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Article

The Effectiveness of the Socio-Scientific Issues based Numbered Head Together Learning Model on Student's Metacognitions Ability

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ABSTRACT

The low understanding of students in receiving learning materials makes the grades and achievements of these students tend to be lower, this is caused by several factors. As for one of the factors related to the understanding of students in receiving learning materials and the success of the learning process, especially science subjects, namely the metacognitive abilities of these students. To be able to attract students' interest in learning and also to be able to improve the metacognition abilities of students, especially in science subjects, a learning model is needed and accompanied by an appropriate and effective approach so that it can attract students' interest in learning and can also improve students' metacognition abilities. In conducting research, the type of research used is experimental quantitative research. The population in this study were seventh grade students at MTs Darul Huda Ponorogo, where the samples taken were students of class VII-32 totaling 24 students and class VII-33 totaling 25 students. This study used observation methods, response questionnaires, and metacognition tests as data collection instruments. Based on data analysis, it was found that the implementation of the learning process using the NHT (Numbered Head Together) model based on SSI (Socioscientific Issue) at MTs Darul Huda was very well implemented, students' responses to the learning process using the NHT (Numbered Head Together) model based on SSI (Socioscientific Issue) obtained 95% very good response, After conducting the N-Gain test to determine the effectiveness of the learning model applied by researchers, it can be seen that the use of the NHT (Numbered Head Together) method is quite effective in improving the metacognitive abilities of students in science subjects on environmental pollution material.

INTRODUCTION

Education is one of the efforts made to provide learning, understanding, and understanding of students or learners. Where the education provided aims to provide various lessons related to good and true noble values that need to be owned and applied in life (Fihani et al., 2021). One of the subjects that can be related to natural phenomena or events that are around or life is science. Science is one of the subjects that is closely related and very important

for life, related to how the universe in which we live can occur, how the universe is now, and how the universe will look in the future (Sujana et al., 2014).

The problem that is often faced by some teachers is the low value of students' metacognition abilities, especially in science subjects. Science subjects are considered as one of the subjects that are difficult to understand by most students (Rosa, 2015). This is because in the learning process that takes place, the teacher as a facilitator only explains and presents various materials and practice questions without linking the material presented to the daily lives of students or problems that are familiar to students. From the process of delivering material by teachers who are deemed ineffective, students do not understand the material they have learned and make the assumption that learning is difficult, so that students cannot apply the material they have obtained at school when the learning process takes place with their daily lives. The difficulty of students in receiving material in the learning process at school causes low understanding of students so that the scores obtained by these students in science subjects tend to be lower (Putriana et al., 2018). Indicators of metacognition ability are planning, monitoring, and assessment. Where in this planning process students are expected to be able to develop plans and be able to determine or the right plan in solving a problem presented. In the monitoring process, students are expected to be able to determine and apply a plan that has been designed to solve a problem that has been presented. Meanwhile, in the assessment process, students are expected to be able to evaluate, assess, and make conclusions according to the steps or plans they have implemented in solving a problem (Anggraini et al., 2021).

Based on previous research in junior high school in 2021, it is known that the NHT *(Numbered Head Together)* learning model is able to improve the metacognition ability of VIII grade students at MTs Darul Huda Ponorogo (Anggraini et al., 2021). In the learning process on the presentation of material through the SSI *(SocioScientific Issue)* approach, students are more interested in learning how problems, phenomena, and hot issues that have been presented can occur and how they relate to learning material. The interest of students to learn is able to foster curiosity which can encourage students to learn and understand the material presented by the teacher, so that the enthusiasm for learning that grows from students is able to increase students' understanding related to the learning material that has been delivered in the learning process (Widhy et al., 2013). In conclusion, using the SSI (Socio-Scientific Issues) approach can help students learn better. This method makes it easier for them to understand what the teacher is teaching. When students grasp the material well, they can improve their grades and use what they've learned in their everyday lives. By using the NHT (Numbered Head Together) learning model, students are required to be active in following the learning process carefully and are also required to actively participate in group discussions so that each student can understand the problems presented and how the solution will be used to solve these problems properly. The results of the research that has been tested by researchers at one of the MTs in Ponorogo can be seen that the metacognition ability of students is still relatively low. This can be seen based on data taken using the metacognition ability test in science subjects showing that the average score of students is low. Where with the average value only 4 of the 20 students scored above the KKM. In addition to the low metacognition ability of students, students' interest in learning is also lacking so that students are less enthusiastic in participating in ongoing learning. Based on observations made by researchers, the average teacher who conducts learning in the classroom pays less attention to the learning model he uses. Therefore, the learning process that takes place is felt to be less effective (Putriana et al., 2018).

The process of delivering material that is considered less effective causes a lack of understanding from students of learning material and makes the assumption that learning is difficult, so that students cannot apply the material they have obtained to their daily lives. The difficulty of students in receiving material in the learning process at school causes low understanding of students so that the scores obtained by these students in science subjects tend to be lower (Putriana et al., 2018). To be able to attract students' interest in learning and to be

able to improve students' metacognition abilities, especially in science subjects, appropriate and effective learning models and approaches are needed so that they can attract students' interest in learning and can improve students' metacognition abilities.

The use of the SSI *(SocioScientific Issue)* approach which directly involves various problems, phenomena, and hot issues in the surrounding community related to science material is able to encourage students to understand the learning material presented so that students can solve the problems presented. From the ability to solve problems possessed by students through the SSI *(SocioScientific Issue)* approach, it can be interpreted that students already have one of the indicators of metacognition ability. Where the metacognition ability is one of the abilities that can support students to solve the problems that have been presented (Sa'adah et al., 2022). Based on this explanation, it can be concluded that the learning method by applying the SSI *(SocioScientific Issue)* approach can help improve students' metacognition ability, so that students are easier to accept the learning material presented and can apply the learning material they have obtained in their daily lives. In addition, students who have metacognition abilities are able to learn by adjusting the abilities that exist in each student so that students can better understand how to learn and can improve their ability to solve the problems presented so that they can support the value and achievement of students in learning.

The NHT learning model based on the SSI (Socio-Scientific Issue) approach can be said to be one of the models and approaches that can improve students' metacognitive abilities. In the NHT learning model based on SSI (Socio-Scientific Issue), there are several characteristics that differentiate it from other learning models, namely: it can develop cooperation among students in each group, all students are required to be active in following the ongoing learning process in order to receive the learning material well, it focuses on scientific issues in everyday life, develops students' critical thinking skills in discussions, and increases students' social awareness of the surrounding environment. Based on this background explanation, the researcher took the title "The Effectiveness of the SSI-Based NHT (Numbered Head Together) Learning Model (Socioscientific Issue) on Students' Metacognition ability". With this research, it is hoped that it can find out how the effectiveness of the NHT (Numbered Head Together) learning model based on SSI (Socioscientific Issue) on the metacognition ability of seventh grade students at MTs Darul Huda Ponorogo, East Java, Indonesia.

METHODS

The research approach used is quantitative research. In conducting research, the type of research used is experimental quantitative research. The population in this study were seventh grade students at MTs Darul Huda Ponorogo, where the samples taken were students of class VII-32 totaling 24 students as the experimental class and class VII-31 totaling 25 students as the control class. The experimental class is the class that is given the treatment and the control class is the class that is not given the treatment. The sample was taken through recommendations from the VII grade tutor at MTs Darul Huda Ponorogo. The experimental research design in this study is as follows:

Tabel 1. Experimental Research Design

Eksperimental Group	*O* *Pre-test*	X_1 Treatment	*O* *Post-test*
Control Group	*O* *Pre-test*		*O* *Post-test*

(Source: Jaedun, 2011)

This research was conducted in one of the schools in Ponorogo Regency, namely MTs Darul Huda Ponorogo. This research was conducted in February-April 2024. The population in this study were seventh grade students at MTs Darul Huda Ponorogo, where the samples taken were students of class VII-32 totaling 24 students as the experimental class and class VII-

31 totaling 25 students as the control class. The experimental class is the class that is given the treatment and the control class is the class that is not given the treatment. The sample was taken through recommendations from the VII grade tutor at MTs Darul Huda Ponorogo.

Figure 1. Implementation of Research

The assessment instrument is compiled based on the indicators contained in the research variables, which will then be developed into question items. Where the question items that have been made are tested with a validator, and then distributed to respondents. The data instruments used in this study are: observation sheet for the implementation of learning activities, metacognition ability test containing questions, and questionnaires of students' responses to the learning process that has been carried out.

Before conducting research, researchers have prepared metacognition ability test questions in the form of pre-test questions and post-test questions to be used as a measure of students' metacognition abilities. The metacognition ability test questions have been validated by an expert lecturer and 2 validators. Then after the metacognition ability test questions were validated, the instrument was tested in the trial class to determine the validity and reliability of the instrument to be used.

After all learning device instruments are validated, the next step is to test the questions in the trial class. This test trial was conducted once on students who were not included in the research sample. The trial was conducted on students of class VII.39 with a total of 28 students. The class was chosen because it had received learning material related to environmental pollution. After the test results are collected, the validity test and reliability test can be carried out. The results of the validity test of the questions in the trial class are as follows:

Table 2. Validity Test Results

Question Number	r Count	r Table	Description
1	0,48845	0,374	Valid
2	0,4416	0,374	Valid
3	0,44342	0,374	Valid
4	0,49687	0,374	Valid
5	0,64425	0,374	Valid
6	0,65067	0,374	Valid
7	0,52437	0,374	Valid
8	0,48171	0,374	Valid
9	0,544	0,374	Valid
10	0,58704	0,374	Valid

Based on the table, it can be seen that from question number 1 to question number 10 has r count greater than r table. So that all items in the test are said to be valid and suitable for researchers to use to collect data.

The reliability test of the test questions in this study was also carried out using *SPSS 18 for windows*. The item reliability test is used to see the accuracy of the item. The following are the results of the item reliability test conducted in class VII-39:

Table 3. Reliability Statistic

Cronbach's Alpha	N of Items
.716	10

Based on this table, it can be seen that the *Cronbach's Alpa* value is 0.718. The reliability test criteria according to Gozali (2018) that the *Cronbach's Alpa* value is accepted if it is greater than 0.6. In the research data that has been carried out, it shows the *Cronbach's Alpa* value of 0.718, so that the instrument tested is reliable. Thus, it can be concluded that the test questions are accurate and consistent so that they can be used for research.

The implementation of the NHT *(Numbered Head Together)* learning model based on SSI (*Socioscientific Issue)* can be analyzed based on the results of observation scores per meeting. After the results of the overall learning model implementation score are obtained, then the score is converted in the form of a percentage. Students' responses to the NHT *(Numbered Head Together)* learning model based on SSI (*Socioscientific Issue)* that has been implemented can be analyzed based on the scores of questionnaires that have been filled in by students after the implementation of learning. The metacognition ability of students can be analyzed through test question data that has been obtained from the experimental class and control class, then will be tested including *normality test, hypothesis test, and independent t-test*.

RESULTS AND DISCUSSION

The results of data in research related to the metacognition abilities of students who have been carried out at MTs Darul Huda Ponorogo class VII-32 as the experimental class and class VII-31 as the control class as follows:

The acquisition of average scores in experimental and control class students is as follows:

Table 4. Pretest and Posttest Values

Test Questions	Class	
	Eksperiment	Control
Pretest	49,16	48,4
Posttest	84,16	72,4

Based on this data, it can be seen that the pretest scores and posttest scores in the experimental class using the Numbered Head Together learning model based on Socioscientific Issue and the control class using conventional learning models or lectures. The following is a graph of the experimental and control class values:

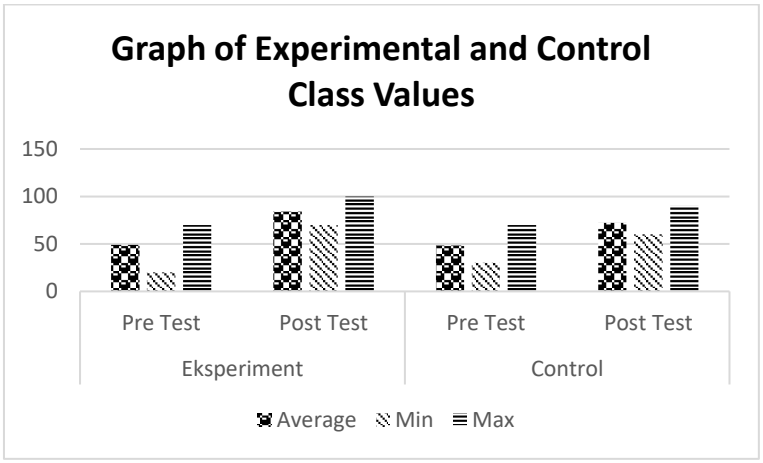

Figure 2. Graph of Experimental and Control Class Values

The data that has been obtained will then be tested in statistical data analysis in the form of prerequisite tests containing normality test and homogeneity test, independent t-test and N-gain test to determine the effectiveness of the use of the learning model used. The normality test is carried out to determine whether the data that has been collected in the study is normally distributed or not. The following are the results of the normality test of research data calculated using SPSS Statistics 18 for Windows software:

Table 5. Normality Test Results

		Residual for Kemampuan_Metakognisi
N		98
Normal Parameters[a,b]	Mean	.0000
	Std. Deviation	10.91611
Most Extreme Differences	Absolute	.106
	Positive	.106
	Negative	-.083
Kolmogorov-Smirnov Z		1.047
Asymp. Sig. (2-tailed)		.223

a. Test distribution is Normal.
b. Calculated from data.

In the normality test that has been carried out, because the data tested does not show that it can be normally distributed or close to normally distributed data, the data must be tested with non-parametric statistics. The normality test hypothesis is Ha and H0, where Ha is normally distributed data while H0 is abnormally distributed data. Based on the results of the Pre Test and Post Test normality test for the Experimental Class and Control Class, using Shoftware SPSS Statistics 18 for Windows, it can be seen that based on the Kolmogorov-Smirnov test of the experimental and control classes, the results of the Pre Test and Post Test normality test have a significance value (Sig.) of 0.223 where the sig value. 0,223 > 0,05. Based on the results of the normality test analysis that the value of Sig. > 0.05 then Ha can be accepted so it can be concluded that the data is normally distributed.

The homogeneity test is carried out with the aim of knowing whether the data obtained is homogeneously distributed or distributed from the same data. In this homogeneity test using pre-test data from the experimental class and control class with the aim of knowing homogeneous distributed data before treatment, so that when at the end of the study if the results are obtained there is an effect of treatment (treatment) then it can be claimed that the difference occurs due to treatment. The prerequisite for the homogeneity test is if the data has gone through the normality test or the data is said to be normally distributed. In the homogeneity test, it was carried out using the Leveve Statistic test method using SPSS Statistic 18 for Windows software. The following are the results of the Pre Test homogeneity test of the experimental class and control class:

Table 6. Homogeneity Test Result

		Levene Statistic	**df1**	**df2**	**Sig.**
Kemampuan_Metakognisi	Based on Mean	2.934	1	47	.093
	Based on Median	3.054	1	47	.087
	Based on Median and with adjusted df	3.054	1	46.176	.087
	Based on trimmed mean	2.757	1	47	.103

Based on the results of the homogeneity test of the experimental and control classes, it can be seen that the pre-test results have a Sig. value on the Based on Mean score of 0.093 where the Sig value of 0.093> 0.05, the null hypothesis (H0) is accepted, so that both data can be said to be homogeneous. So it can be concluded that the pre-test data in the experimental class and control class are distributed from the same or homogeneous data.

The independent samples test is conducted with the aim of knowing whether there is a difference in the average of two unpaired samples. The data needed in the independent samples test is by using the post test scores of the experimental class and control class. The independent samples test was conducted using SPSS Statistic 18 for Windows software. The results of the independent samples test for the experimental and control classes:

Table 7. Independent Samples Test Result

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Mean Difference**	**95% Confidence Interval of the Difference**	
									Lower	**Upper**
Kemampuan_Metakognisi	Equal variances assumed	4.405	.041	3.976	47	.000	11.76667	2.959100	5.81372	17.71961
	Equal variances not assumed			3.953	42.557	.000	11.76667	2.976622	5.76194	17.77139

Based on the results of hypothesis testing with the independent samples test, it can be seen that the post test results have a Sig value. (2-tailed) of 0.00 where the Sig value. (2-tailed) 0.00 <0.05. So it can be concluded that the null hypothesis (H0) is rejected and the alternative hypothesis (Ha) is accepted, so that there is a correlation or relationship between the socioscientific issue approach and students' metacognition ability. In other words, it can be said that the post test score data in the experimental class and control class have significant differences.

The next step, to determine the effectiveness of the application of the NHT (Numbered Head Together) learning model based on SSI (Socioscientific Issue) on students' metacognition ability, the N-Gain test needs to be carried out. The N-Gain test is carried out with the aim of knowing the effectiveness of using a learning model in research. The N-Gain test in this study was used to determine how effective the learning model used in the study with the design of the experimental class and control class. The data needed in the N-Gain test is using data on the pre-test and post-test scores of the experimental and control classes. The N-Gain test was conducted using SPSS Statistic 18 for Windows software. The following is the output of the N-Gain test results:

Table 8. N-Gain Score Results

N-Gain Percent	**Eksperiment**	**Control**
Mean	67.82	46.02
Min	0	0
Max	100	75

Based on the results of the N-Gain score test calculation, it shows that the average N-Gain score for the experimental class using the NHT learning model is 67.82, including in the moderately effective category. While for the average N-Gain score for the control class using the conventional learning model is 46.02 including in the less effective category. So it can be concluded that the use of the NHT learning model is quite effective in improving the metacognitive abilities of students in science subjects on environmental pollution material. While the use of conventional learning models is less effective in improving students' metacognition ability.

One of the factors related to the understanding of students in receiving learning materials and the success of the learning process, especially science subjects, is the metacognition ability of students. Metacognition ability can act as a tool in monitoring the extent to which students can understand and solve a problem presented, so that metacognition ability need and are very important for every student to have in the learning process at school in order to apply the learning material they have obtained in everyday life and the surrounding community. Thus, metacognition ability play an important role in the learning process that takes place because it involves the thinking of students in dealing with the problems presented.

In addition, in the learning process that takes place in the classroom, the teacher who acts as a facilitator will usually only provide and explain the existing material using the lecture method and provide practice questions without linking it to phenomena or events that often occur in the surrounding nature and in life. From the process of delivering material by teachers who are considered less effective, it causes students to find it difficult to accept the learning material they have received so that students assume that science subjects are difficult. Because students cannot receive good learning material in the classroom when the learning process takes place, so that students cannot apply the learning material they have obtained in their daily lives and the surrounding community. Based on this, the use of the SSI (SocioScientific Issue) approach using the NHT (Numbered Head Together) learning model which directly involves various problems, phenomena, and hot issues in the surrounding community related to science material can encourage students to understand the learning material presented so that students can solve the problems presented. From the ability to solve problems possessed by students through the SSI (SocioScientific Issue) approach, it can be interpreted that students already have one of the indicators of metacognition ability, where metacognition ability is one of the abilities that can support students to solve the problems that have been presented. This is in accordance with research conducted by M. Amin Fauzi in 2009 under the title "The Role of Metacognitive Ability in Elementary School Problem Solving" that students who have high metacognitive abilities will be able to solve problems well.

Therefore, there is a very close relationship related to the learning process using the NHT (Numbered Head Together) learning model based on SSI (Socioscientific Issue) on metacognition ability, especially in science subjects. From this explanation, it can be concluded that using the NHT (Numbered Head Together) learning model with the SSI (SocioScientific Issues) approach can help improve students' metacognition ability, so that students are easier to accept the learning material presented and can apply the learning material they have obtained in their daily lives. The increase in research results can be concluded from the homogeneity test value data that the data tested for pre-test results has a Sig value. on the Based on Mean score of 0.093 where the Sig value of 0.093> 0.05, the null hypothesis ($_{H0}$) is accepted, so that both data can be said to be homogeneous. So it can be concluded that the pre-test data in the experimental class and control class are distributed from the same or homogeneous data. With both homogeneous data, it can be said that when at the end of the study the results are obtained on the effect of treatment in the classroom, it can be claimed that the difference occurs due to treatment in the classroom, not because one class is superior. In addition, students who have metacognition abilities are able to learn by adjusting the abilities that exist in each student so

that students can better understand how to learn and can improve their ability to solve the problems presented so that they can support the value and achievement of students in learning.

CONCLUSION

This study shows that the application of the NHT learning model with a social-scientific problem (SSI) approach at MTs Darul Huda is quite effective in improving students' metacognition skills, especially in science subjects, especially environmental pollution material. 95% of students gave a positive response to this learning method, and the test results showed a significant increase in students' metacognition skills after participating in learning with this NHT model.

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