Volume 9 Number 1, April 2024, pp. 93-103
P-ISSN:2477-7935
E-ISSN:2548-6225
DOI: 10.59052/edufisika.v9i1.29681

THE INFLUENCE OF A GUIDED INQUIRY LEARNING MODEL ON STUDENT MOTIVATION AND LEARNING OUTCOMES ON SOLAR SYSTEM MATERIAL

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Article Info
Received: 29 Nov 2023
Revised: 12 Jan 2024
Accepted: 21 Mar 2024
OnlineVersion: 30 Apr 2024

Abstract :
This research aims to determine the effect of the guided inquiry learning model on student motivation and learning outcomes at Junior high school 2 Piyungan. This research uses a quantitative approach with a quasi-experimental type of research in the form of Nonequivalent Control Group Design. The population of this study were all students in class VII of Junior high school 2 Piyungan with a sample of 64 students. The research instruments used were test instruments in the form of multiple choice questions and non-test instruments in the form of questionnaires. The data analysis technique used in the research is descriptive statistical analysis and inferential data analysis using the Paired Sample t-test and MANOVA test. The research results were analyzed using statistical analysis showing that the average value of learning motivation and learning outcomes for experimental class students was greater than that of the control class. These results are supported by the results of inferential analysis using the MANOVA test which shows a sig. (2-tailed) 0.000 < 0.05. This means that H0 is rejected and Ha is accepted. Thus, it can be said that the guided inquiry learning model influences student motivation and learning outcomes. This research can be used as a reference for further research regarding the influence of the guided inquiry learning model on student motivation and learning outcomes.

Keywords: Guided Inquiry, Learning Outcomes, Motivation

INTRODUCTION

Science and technology are developing rapidly providing benefits to human life. Humans can broaden their horizons by using the various kinds of knowledge they have, one of which is through Natural Sciences (Shrivastava et al., 2020). In essence, Natural Science is a product, process and attitude. The results of discoveries from various investigative activities are collected and arranged systematically into a collection of knowledge called a product (Asmawati, 2020). This collection of knowledge includes facts, concepts, principles, laws, formulas, theories and models. Natural Science as a process includes an understanding of how scientific information is obtained, tested, and validated (Tshitoyan et al., 2019;

Roscher et al., 2020). Natural Science subjects are related to how to find out about nature systematically, so that Natural Science is not only mastery of a collection of knowledge in the form of facts, concepts or principles but is also a process of discovery (inquiry) (Suryawati & Osman, 2017; Saefudin & Saputri, 2018). Through learning Natural Sciences students can discover facts, build concepts, theories and scientific attitudes so that the teaching and learning process places more emphasis on a process skills approach.

Science process skills serve as a foundation for other cognitive skills such as logical thinking, reasoning and problem solving skills. Improving science process skills needs to be carried out to develop students' abilities in learning Natural Sciences through developing process skills, namely social and physical skills processed to obtain better knowledge (Yuliati, 2016; Siahaan et al., 2020). Improving science process skills can be done by implementing a learning model that invites students to search, discover and understand material concepts (Fitriyani et al, 2017; Novitasari et al., 2017). One model that aims to discover and master material concepts is the guided inquiry learning model.

Guided inquiry learning limits the teacher's role as a source of information. Teachers do not explain concepts but guide students to discover these concepts through learning activities, so that the concepts obtained based on learning activities and experiences will always be remembered by students for a long time (Octavia, 2020; Wahyuningsih, 2020). The inquiry model learning stage consists of observation, asking questions (formulating problems), formulating hypotheses, designing experiments, carrying out experiments, collecting data, analyzing data, argumentation (Yanto et al., 2019; Gunawan etal., 2020). At this stage of the learning process, students receive guidance from the teacher to get answers to problems (Kurniawan et al., 2022). This is because students have a high level of involvement in the learning process, this process involves students trying to find concepts or understanding of the topics given by the teacher (Syamsu, 2018; Kelana & Wardani, 2021). The inquiry learning model can accommodate students in practicing science process skills through the learning stages they have (Stender et al., 2018; Elfeky et al., 2020). The advantage of the guided inquiry learning model is that it is effective in increasing student motivation (Rahayu et al., 2018; Margunayasa et al., 2019).

Motivation is the overall driving force within oneself that gives rise to learning activities, which ensures the continuity of learning activities (Filgona et al., 2020). Motivation to learn is a psychological factor that is non-intellectual in nature. Someone who has high enough intelligence can fail because of a lack of motivation in learning. Motivation has an important role in the teaching and learning process for both teachers and students (Seven, 2020). For teachers, knowing students' learning motivation is very necessary to maintain and increase students' enthusiasm for learning. For students, motivation to learn can foster enthusiasm for learning so that students are encouraged to carry out learning actions. Students carry out learning activities happily because they are driven by motivation. Currently, many students are less motivated to study. This can be seen from the attitude of students who are indifferent to the learning process, do not pay attention to the teacher when explaining the material and do not carry out the tasks given by the teacher.

Motivation in students will have an impact on the character of students who are enthusiastic, diligent, tenacious and fully concentrated in learning. Motivation as a driving force in raising enthusiasm for learning at school. Students will try to improve their learning achievements by knowing the learning results they have obtained (Putra et al., 2018; Susilawati et al., 2020). Apart from that, children will be motivated to explore their existing abilities for smooth and successful learning so that their learning outcomes improve. Therefore, the success of student learning achievement needs to be improved continuously. By increasing students' learning motivation so that there is an increase in interest in learning which has an impact on learning outcomes (Lin et al., 2017; Yusuf, 2021). The motivation that students have to learn plays a very important role in the progress and achievement of students' learning in certain subjects. If students have high motivation, they are likely to be successful in the learning process so that they get high grades (Gbollie & Keamu, 2017; Yu & Singh, 2018). It can be interpreted that the higher a person's level of motivation, the greater the effort that person makes in achieving success in learning.

Previous research conducted by Lovisia (2018) stated that the Guided Inquiry learning model had an effect on physics learning outcomes with the results of t-test analysis with t_{count} (2.61) > t_{table} (2.02) with $\alpha = 0.05$. Research conducted by Wartini (2021) states that the application of the guided inquiry learning model is able to increase student learning motivation and students' critical thinking abilities with an average student learning motivation score of 109.27 in the high category and an average critical thinking ability score. students' classical completion was 90.6% in the good category. Then research conducted by Wati, Ningrat & Didik (2021) stated that student motivation and learning outcomes on solar system material could be increased by implementing CTL-based physics learning through experimental methods with the result of increasing student learning motivation reaching a percentage of 75% in the high category and Student learning outcomes achieved an average score of 71 with a classical completion score of 88%. Based on existing research conducted by previous researchers, there has been no research regarding the influence of the guided inquiry learning model on learning motivation and student learning outcomes on solar system material at SMP Negeri 2 Piyungan. Therefore, researchers conducted this research to complement previous research.

Based on this description, it can be seen the importance of learning motivation and learning outcomes for students, especially in class VII middle school solar system material. The research was conducted using the guided inquiry model as a learning model to increase learning motivation and student learning outcomes on solar system material. So, researchers conducted research with the aim of finding out the effect of the guided inquiry learning model on student motivation and learning outcomes on solar system material at Junior high school 2 Piyungan.

RESEARCH METHOD

This research is quantitative research with a quasi-observation method. The observation design used by researchers is Nonequivalent Grub Design control. The independent variable (X) is a variable that influences the emergence of the dependent variable, and there are two types of variables explored in this research. Meanwhile, the existence of the independent variable is influenced by the dependent variable (Y). The guided inquiry learning model is the dependent variable (X), student motivation and learning outcomes are the independent variables (Y), and the questionnaire question sheets and test sheets are the control factors. This research was carried out over three meetings in classes VII-A and VII-B at SMP Negeri 2 Piyungan. Class VII-A is the experimental class and class VII-B is the control class.

The population of this study were all students in class VII of SMP Negeri 2 Piyungan. Samples were obtained using simple random sampling techniques. Through this technique, a sample of 64 students was obtained in the research. The sample consisted of 32 students from class VII-A as the experimental group and 32 students from class VII-B as the control group.

The research design regarding the influence of the guided inquiry learning model on student motivation and learning outcomes on solar system material can be seen in table 1.

Table 1. Research Design

Design	Pre-test	Treatment	Pos-test
Experimental Class	T_1	X_1	T_2
Control Class	T_1	X_2	T_2

Information:

T_1 = Following the behavior in the experimental class and control class, a pre-test was given.
T_2 = A post-test was administered following the behavior of the experimental and control groups.
X_1= The Guided Inquiry Learning Model is used for learning in experimental classes.
X_2= Learn by following traditional teaching methods known as direct instruction.

The instruments used in this research are non-test instruments and test instruments. The non-test instrument used was a questionnaire to determine the increase in students' learning motivation on solar system material after using the guided inquiry learning model. Learning motivation questionnaires are given to students after classroom learning activities are completed. The student motivation questionnaire grid can be seen in table 2.

Table 2. Student Learning Motivation Questionnaire Grid on Solar System Material

Indicators of Student Learning Motivation	Item number
Student interest and attention	1,2,3
Students' sense of enjoyment in learning activities	4,5,6
Students' responsibilities in carrying out their learning tasks	7,8,9,10

The test instrument used in this research is multiple choice questions on solar system material. Tests are carried out before and after learning activities which are called pre-test and post-test. The test instrument consists of 20 multiple choice questions.

Data analysis in this research uses descriptive statistical analysis and inferential statistics with the help of the SPSS 22.0 application. Descriptive statistics are used to analyze and present data that has been obtained from calculating the mean, maximum score and minimum score. Inferential statistics are used to test hypotheses which consist of prerequisite tests, namely the normality test and homogeneity test, then continued with hypothesis testing (MANOVA test) with a significance level of 5%, then the test results are compared with t_{table}. If the significance value is <0.05 then H_0 rejected and H_a accepted. This means that there is an influence between variables.

RESULTS AND DISCUSSION

Research results have been obtained through test instruments and non-test instruments. The test instrument used in the research was 20 multiple choice questions to determine the learning outcomes of class VII students on the solar system material. The non-test instrument used was a questionnaire to determine students' learning motivation through a guided inquiry learning model on class VII solar system material.

Student Learning Motivation

The results of research regarding student learning motivation in the experimental and control classes can be seen in Figure 1.

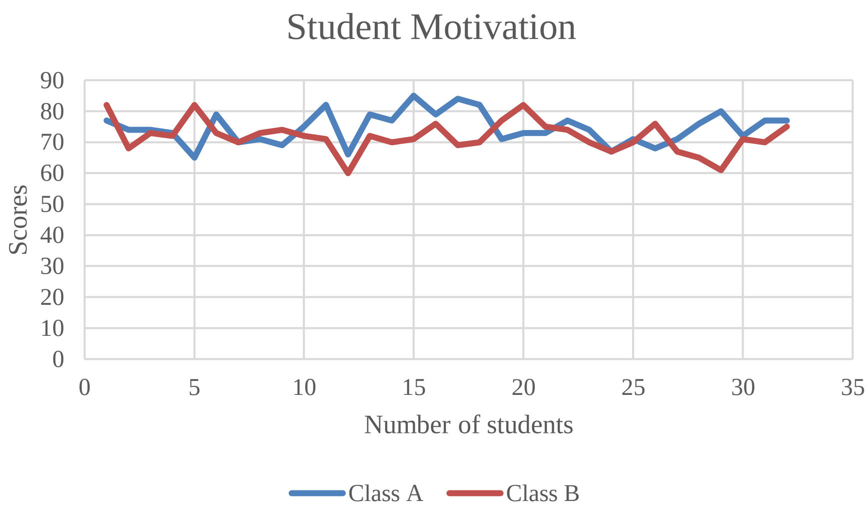

Figure 1. Student Motivation Graph

Based on Figure 1, it can be seen that the red line is the score of the learning motivation of control class students, namely class VII-B, and the blue line is the score of the learning motivation of experimental class students, namely class VII-A, on the topic of the solar system. The results showed that the control class got an average score of 71.81, the maximum score was 82, and the lowest score was 60. Then the experimental class got an average score of 74.63, a maximum score of 85, and a minimum score of 65. It can be seen that the average score of the experimental class is greater than the control class, this states that students' learning motivation towards solar system material in the experimental class is greater than the control class.

Student Learning Outcomes

The tests carried out consisted of pre-test and post-test. Pre-test and post-test on solar system material were carried out in the control class and experimental class. The test results for the control class can be seen in Figure 2.

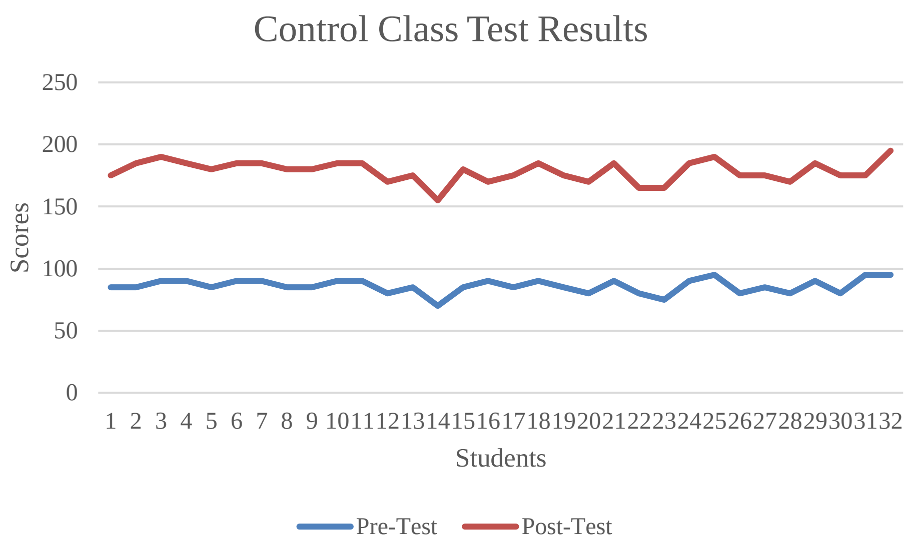

Fig 2. Graph of Control Class Pre-Test and Post-Test Scores

Based on Figure 2, it can be seen that the blue line shows the students' pre-test scores and the red line shows the control class students' post-test scores on the solar system material. Students' pre-test scores obtained a maximum score of 95 and a minimum score of 70 with an average score of 84,85. Following the post-test scores, students obtained a maximum score of 100 and a minimum score of 80 with an average score of 92.50. The student test scores on the solar system material have increased, it can be seen that the average pre-test score is smaller than the average post-test score, namely 84,85 and 92.50. This states that the learning outcomes of control class students increased from 84,85 to 92.50.

The test results in the experimental class can be seen in Figure 3.

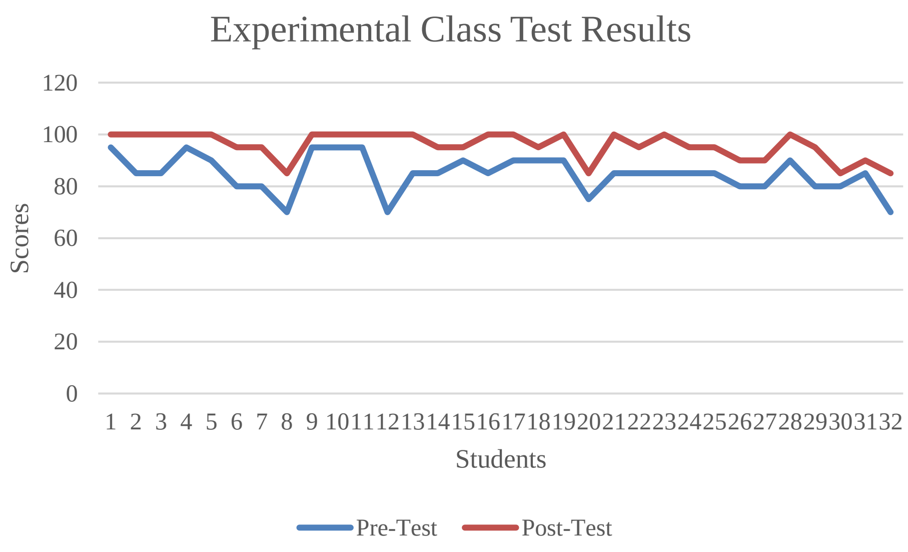

Figure 2. Graph of Experimental Class Pre-Test and Post-Test Scores

Based on Figure 3, it can be seen that the blue line shows the students' pre-test scores and the red line shows the post-test scores of experimental class students on the solar system material. Students' pre-test scores obtained a maximum score of 95 and a minimum score of 70 with an average score of

85.93. Then the students' post-test scores obtained a maximum score of 100 and a minimum score of 80 with an average score of 95.78. The student test scores on the solar system material have increased, it can be seen that the average pre-test score is smaller than the average post-test score, namely 85.93 and 95.78. This states that the learning outcomes of experimental class students increased from 85.93 to 95.78.

Based on the test results obtained in the control class and experimental class, it can be seen that the scores in the pre-test and post-test for the control class are smaller than those in the experimental class. Even though the two classes have the same minimum and maximum scores on the pre-test and post-test, there are differences in the average scores obtained. The average pre-test and post-test scores for the control class were 84.85 and 92.50, while the average pre-test and post-test scores for the experimental class were 85.93 and 95.78. It can be seen that the average score obtained by experimental class students was greater than that of the control class, both in the pre-test and post-test.

The influence of the guided inquiry learning model on student motivation and learning outcomes

Motivation data and student learning outcomes were analyzed through descriptive statistics, then analyzed through inferential statistics with the help of the SPSS 22.0 application to see the effect of the guided inquiry learning model on student motivation and learning outcomes. Student motivation and learning data were tested for homogeneity first. The results of the homogeneity test can be seen in table 3 below.

Table 3. Homogeneity Test Results of Student Motivation and Learning Outcomes Data

	Levene Statistic	df1	df2	Sig.
Motivation to learn	.362	1	62	.550
Learning Outcomes (Pre-Test)	.048	1	62	.827
Learning Outcomes (Post-Test)	.003	1	62	.960

Table 3 shows the results that learning motivation obtained a significance value of 0.550. Then student learning outcomes in the pre-test and post-test obtained a significance value of 0.827 and 0.960. The significance value obtained for learning motivation, pre-test and post-test is greater than 0.05, so it can be stated that the homogeneous variance data is correct. The prerequisite tests have been completed, then a paired sample test is carried out using the Manova test.

T Test

Table 4. Questionnaire Output Data

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Questionnaire Experiment	77,00	32	5,298	,936
	Control Questionnaire	71,81	32	5,083	,899

		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference: Lower	95% Confidence Interval of the Difference: Upper	t	df	Sig. (2-tailed)
Pair 1	Angket_Eksperimen - Angket_Kontrol	5,188	7,195	1,272	2,593	7,782	4,078	31	,000

Table 4 shows that the experimental class average is 77.00 and the control class average is 71.81. with signs. (2-tailed) value 0.000-0.05. As a result, it is rejected and H_a is accepted.

Tabel 5. Data Output Kelas Eksperimen

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre_Test - Post_Test	-19,688	8,126	1,436	-22,617	-16,758	-13,706	31	,000

Table 5 shows that the sig. (2 tailed) of 0.000 < 0.05. So, in the experimental class H_0 is rejected and H_a is accepted.

Table 6. Control Class Output Data

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre_Test - Post_Test	-13,594	9,353	1,653	-16,966	-10,222	-8,222	31	,000

Based on table 6, it is known that the sig. (2 tailed) of 0.000 < 0.05. So in the control class H_0 is rejected and H_a is accepted

Manova Test

Table 7. Data from the Manova Test on Learning Outcomes Motivation

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	,998	18341,154[b]	2,000	61,000	,000	,998
	Wilks' Lambda	,002	18341,154[b]	2,000	61,000	,000	,998
	Hotelling's Trace	601,349	18341,154[b]	2,000	61,000	,000	,998
	Roy's Largest Root	601,349	18341,154[b]	2,000	61,000	,000	,998
Kelas	Pillai's Trace	,231	9,154[b]	2,000	61,000	,000	,231
	Wilks' Lambda	,769	9,154[b]	2,000	61,000	,000	,231
	Hotelling's Trace	,300	9,154[b]	2,000	61,000	,000	,231
	Roy's Largest Root	,300	9,154[b]	2,000	61,000	,000	,231

a. Design: Intercept + Kelas
b. Exact statistic

Based on table 7, testing Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root all produce Sig. 0,000. The f table value is 3.15 based on df_1 = 2 and df_2 = 61 at a significance level of 5%. The sig value has been determined according to the parameters listed in table 18 at 0.000, where the value is <0.05, so H_0 rejected and H_a accepted. Thus producing the MANOVA test results shown in table 7. Based on the table from the MANOVA test for the sig value. (2-tailed) 0.000 < 0.05. To draw conclusions, this value is compared with a significance of 0.05. And it is obtained that sig. 0.000 < 0.05 which means H_0 is rejected and H_a is accepted. Thus, it can be said that the guided inquiry learning model influences student motivation and learning outcomes.

The research results obtained and analyzed descriptively show that learning motivation and learning outcomes in the experimental class are greater than in the control class. In the experimental class, a guided inquiry learning model is applied in learning activities, while in the control class, a traditional teaching method known as direct instruction is applied. It can be seen from the results of the descriptive statistics that the experimental class students' learning motivation obtained an average score of 74.63, while those in the control class obtained an average score of 71.81. It can be seen that the guided inquiry learning model helps increase students' learning motivation on solar system material. This is supported by the learning results obtained by students where the pre-test and post-test results in the experimental class are also greater than the control class. The average pre-test and post-test scores for the experimental class were 85.93 and 95.78, while the average pre-test and post-test scores for the control class were 84.85 and 92.50. The test results obtained by students show that the guided inquiry learning model can improve student learning outcomes on solar system material. So, the guided inquiry learning model influences learning motivation and student learning outcomes on solar system material.

The statistical analysis obtained was strengthened by the results of inferential analysis using the MANOVA test to see the effect of the guided inquiry learning model on student motivation and learning outcomes. The MANOVA test results show that the sig. (2-tailed) 0.000 < 0.05. This means that H_0 is rejected and H_a is accepted. Thus, it can be said that the guided inquiry learning model has an influence on student motivation and learning outcomes in the solar system material.

Learning using the guided inquiry model emphasizes maximum student activity which is directed at searching for and finding answers to something that is asked for themselves. Direct experience gained during the learning process using the guided inquiry model can increase student motivation and learning outcomes. The guided inquiry learning model makes students actively involved in learning, such as: formulating problems, formulating hypotheses, designing experiments, conducting experiments, collecting and analysing data, then drawing conclusions. Students' active involvement in learning makes students learn meaningfully. Students not only learn by memorizing but build and understand concepts on their own. Activities in guided inquiry learning steps make it easier for students to gain experience both physically and mentally, so that physics learning outcomes in the experimental class are higher than in the control class.

The use of experimental methods in this inquiry learning model really supports students in discovering concepts in solar system material. During the experimental class learning process, students receive guidance as needed. In the initial stage the teacher provides a lot of guidance, then in the next stage the guidance is reduced, so that students are able to carry out the inquiry process independently. The guidance provided can be in the form of questions and discussions that can direct students to understand concepts. Apart from that, guidance is also provided through structured student worksheets. This inquiry step makes it easier for students to understand existing problems so that they can improve student learning outcomes. The application of conventional learning in the control class has less influence on students' physics learning outcomes, because it uses the lecture method and directly discusses example problems, so that students become less active and the learning process only focuses on the teacher. This is what causes low learning motivation which has an impact on low learning outcomes.

Based on research conducted by Karsono (2017), it was found that the learning pattern using textbooks is very dominant and science learning is still dominated by learning that places science as a product only because learning still uses the lecture method which causes students to be less active in learning. Research conducted by Harni (2020) states that low learning motivation then has an impact on decreasing student learning outcomes, so that the learning process seems less than optimal. Then research conducted by Sudewiputri & Dharma (2021) states that the lack of motivation to learn and low science learning outcomes is caused by teachers still using conventional methods (lectures) in learning so that students tend to be passive and learning becomes less interesting and if this is allowed to continue continuously, this will have an impact on not achieving learning goals and reducing the quality of learning in educational units. Based on previous research, it appears that low learning motivation and learning outcomes are influenced by the learning model used, so the appropriate learning model to increase learning motivation and student learning outcomes is the guided inquiry learning model.

The use of the guided inquiry learning model influences learning motivation and student learning outcomes on solar system material. This guided inquiry learning model can increase student motivation and learning outcomes. When student learning motivation increases, student learning outcomes also increase. So as a teacher, it is very important to apply the guided inquiry learning model in learning activities so that learning becomes meaningful and not boring. This research can be a reference for future teachers and researchers. Teachers can see in this research that the application of the inquiry learning model to solar system material can increase student motivation and learning outcomes. For researchers, researchers can use this research as a reference for further research with different variables because this research is only limited to using the guided inquiry learning model as the dependent variable, learning motivation and learning outcomes as independent variables, and only researches the solar system material.

CONCLUSION

The results of the research which were analyzed using statistical analysis showed that the learning motivation of experimental class students obtained an average score of 74.63, while those in the control class obtained an average score of 71.81. Then the average pre-test and post-test scores for the experimental class were 85.93 and 95.78, and the average pre-test and post-test scores for the control class were 84.85 and 92.50. It can be seen that the guided inquiry learning model has an effect on learning motivation and student learning outcomes on the solar system material. This result is supported by the results of inferential analysis using the MANOVA test which shows a sig. (2-tailed) $0.000 < 0.05$. This means that H0 is rejected and Ha is accepted. Thus, it can be said that the guided inquiry learning model has an influence on student motivation and learning outcomes in the solar system material.

ACKNOWLEDGMENTS

The author would like to express his deepest gratitude to all participants who were willing to participate in this research. The author also thanks all parties who have contributed to writing this article.

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