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Application of Ethnoscience-Based Guided Inquiry Models to Improve Science Process Skills in the Material of the Human Excretory System

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Abstract

This study aims to describe the implementation of learning, students' science process skills, and students' responses after participating in learning with an ethnoscience-based guided inquiry learning model on the material of the human excretory system. This research method uses a Quasi Experimental Design with the design "The Only Pretest-Posttest Control Group Design" whose research targets are students in class VIII-D SMPN 16 Surabaya as the experimental class, class VIII-A as the control class, each of which consists of 30 participants. Data obtained by observation, test, and questionnaire methods were then analyzed descriptively quantitatively. The results showed that the proportion of learning implementation was 87.94 in the experimental class for 3 meetings, said to be in the practical and effective category. In the experimental class, science process skills increased significantly with the aspect of predicting and concluding the N-Gain value, namely 0.8, which increased with the high criteria, drawing conclusions, namely 0,7, which experienced an increase in the degree of high criteria, and the observing aspect, which was 0,4 with the criteria moderate rise. Students responding to the implementation of the ethnoscience-based guided inquiry learning model to improve science process skills by 86.84% were categorized as very good. Based on the description above, it can be interpreted that the application of the ethnoscience-based guided inquiry learning model can improve students' processing skills in the material of the human excretory system.

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INTRODUCTION

Education as an effort to prepare students to face an environment that is always experiencing very rapid changes (Herlina, 2019). Through education, especially learning Natural Sciences subjects, teachers are required to be more creative and innovative (Damopolii et al., 2018). Science learning will be carried out well if it is based on skills and develops facts based on phenomena that occur, develops inquiry process skills to identify, formulate and solve problems with real action (Kemendikbudristek, 2022).

During this science learning most only focus on the theory in student handbooks (Khafid et al., 2019). Through investigative activities students conduct experiments to observe the phenomena that occur. If students carry out investigations, they can apply different investigative skills, such as asking questions, submitting hypotheses, conducting experiments to test hypotheses, taking and analyzing data, making conclusions, communicating, and making research reports conducted (Osman et al., 2013). Learning is said to be meaningful if students can find the concept of the material being understood. Students' science process skills will also develop through direct observation in investigative activities carried out in learning (Damopolii et al., 2018).

The goal of learning science is not only to understand facts, concepts, laws, principles and theories related to science, but also to apply science process skills. These science process skills help students to learn more about science, concepts, principles, or theories (Artayasa et al., 2021). When science process skills are applied, students will discover by themselves new knowledge and meaningful things in learning.

Observations conducted at SMP Negeri 16 Surabaya on the subject of the Human Excretory System found that students with a percentage of 60% could not formulate problems (predict) and 73.3% could not formulate hypotheses according to the problem formulation. 53.3% of students did not correctly determine variables and define operational variables or (observe) correctly. In making conclusions, there were 56% of students who still did not provide statements or results obtained correctly. In addition, interviews with science subject teachers said that learning was carried out using conventional methods. This explains that in science learning the teacher is the center of the learning process. If science process skills are low due to several causes, namely just mastering concepts in the learning process, as well as students' science process skills that have not been explored optimally (Sunanto & Bangsa, 2021).

The solution to the above problems is by applying an appropriate learning model, namely the guided inquiry model. This learning model emphasizes that students can find scientific concepts and principles independently and develop creativity in solving problems, but the teacher still guides students in the process of solving problems (Juhji, 2016). The guided inquiry learning model directs students in developing knowledge and skills. Students not only get the material presented, but analyze, sort, and respond to it when solving problems (Nuryadin & Delinda, 2018). So that way the skills that exist in students, namely science process skills in themselves can be developed, especially learning science

One of the efforts that teachers can make is to modify the learning model where the material presented is related to everyday life so that students are able to understand the material being taught and are active in learning. The learning process that relates to life is contextual learning. By raising the contextual theme of local culture which contains science learning which aims to increase students' interest in learning science (Agatha & Budiyanto, 2021). Ethnoscience-based learning contains material taught by teachers with the context of students' lives and is related to technology and science, resulting in learning that is practical and useful in life, not just informative (Suastra et al., 2011). Learning with an ethnoscience approach through observation, discussion, communicating results, and doing practicum students are expected to be able to carry out science process skills. There was an increase because during the learning process students used an ethnoscience approach accompanied by science process skills (Pertiwi & Rusyda, 2019). According to (Rustaman, 2005) through the experiences gained in the direct learning process, students' science process skills will also develop.

The research results of Syazali & Umar (2022) The guided inquiry model by promoting culture-based learning is proven to be able to improve science process skills. The research results of Andriani & Widodo (2018) Ethnoscience-based Student Worksheets (LKS) through a scientific approach can be used and can train students' science process skills.

Based on the description above, researchers conducted a study entitled "Application of the Ethnoscience-Based Guided Inquiry Learning Model to Improve Science Process Skills in the Material of the Human Excretory System". With the application of the guided inquiry learning model associated with ethnoscience, it is hoped that students' science process skills will increase from the results of previous observations on the material on the Human Excretory System.

METHODS

Quantitative research uses the Quasi Experimental Design method to measure students' science process skills improvement through differences in pretest and posttest results before and after learning. The design of this research is "The Only Pretest-Posttest Control Group Design"(Pramudyani, 2018). The sample in this study was taken from one class to serve as an experimental class with the treatment of the ethnoscience-based guided inquiry learning model, namely class VIII-D, and compared to a class that did not apply the ethnoscience-based guided inquiry learning model, namely class VIII-A, with a total of 30 students. because in these classes students are heterogeneous or have different academic abilities.

Data collection in this study was carried out using several methods including: Observation Method, the observation carried out aims to determine the implementation of the researcher's learning activities with the ethnoscience-based guided inquiry learning model in accordance with the Learning Implementation Plan. Observations were made by two observers who were in the class when the learning took place. Questionnaire Method, this study uses a questionnaire to collect data related to student responses during learning. Questionnaires were given to students after the implementation of guided inquiry learning based on ethnoscience. Test, the written test in this study was described in two assessments, namely the form of question sheets for the pretest and posttest, to collect data related to students' science process skills by applying the ethnoscience-based guided inquiry learning model in the experimental class and conventional learning models in the control class. (LKPD) student worksheets is also used to collect data related to science process skills.

In the observation sheet on the implementation of lesson plans, data on teacher performance were obtained in managing and implementing learning in research. The data is then analyzed by calculating the average value (mean) based on the learning implementation criteria applied from each perspective. The implementation of learning can be categorized as effective if the teacher's ability to manage and carry out learning has at least reached a fairly practical category (Depdiknas, 2006).

In this research, the Likert Scale method was used with a data collection tool using a scale of student responses to ethnoscience-based guided inquiry learning. Learning is considered effective if the teacher's ability to manage and implement learning has reached a very strong or strong category. Data analysis on the Improvement of Students' Science Process Skills was obtained from the percentage of students' mastery of science process skills during learning that applied guided inquiry models based on ethnoscience and conventional learning through analysis of the results of pretest and posttest work. The instrument used in this study used the Science Process Skills test with data analysis using a paired t-test. The t-test was carried out after the prerequisite test, namely the normality test and homogeneity test, to find out whether there was a significant difference between the experimental class and the control class. Normality and homogeneity tests were carried out using the Kolmogorov-Smirnov test with a significance level of 0.05. Regarding data analysis used to determine the increase in students' Science Process Skills using a normalized average score which is processed using the equation developed by using the N-gain equation (Meltzer, 2002).

RESULTS AND DISCUSSION

This research was conducted in the 2022-2023 Academic Year Even Semester in two classes of subjects with three meetings. There are three data analyzes to answer the formulation of the problem in the research, namely:

Table 1. The Percentage of Learning Implementation at Each Meeting in the Experimental Class

Learning Activities	Meeting 1		Meeting 2		Meeting 3		Average	Result
	P1	P2	P1	P2	P1	P2		
Introduction	91,67	95,83	92,86	89,29	100	95,83	94,25	
Core Guided Inquiry Phase Formulate Problems Proposing a Hypothesis Collecting data Testing Hypotheses and Formulating Conclusions	90,62	90,62	93,75	81,25	82,14	92,86	73,03	87,94
Closure	100	100	100	87,50	100	91,67	96,53	

The percentages in table 1. show the implementation of the ethnoscience-based guided inquiry learning model in the excretion system material of 87.94 in the practical category based on the interpretation scale with the evaluation criteria of the implementation of learning and is said to be effective with an average percentage of each phase in each meeting, namely 94.25; 73.03; and 96.53.

The introduction stage the teacher explains the topic, objectives, and expected learning outcomes achieved by students. Explain the main activities that must be carried out by the participants learn to achieve goals. At this stage, the steps of inquiry are explained and the purpose of each step, starting from step formulate formulate the problem to formulate conclusions and Explain the importance of topics and learning activities. This is done in order to provide motivation to learn students.

In the core learning phase, students receive a guided inquiry model stimulus with syntax to achieve the inquiry objectives. The syntax of guided inquiry is to formulate a problem, propose a hypothesis, collect data, test the hypothesis and then formulate a conclusion. This is based on research on guided inquiry syntax sourced from Sulistiyono (2020) which focuses more on students and aims to make students more creative and innovative. While the teacher's role is to guide and direct student learning to solve the problem. In the core activities, the teacher guides students to carry out experiments or observations based on ethnoscience to answer the formulation of problems that are still under the guidance of the teacher. factors at this stage students still need direction from the teacher and in obtaining data.

In closure activities, the teacher concludes from the learning activities that have been carried out associated with experiments or observations carried out by students, then reflects on the learning activities carried out

Students' science process skills are obtained by using the instrument questions which are carried out before (pretest) and after (posttest) the ethnoscience-based guided inquiry model is applied.

Table 2. N-Gain Pretest and Posttest Science Process Skills Experiment Class

Aspects of Science Process Skills	*Pretest*	*Posttest*	N-Gain	Criteria N-Gain
Predict	50	94	0,8	High
Developing a Hypothesis	70	93	0,7	High

Observe	35	62	0,4	Moderate
Conclude	43	92	0,8	High

In the experimental class, science process skills increased significantly as shown in table 2. with the aspects of predicting, formulating hypotheses, and concluding increases with high criteria, while the observing aspect has increased with moderate criteria.

The pretest and posttest skills of the experimental class and the control class were analyzed by looking at the percentage of the N-Gain criteria. Figure 1. provides information about the N-Gain results in each class.

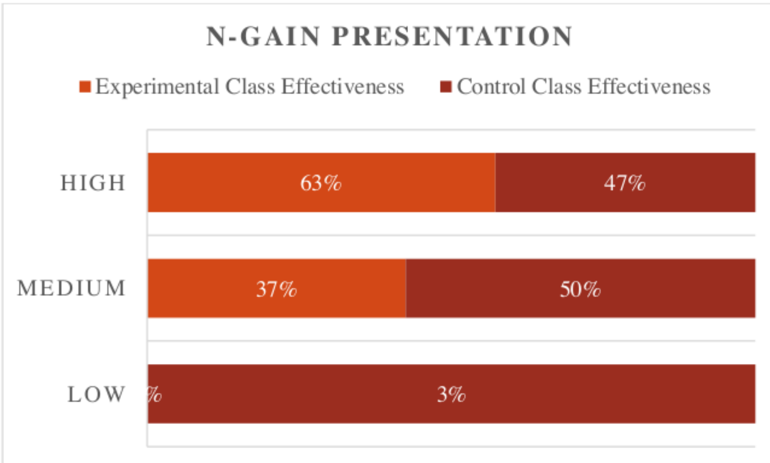

Figure 1. Experiment Class and Control Class N-Gain Results

Based on the N-gain value, Figure 1. shows an experimental class of 19 students (63%) with high criteria indicating that the 19 students experienced a significant increase in science process skills. A total of 11 students (37%) with moderate criteria indicated that the 11 students experienced sufficient or moderate improvements in scientific literacy skills. There are no students (0%) with low criteria. In the control class there were 14 students (47%) with high criteria indicating that the 14 students experienced a significant increase in science process skills. A total of 15 students (50%) with moderate criteria indicated that these 15 students experienced an increase in science process skills which was lower than the other 14 students, but the increase was considered sufficient. A total of 1 student (3%) with low criteria indicates that 1 student in the control class experienced an insignificant increase in science process skills.

Furthermore, to analyze the differences between the experimental class using the ethnoscience-based guided inquiry learning model and the control class using the conventional learning model, namely the Paired t Test, but before conducting the paired t test, prerequisite tests were carried out first, namely the Normality Test and Homogeneity Test.

Based on SPSS calculations, it was found that the pretest data for science process skills for both the experimental class and the control class had sig values > 0.05, namely 0.079 and 0.069 respectively, so it can be concluded that the data group is normally distributed. After the normality of the data is known, then the homogeneity test is carried out. The results of the research variable homogeneity test showed that the pretest had a significant value of 0.753 while the posttest had a significant value of 0.666. From the results of calculating significant prices for pretest or posttest data greater than 0.05 (sig > 0.05), it can be concluded that the data in this study have a homogeneous variance. after that a paired t test was carried out, based on the value of $t\ hitung$ of 26.083 with a significance of 0.000 and the value of $t\ tabel$ of df

59 from the total sample minus one, which is 2.001. So it can be concluded that $thitung >$ $ttabel$ (26.083>2.001) and the significance value is less than 0.05 (p=0.000<0.05), so it can be stated that there is a difference between the pretest and posttest results in the experimental class and the control class.

In the experimental class, students completed the material on the human excretory system, because it was above the (KKM) criteria of the Indonesian Ministry of Education and Culture (2015), that is 80. But in the comparison class there were 5 students who had not finished the material on the human excretory system. This is influenced by the different cognitive, skill and affective levels of each learner.

Based on data collection, namely 30 students at the end of the third learning meeting were given a response questionnaire which contained 15 items to find out the application of the ethnoscience-based guided inquiry learning model carried out by researchers in the experimental class, the applied learning received feedback from students namely 86.84 % based on a Likert scale proved to be very effective or very strong. Analysis of student responses provides an explanation of the ethnoscience-based guided inquiry learning model which is very good or effective in improving students' science process skills. The teacher never uses ethnoscience teaching, so that in the learning process of the human excretory system material the students are very enthusiastic. This shows that students are active and happy in learning. This can be supported by increasing the results of students' science process skills in natural subjects.

Based on the analysis of the resulting data, it has been proven that there is a significant difference between the ethnoscience-based guided inquiry model and the conventional model in improving students' science process skills in class VIII science learning at SMP Negeri 16 Surabaya. The thing that causes the ethnoscience-based guided inquiry model to have an average and higher increase compared to the conventional model is because the ethnoscience-based guided inquiry model emphasizes active students in learning (Surawan, 2020). Ethnoscience learning students will be able to understand the local wisdom of their area (Setiawan, 2017). Through this learning students can meet the information they get at school with everyday life. According to (Rustaman, 2005) science process skills can be developed through direct experiences as learning experiences, namely the use of family medicinal plants in treating diseases of the human excretory system and excessive consumption of family medicinal plants turns out to have a negative impact on the health of the excretory system of human organs. Even though students are given the same material at the same time, in the ethnoscience-based guided inquiry model students are given examples of cases or activities related to daily life associated with the use of family medicinal plants, where students are trained to search and find existing problems (Nuryadin & Delinda, 2018). Whereas in the conventional method students are only fixated on the teacher's explanation and students are less active in learning (Suastra, 2010).

Students are enthusiastic and active in participating in learning, this is in accordance with Permendikbud No. 65 of 2013 that learning must be innovative. In this study the teacher applies the guided inquiry learning model based on ethnoscience. The material used is the excretory system which is related to everyday life because students understand the human body which is related to the excretory system and how to take care of the human body, especially the organs of the excretory system so that it stays healthy and works well after utilizing family medicinal plants in the surrounding environment . Students in the excretory system material were more active by using the ethnoscience-based guided inquiry method or the experimental class by producing an increase in science process skills compared to the class that was not treated with the ethnoscience-based guided inquiry learning model or the control class. An understanding of ethnoscience in learning can enable students to develop an understanding of science and technology, as well as strengthen their intercultural and multicultural skills (Sumarni et al, 2022).

In inquiry learning students are invited to discover concepts independently (Agung, 2009). In this research is associated with analyzing the toga plants in schools both in terms of the benefits and disadvantages that are given if the consumption period is too excessive, students discover the concept of how to properly use toga plants through this ethnoscience guided inquiry learning assisted by teacher guidance. Through the process of finding concepts independently, it can train students' science process skills, so that students' mastery of concepts becomes optimal (Nursalim et al., 2007). Besides that, finding concepts independently makes activities or processes while finding concepts last a long time in students' memories, thus making students' mastery of concepts more optimal. The process of finding concepts in inquiry learning can be based on ethnoscience. Efficient learning can assist in the process of increasing students' mastery of science concepts and process skills based on local wisdom (Physics et al., 2019). So that according to the results of Andriani & Widodo's research (2018) Ethnoscience-based Student Worksheets (LKS) based on scientific approaches can be used and can train students' science process skills.

CONCLUSION

The results showed that the proportion of learning implementation was 87.94 in the experimental class for 3 meetings, said to be in the practical and effective category. In the experimental class, science process skills increased significantly with the aspect of predicting and concluding the N-Gain value, namely 0.8, which increased with the high criteria, drawing conclusions, namely 0.7, which experienced an increase in the degree of high criteria, and the observing aspect, which was 0.4 with the criteria moderate rise. Students responding to the implementation of the ethnoscience-based guided inquiry learning model to improve science process skills by 86.84% were categorized as very good. Based on the description above, it can be interpreted that the application of the ethnoscience-based guided inquiry learning model can improve students' processing skills in the material of the human excretory system. The teacher acts as a facilitator who guides students during the inquiry process by providing questions related to ethnoscience on family medicinal plants, inviting students to discuss, and providing constructive feedback (Pertiwi & Rusyda, 2019). In addition, students are also encouraged to seek information through scientific literature and other relevant sources facilitated by the teacher in student worksheets (LKPD).

SUGGESTION

Based on the tests carried out, researchers can provide recommendations that teachers should focus on students whose ability to understand lessons is weak so they can learn optimally. The strategy for implementing an education system that is not in accordance with the curriculum must pay attention to assumptions about using enough time productively to fulfill public desires. For further researchers are expected to be able to observe all aspects of science process skills in the learning process

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