Abstract Guided Inquiry Learning with Mind Mapping and Concept Map to Increase Concept Mastery and Student Learning Motivation

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Abstract: This study aims to measure students' conceptual mastery and motivation in learning the respiratory system. The study was conducted on class VIII SMPN 1 Klapanunggal students in 2017/2018. The learning used in this study was through guided inquiry learning with mind mapping with pretest posttest control group design. The use of this research design involves two classes as research samples, one experimental class and one control class. The selection of these two classes is done by taking subjects not based on strata, random or regional but based on certain goals. The research subjects were divided into two groups, namely the experimental group and the experimental group. control. The experimental group received Guided Inquiry learning with mind mapping, while the control group was the group that received Guided Inquiry learning with concept maps. The results of mastery of the concept of the experimental class and control class each obtained an average gain of 6.09 and 5.78, the average pretest score of the experimental class students was 51.9 and the control class students were 44.7 from the ideal score. This shows that the average pretest score of the two classes is not much different. It can be concluded that the average N-gain in the control class is 36.9% in the medium category, while in the experimental class the average N-gain is 43.7% in the medium category.

Keywords: *Mind Mapping, Concept Mastery and Learning Motivation.*

INTRODUCTION

Science learning aims to (1) develop natural science skills or skills as shown by understanding the natural science concepts being studied, explaining the interrelationships between concepts and applying concepts flexibly, accurately, efficiently and precisely in problem solving, (2) using reasoning on patterns, nature, or manipulating natural science in making generalizations, compiling evidence, or explaining scientific ideas and statements. (3) demonstrating the strategic ability to create, interpret and complete natural science models in problem solving. (4) have an attitude of appreciating the

usefulness of science in life. Science education is expected to be a vehicle for students to learn about themselves and the natural environment, as well as prospects for further development in further development.

However, the facts in the field of science lessons become a burden for students who consider science a difficult learning in the district. Bogor. Students' interest in participating in science learning is low, many students get low UAS or daily scores, and even then there are still many who have to take remedial courses because they have not reached the predetermined KKM. The problem is classic because teachers rarely have sensitivity to students, science teachers only teach with conventional methods and students think science learning is boring, therefore teachers should always cultivate teaching process skills where the problem lies so students are not enthusiastic in participating in science learning. To improve learning outcomes, it is necessary to change the mindset that is used as a basis for implementing the science learning curriculum, because teachers have a position that can determine the success of learning, by designing, managing and evaluating learning. In general, the media in teaching is very influential in the learning process, the teacher is able to predict the ability of students to master the material or not, with such a mindset the teacher can determine actions for problems that occur during the learning process.

Starting from the problems above, to increase students' enthusiasm in participating in science learning and so that students have good quality learning outcomes, the researchers tried to examine the application of guided inquiry learning with main mapping to improve conceptual mastery and student motivation.

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METHODS

This research is a quasi-experimental study using two groups, namely the control group and the experimental group. This research was carried out in the second semester of the 2017 – 2018 academic year at SMPN 1 Klapanunggal. The subjects of the study were students of class VIII as many as 2 groups of 64 students, each group of 32 students. . This study used a non-equivalent pretest-posttest control group design. This study was used to determine the difference between the experimental class that was given Guided Inquiry learning with mind mapping and Guided Inquiry learning with concept maps as the control class. Research can be Table 1.

Table 1 Research Design

Group	Pretest	Treatment	Posttest
A	O	X_1	O
B	O	X_2	O

Information:
A: Experiment class
B: Control class
O: Initial test (pretest) and final test (posttest)
X1: Guided Inquiry Learning with mind mapping
X2: Guided Inquiry learning with concept maps

RESULTS AND DISCUSSION

The main points presented in the description of the research results consist of two parts. The first part is about the learning outcomes of students' conceptual knowledge on respiratory system material, while the second part discusses the results of research that has been carried out.

Description of Concept Mastery Data

Concept mastery data were taken from the pre-test and post-test from the control class and the experimental class, by working on 30 multiple-choice questions. The description of the data on the mastery of the concept is contained in Table 2.

Table 2. Description of Concept Mastery Data for Experimental and Control Class Students

Description	Mastery of the concept of control class students		Mastery of Concepts of Experimental Class Students	
	Pretest	Posttest	Pretest	Posttest
Average Value	44,69	64,95	51,98	72,29
median	40	65	40	71,65
mode	33,33	73,3	53,33	80
Standard Deviation	15,79	16,64	8,46	14,94
Variance/variety	249	276	71,58	223
Spiky	0,24	-1,06	-0,49	-1,13
Tilt	0,75	-0,75	0,01	-0,12
Range	63,33	56,7	33,33	53,4
Minimum Value	20	33,3	36,67	43,3
Maximum Value	83,33	90	70	96,7
Total number	1430	2047	1663	2313
Amount of Data	32	32	32	32

Analysis of Students' Concept Mastery Pre test Results

At the first meeting the teacher conducted a pre-test to the students in both the control class and the experimental class. The results of the two pre-tests will be tested for the difference in average. It is necessary to know whether the two classes depart from the same conditions. To determine the technique of testing the average difference, it is necessary to test for normality and homogeneity. Normality test results using Kolmolgrov-Smirnov. The results of the normality test can be presented in Table 3.

Table 3. Pre-test Normality Test Control Class and Experiment Class

Data	Sig.	Decision
Control	0.051	Normal
Experiments	0.084	Normal

The data were normally distributed for the control class with a significance value of 0.051 > 0.05 while in the experimental class the data was also normally distributed with a significance value of 0.084. So it can be seen that the control class and the experimental class are normally distributed. Furthermore, both classes were tested for homogeneity using Levene's test. The results of the homogeneity test of the pretest control class and the experimental class with a significance value of 0.585, with $\alpha = 0.05$, the significance value is $0.585 > \alpha$, so the data is homogeneous.

After knowing the data is normally distributed and homogeneous, so that the hypothesis test used is parametric statistics, namely the Independent t-test. The F value shows a significance of 0.301 > 0.05, the data variance is the same, and because the P value is 0.037 < 0.05, there is a difference in mastery of the concepts of the control class and the experimental class.

From the Independent t-test, it shows the value of sig. (2-tailed) 0.037 < 0.05, this means that Ha is accepted so that there is a difference in the initial knowledge of the control class and the experimental class, both classes come from the same conditions.

Improved Mastery of N-Gain Concept

The results of the research on increasing mastery of the N-Gain concept are presented in table 4.

Table 4. Obtaining N-Gain Values for Control and Experiment Groups

Group	Gain %	N-Gain	Category
control group	36,90	0,40	Currently
experimental group	43,70	0,40	Currently

In general, the description of student learning outcomes for mastery of concepts in the control class and experimental class, the pretest and posttest scores can be seen in Table 5.

Table 5. Student Learning Outcomes for Concept Mastery

Group	**Statistical Parameters**	**Score**		**(%)**	Category
		Pretest	**Posttes**	***N-Gain***	
control	**Total students**	**32**	**32**	**36,90**	**Currently**
	Average	44,69	63,96		
experi	Total students	32	32	43,70	Currently
mental	Average	51,98	72,29		

Data processing results of the initial test, post-test and normalized N-gain for students' mastery of concepts in the Respiratory System material in the control class and the experimental class.

Based on Table 5 The average pretest value of students' concept mastery in the control class was 44.69 and the experimental class was 51.98, while the average posttest score for the control class was 63.96 and the experimental class was 72.29. Furthermore, the average percentage of normalized N-gain for the control class is 36.90% and the experimental class is 43.70%. The above shows that there are differences in the increase in mastery of concepts of students who study the Respiratory System material through Guided Inquiry learning with mind mapping compared to students who learn through Guided Inquiry learning with concept maps.

Concept Mastery Hypothesis Test

Before testing the hypothesis, first know the normality and homogeneity of the data. The complete data is presented in Table 6.

Table 6. N-Gain Normality Test for Control Class and Experiment Class

Data	Sig.	Decision
Control	0.200	Normal
Experiments	0.094	Normal

The data were normally distributed for the control class with a significance value of 0.200 > α, with α = 0.05, and for the experimental class also normally distributed with a significance value of 0.094 > 0.05. Based on Table 6. it can be seen that the control class and the experimental class are normally distributed. Furthermore, both classes were tested for homogeneity using Levene's test. The results of the N-Gain homogeneity test for the control class and the experimental class with a significance of 0.080 with α = 0.05, then the data is homogeneous.

After knowing that the data is normally distributed and homogeneous, the hypothesis is tested using parametric statistics with an independent t-test.

The results of the independent t-test test obtained a significance value (2-tailed) of 0.005, a significance value of 0.005 < 0.05, Ha is accepted, meaning that there is a significant increase in students' conceptual mastery between Guided Inquiry learning with mind mapping and Guided Inquiry learning with concept maps. The results of students' abilities in each sub and concept domain indicators

The topic of the Respiratory System that is taught in the control and experimental classes consists of several sub-concepts, namely the human respiratory organ, the mechanism of human respiration, respiratory frequency, respiratory volume, disorders of the respiratory system. To measure students' mastery of concepts in the sub-concepts, a multiple-choice test of 30 questions was used. The test using the same questions was given to both classes, each with 32 students, the control class with 32 students, while the experimental class with 32 students. Overall, the prettest-posttest and N-Gain results in percentages for each sub-concept in the measurement topic are shown in table 7.

Table 7. Mastery of Student Concepts in Each Sub-Concept of Control Class and Experiment Class

Sub Concept	Question number	Average score				N-Gain (%)	
		Control		Experiment			
		Pretest	Posttest	Pretest	Posttest	Contr	Exper
Respiratory Organs	1, 2, 3, 4. 5	43,13	63,13	44,38	65,70	35,17	38,33
Human Breathing Mechanism	6, 7, 8, 9, 10, 11, 12, 13, 14,15, 16, 17, 18	44,47	65,87	53,61	73,80	38,54	43,52
Breathing Frequency	19, 20, 21, 22	40,63	70,31	52,34	75,78	49,99	49,18
Breathing Volume	23, 24	48,44	68,75	53,13	67,19	39,39	30,00
Disorders of the respiratory system	25, 26, 27, 28, 29, 30	57,50	65,63	65,00	86,88	19,13	62,51

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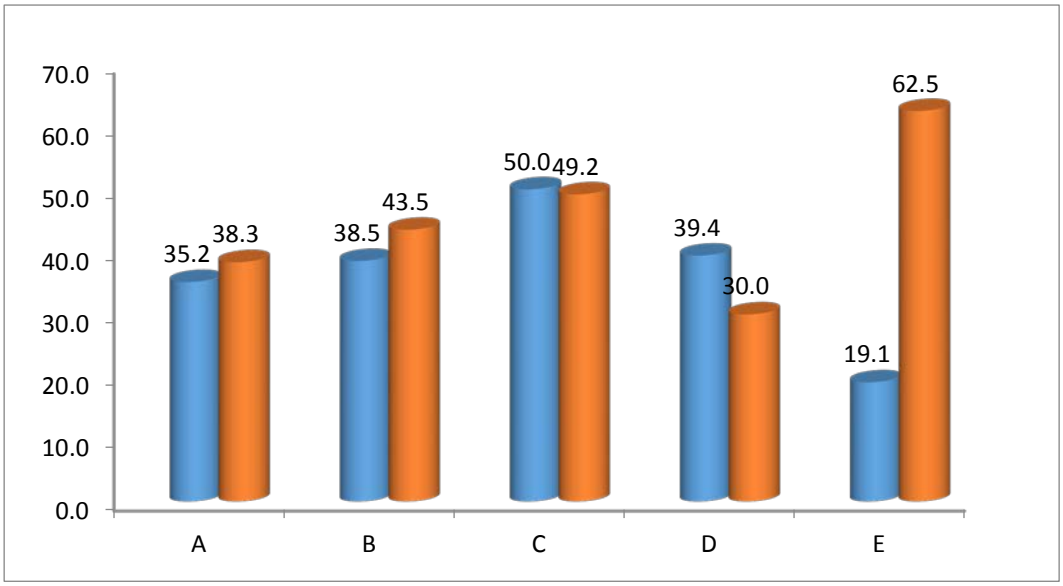
Based on the percentage of acquisition of mastery scores for each pretest sub-concept of the experimental class, the highest value occurred in the sub-concept

of disorders of the respiratory system of 65.00% and the lowest value was on the respiratory organ sub-concept of 44.38%, while the percentage of pretest mastery of each sub-concept in the control class had the greatest value. 57.50% on the sub-concept of disorders of the respiratory system, while the lowest value is on the sub-concept of respiratory frequency of 40.63%. The percentage of posttest in the experimental class with the highest value is in the sub-concept of disorders of the respiratory system by 86.88% and the lowest is in the sub-concept of respiratory organs by 65.70%, while the percentage of posttest in the control class has the highest value in the sub-concept of respiratory frequency of 70, 31% and the lowest is in the sub-concept of the respiratory organ with a value of 63.13%. Thus, it can be concluded from the description above that there is an increase in conceptual mastery in each sub-concept in the experimental class and control class.



Picture 1. Comparison of the N-Gain Percentage of Concept Mastery in Each Sub Concept

Information:
A = respiratory organs
B= Human breathing mechanism
C = respiratory rate
D= Respiratory volume
E = Disorders of the respiratory system

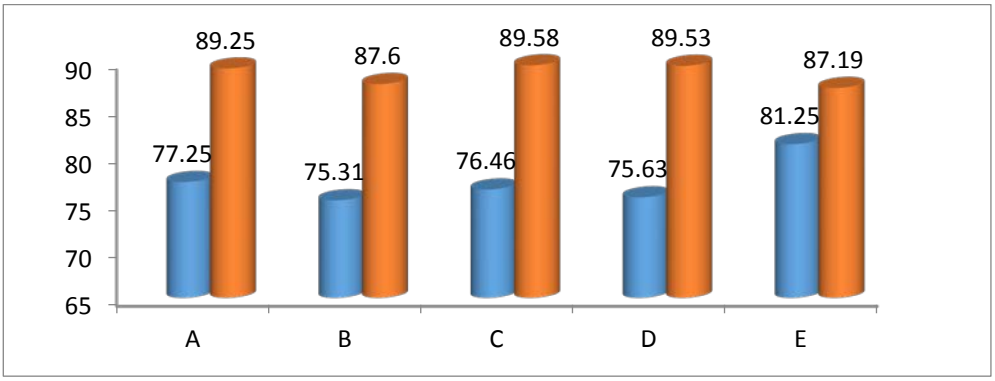
Based on picture1. above, the normalized N-Gain value for each sub-concept mastery, the experimental class has a higher N-Gain percentage compared to the control class.

Table 8. Description of Student Learning Motivation Data for Experiment Class and Control Class

Description	Control Class Students' Learning Motivation	Control Class Students' Learning Motivation
Average Value	76,62	88,66
median	78	90
mode	82	92
Standard Deviation	6,74	5,12
Variance/variety	45,40	26,17
spiky	-0,62	6,34
tilt	-0,19	-2,12
Range	27	26
Minimum Value	63	69
Maximum Value	90	95
Total number	2452	2837
Amount of Data	32	32

Student Motivation Results per Indicator

The results showed that the experimental group's learning motivation was better than the control group. The results of learning motivation for each indicator are presented in picture 2.



Picture. Learning Motivation of Control and Experiment Class Students

Information:
A= Shows interest in learning materials
B= Desire and persistence to succeed

C = Can defend opinion
D = Tenacious in the face of adversity
E= A conducive atmosphere in learning

In picture 2. shows the average learning motivation in all aspects of the experimental class is better than the control class. The aspect of being able to maintain an opinion has the highest value, which is 89.58% in the experimental class and 81.25% in the control class in the aspect of a conducive atmosphere in learning.

Student Learning Motivation Hypothesis Test

Before testing the hypothesis, first know the normality of a data. The complete data is presented in Table 8.

Table 8. Normality Test of Learning Motivation of Students in Control Class and Experiment Class

Data	Sig.	Decision
Control	0.118	Normal
Experiments	0.200	Normal

The data is normally distributed for the control class because the significance value is 0.118>α, with = 0.05, the data is also normally distributed for the experimental class with a significance value of 0.200>α. Based on Table 4.10, it can be seen that the control class and the experimental class have a normal distribution. Furthermore, both classes were tested for homogeneity using Levene's test. The results of the homogeneity test of learning motivation in the control class and the experimental class with a significance of 0.593>α, the data is homogeneous. After knowing that the data is normally distributed and homogeneous, the hypothesis is tested using parametric statistics with the Independent t-Test test.

The results of the independent t-test test obtained a significance value (2-tailed) of 0.000 <0.05, then Ha was accepted, namely there was a difference in the increase in learning motivation in guided inquiry learning with mind mapping and in guided inquiry learning with concept maps.

The main purpose of this research is to find out which is more effective in science learning that applies Guided Inquiry learning with mind mapping or science learning that applies Guided Inquiry learning with concept maps. The effectiveness of learning is seen from the increase in N-gain for students' mastery of concepts, and students' motivation to learn.

The results of the initial test of students' mastery of concepts on the subject of the respiratory system, it is known that the average score of the control class is

almost the same as the experimental class. Thus, it can be concluded that both classes have the same initial ability.

Furthermore, based on the posttest scores on the learning model, students who received Guided Inquiry learning with mind mapping to improve students' overall concept mastery showed better results than the control class who received Guided Inquiry learning with concept maps. This is indicated by the difference in the posttest mean and N-gain of the two classes. The high acquisition of posttest scores and N-gain scores for the experimental class was caused by using the Guided Inquiry learning model with mind mapping to improve students' conceptual mastery in learning to train students' conceptual mastery skills and assist students in solving problems.

Is an increase in mastery of higher concepts in the experimental class compared to the control class because Guided Inquiry learning with mind mapping has the privilege of pouring creativity into a more attractive learning?

According to Rahayu (2018), there are many advantages in using mind mapping, namely (1) being able to see the overall picture, (2) there is a grouping of information, (3) attracting the eye and not boring, (4) easy to concentrate, and (5) easy to understand. remember because there are visual markers.

Based on the results of observations on the implementation of the Guided Inquiry learning process to improve mastery of concepts, it plays a very important role in an interactive and communicative learning atmosphere. This can be seen during the learning process, where students are very enthusiastic and have high enthusiasm in carrying out the stages in learning using Guided Inquiry learning. According to Yovan (2008), the virtues of the recording method using mind mapping include (1) the main theme being defined. very clearly because it is stated in the middle, (2) the priority level of information is better identified, (3) the relationship of each information can be easily recognized, (4) easy to understand and remember, (5) very unique and (6) use keywords. Rahayu (2018) also explains that the mind mapping method can improve science learning outcomes for junior high school students on household chemicals and chemical side effects in everyday life. During the activity in groups, the teacher only acts as a mediator and facilitator.

Based on the results of the analysis, the learning motivation of the experimental class students using Guided Inquiry learning with mind mapping also showed better results than the control class using Guided Inquiry learning with concept maps.

The application of Guided Inquiry learning with mind mapping in the applied learning is able to develop several aspects, namely making students able to express creative learning ideas, fostering student interest in learning, making observations and discoveries in learning, and can improve learning achievement.

CONCLUSIONS

Based on the results of the study obtained the following conclusions:

1. Mastery of concepts in the respiratory system material can be improved through Guided Inquiry learning with mind mapping.
2. On the material of the respiratory system, there was an increase in students' learning motivation through Guided Inquiry learning with mind mapping.
3. Students give positive responses to science learning through Guided Inquiry learning with mind mapping.

Science learning through Guided Inquiry learning with mind mapping on the respiratory system material can help students develop creative ideas, encourage cooperation in completing assignments, students are able to interpret their findings independently, creatively, and fun. The success and achievements of students can be achieved if the learning process is of high quality.

Implication

The results of this study provide input to the teacher, Guided Inquiry learning with mind mapping can be used in science learning on the respiratory system material. This learning makes it easier for students to master the concepts in the material.

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