is greater than the average score of the control class with an average difference of 0.98. However, to know the difference in the average pretest value is significant or not, then the pretest values of the experimental class and the control class must be tested with the following statistical tests.

Pretest Data Population Distribution Normality Test

Test the normality of the data intended to determine the statistics to be used and to find out whether the pretest obtained from the experimental class and control class is normal or not. The normality test in this study was conducted a test of normality from Shapiro-Wilk using IBM SPSS Statistics version 20 with a significance level of 5% ($\alpha = 0.05$). The normality test used Shapiro-Wilk because the sample used < 50 people. Based on the results of the normality test the distribution of the population obtained a significance value for the experimental class of 0.013. Since the significance value of the experimental class is less than 0.05, it can be concluded that the sample of the experimental class is not normally distributed. While the control class obtained a significance value of 0.145 more than 0.05, the control class sample was normally distributed. Because the data does not distribute normally, the test continued using non-

parametric statistics, namely the Mann-Whitney test using IBM SPSS Statistics software version 20..

Test The Similarity of Two Average Pretest Values

Based on the results of the normality test it appears that the control class comes from data that is not normally distributed, then the test continued using non-parametric statistics, namely the Mann-Whitney test using IBM SPSS Statistics version 24 software. The Mann-Whitney test to find out if the two classes had the initial ability of mathematical representations to be equivalent or different. The decision-making criteria for the similarity of the two average pretest results with Mann-Whitney and the significance level of 0.05 are as follows:

H_0 is accepted, when the significance value ≥ 0.05

H_0 is rejected, if the significance value < 0.05

The results of the pretest data test with the Mann-Whitney test are as follows:

Table 2. Mann Whitney Data Pretest Test Results

Uji Mann- Whitney U*t*	
Asymp. Sig. (2-tailed)	**Keterangan**
0,506	H_0 diterima

Based on the results of the Test Mann Whitney obtained a significance value of 0.506 more than 0.05 so that H_0 was received. Thus it can be concluded that pretest mathematical representations of experimental classroom students and control classes are equal or equivalent. Because the initial ability of both classes is equivalent, research can be continued by giving different treatment*Posttest* Kemampuan Representasi Matematis

The purpose given posttest to find out postes mathematical representations of students in experimental classes and control classes equal or not. So it will determine the statistical test that will be done next. Descriptive analysis of postes data is done using IBM SPSS Statistics version 24 software. As for the results of descriptive statistical analysis of experimental class posttest score data and control classes as follows:

Table 3. Statistic Description of Posttest Data

Class	N	Ideal Minimum Score	Ideal Maximum Score	Mean	Standard Deviation	Minimum Score	Maximum Score
Experiment	30	0	32	24,23	5,001	10	32
Control	30	0	32	21,33	4,302	16	32

Based on Table 3 above, it can be seen that the average posttest score of the experimental class is 24.23 with a standard deviation of 5.001. As for the control class obtained an average of 21.33 with a standard deviation of 4,302. The lowest postes value of the experimental class is 10 and the highest value is 32, while the lowest postes value of the control class is 16 and the highest value is 32. From the description of the data it appears that the average score of the experimental class is greater than the average score of the control class with an average difference of 2.90. To answer the hypothesis, postes data tested prerequisites with normality tests.

Test the Normality of Population Distribution of Postes Data

Test the normality of the data to find out the postes data in the experimental class and the control class is normal or not. The normality test in this study was conducted with Shapiro-Wilk using IBM SPSS Statistics version 24 with a significance level of 5% ($\alpha = 0.05$). The normality test used Shapiro-Wilk because the sample used < 50 people.

Based on the results of the normality test the distribution of the population obtained a significance value for the experimental class of 0.165. Since the significance value of the experimental class is more than 0.05, it can be concluded that the sample of the experimental class is normal distribution. While the control class obtained a significance value of 0.040 less than 0.05, the control class sample did not distribute normally. Because the data did not distribute normally, the test was continued using non-parametric statistics, the Mann-Whitney test using IBM SPSS Statistics version 24 software.

Two Average Postes Value Equality Test

Based on the results of the normality test of posttest data it is known that the sample of the experimental class and control class is not normal distribution. So for the next Mann-Whitney test to find out both classes have the final ability of the same or different mathematical representation abilities. The formulation of the posttest hypothesis with Mann Whitney is as follows:

$H_0 : X = Y$

$H_1 : X \neq Y$

Description: X, Y sequentially represents the average postes of the mathematical representation ability of experimental classes and control classes. The decision-making

criteria of the test similarity of two average posttest results with Mann-Whitney and with a significance level of 0.05 as follows:

H_0 is accepted, when the significance value ≥ 0.05

H_0 is rejected, when the significance value < 0.05

Based on the results of the Test Mann Whitney obtained a significance value of 0.010. The value is less than 0.05 so H_0 is rejected. Here is Table 4 of the results of the Mann Whitney U test.

Table 4. Mann Whitney Test Results Data Posttest

Uji Mann- Whitney U	
Asymp. Sig. (2-tailed)	**Explanation**
0,010	H_0 is rejected

Based on Table 4 above it can be concluded that the final ability of mathematical representations of experimental classroom students and control classes is different. Based on research, students who use Auditory Intellectually Repetition learning are higher than students who get learning with conventional models. This is because students who get auditory intellectually repetition auditory learning, students help the sense of the ear, Intelectually used for thinking, and there is a step of repetition as much as helping the student's representation ability in learning mathematics. Mudzakkir (2006) groups mathematical representations into three forms, namely representations in the form of diagrams, graphs, or tables, and images; mathematical equations or expressions; and written words or text. According to research conducted by Wijayanti (2017), students with high visual-spatial have difficulty translating problems into mathematical models and difficulty finding problem-solving steps correctly. Through Auditory Intellectually Repetition learning, students are required to pay attention to the material by using the ear's senses and thinking to understand the material taught, after which students obtain repetition. For students who have low efficacy, it can be helped by the steps that exist in auditory intellectually repetition learning. The problems given in learning are presented in the form of audio and images, so that the student's representation skills can be used.

Mathematical representation is a substitute form of a mathematical problem situation used to find a solution (Mustangin, 2015; Syahdi, 2019). In line with fatqurhohman (2016). Mathematical representations can also be said to be the result of a

person's ideas mathematically being realized in certain ways (through words, written text, images, or symbols) in an attempt to find solutions. According to Hariati (2016), mathematical representation is very important, especially by communicating ideas / ideas, can facilitate in solving problems.(Herawaty et al., 2019). According to Suherman (2003) auditory intelectully repetition is learning that assumes that learning will be effective if it shows three things, namely Auditory, which means that the sense of the ear is used in learning by listening, listening, speaking, presentation, argumentation, expressing opinions and responding. Intelectually, thinking means that thinking skills need to be trained through the practice of reasoning, creating, solving problems, constructing and applying. Repetition (repetition) through the work of problems, assignments or quizzes so that students in solving problems are more accustomed and understand the material more deeply and more broadly.

Differences in Students' Self-Confidence

Attitude questionnaires are given to students in experimental classes and control classes after the treatment is completed or the learning ends. The goal is to determine students' attitudes towards the use of the Auditory Intellectually Repetition model and students' attitudes toward ordinary learning models in mathematical learning. However, to find out whether the difference in the average confidence attitude of the student is significant or not, then the values of the experimental class and the control class must be tested with the following statistical tests:.

Test the Normality of Data Distribution questionnaire

Test the normality of the data to determine the statistics to be used and to find out whether the questionnaires obtained from the experimental class and control class are normal or not. The normality test in this study was conducted a test of normality from Shapiro-Wilk with a significance level of 5% ($\alpha = 0.05$). The normality test used Shapiro-Wilk because the sample used < 50 people. Based on the results of the normality test the distribution of the population obtained a significance value for the experimental class of 0.025. Since the significance value of the experimental class is less than 0.05 it can be concluded that the sample of the experimental class does not distribute normally. While the control class obtained a significance value of 0.064 more than 0.05, the control class sample was normally distributed. Because the experimental class originated in a population that did

not distribute normally, the data analysis continued with the non-parametric statistical test, the Mann-Whitney Test.

Two Average Similarity Tests

Based on the results of the test normality data questionnaire it is known that the sample of the experimental class and control class is not normal distribution. So for the next Mann-Whitney test to find out both classes have the final ability to solve mathematical problems the same or different.

Formulation of the hypothesis of the results of the questionnaire with the Mann Whitney test as follows:

$H_0 : X = Y$

$H_1 : X \neq Y$

Description: X, Y sequentially represents the average confidence attitude of experimental and control class students. The decision-making criteria for the similarity test of two averages of the results with Mann-Whitney and with a significance level of 0.05 are as follows:

H_0 is accepted, when the significance value ≥ 0.05

H_0 is rejected, when the significance value < 0.05

As for the results of the data test questionnaire with the Mann-Whitney test as follows:

Table 5. Mann Whitney's Test Results Of Self-Confidence

Uji *Mann Whitney*	
Asymp. Sig. (2-tailed)	**Explanation**
0,00	H_0 is rejected

Based on the results of the Mann Whitney test contained in Table 5 obtained a significance value of 0.010. The value is less than 0.05 so H0 is rejected. Then it can be concluded that the confidence of experimental classroom students and control classes is different.

A confident attitude is given to students in the experimental class after the awarding of the learning ends. The goal is to find out the student's confident attitude towards the use of the Auditory Intellectually Repetition model in math learning. The questionnaire contains 20 statements consisting of 10 positive statements and 10 negative statements. In each statement there are 4 options, namely Strongly Agree (SS), Agree (S), Disagree

(TS) and Strongly Disagree (STS). The following is presented recapitulation of the results of the student's overall attitude:
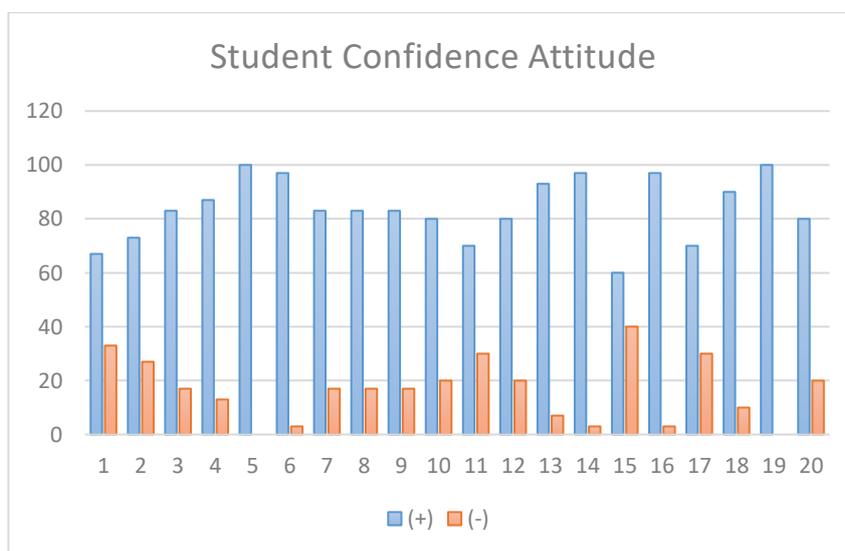

Figure 1. Student Confidence Attitude Diagram

Based on Figure 1, it is known that almost all students get a positive attitude on every statement. The positive attitude is also based on the point that shows that students receive well learning with the Auditory Intellectually Repetition model.

Self-confidence (Depdiknas, 2012:21) is an attitude that indicates understanding self-ability and the value of self-esteem. Self-confidence needs to be instilled in students through fun methods so that students do not get bored quickly. Teachers as educators must creatively look for ideas to choose the right method in developing students' confidence. Children's confidence should always be trained so that students are not always afraid and reject themselves when they get the activities requested from the teacher, such as when students present in front of the class, telling findings in solving math problems to their classmates in front of the class. Students who acquire Auditory Intellectually Repetition learning have a higher confidence attitude than conventional learning. Students who have high confidence, students can learn more passionately and get better results, because with a confident attitude, sisw can be confident in presenting the results of his findings in front of the class, students are ready to account for the teacher's duties to his friends, and students are ready to help their friends in group work. In line with the opinion of Carol Seefidt & Barbara A. Wasik, (2008: 169) children who have a steady attitude of confidence, generally are ordinary people and willing to learn, can control their own behavior, and relate to others effectively.

CONCLUSION

Based on the research obtained conclusions, there is a difference in the ability to mathematical representation of the confidence attitude of students who use Auditory Intellectually Repetition learning with the ability of mathematical representation of students using conventional learning models. Students' mathematical representation ability in Auditory Intellectually Repetition learning is higher than the ability of mathematical representation in conventional learning. Students' confident attitude in math learning using auditory intellectually repetition learning models is almost entirely positive. Students who have low ability there are still those who lack confidence, because the student is not sure of his ability so by using auditory intellectually repetition learning, the student is still shy so that in his learning is less than optimal. Then based on the results of the study, researchers can give advice to students should give more positive attitudes to the math learning process, teachers should use a new atmosphere when learning and the Auditory Intellectually Repetition model can be one of the alternatives to mathematical learning, and to other researchers should be able to do learning that can foster students' confidence and other mathematical abilities.

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