

The Comparison of Guided Inquiry Learning with Problem Based Learning toward Science Process Skills of Students' Environmental Pollution Material in Junior High School

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ABSTRACT

This study aims (1) to determine whether the guided inquiry learning model has an effect on the students' science process skills, (2) to find out whether the PBL learning model affects the students' science process skills, (3) to find out the differences in the students' science process skills. VII SMPN 5 Dusun Selatan which uses the guided inquiry learning model and the PBL learning model. The method in this research is comparative quantitative. The research design used was the Nondomized Control Group Pretest-Posttest Design. The instrument used was a test in the form of multiple choice questions totaling 25 questions and an observation sheet for students' science process skills. The research sample was students of class VII A and class VII B at SMPN 5 Dusun Selatan. The data collection technique was carried out using the observation method of students' science process skills and learning outcomes tests. The data were analyzed descriptively. The results of this study show that (1) the value of the science process skills of students using the guided inquiry learning model has an average value of 92%, (2) the value of the science process skills of students using the PBL learning model has an average value of 96 %, (3) the difference in the science process skills of students who are taught using the guided inquiry learning model and the PBL learning model, it can be seen from the results of the average value obtained that there are differences, where the PBL learning model has a higher average value than the learning model. guided inquiry. The learning outcomes of the guided inquiry class had an average score of 39 on the pretest and 68 on the posttest. Meanwhile, the average value of the pretest in the PBL class was 40.4 and the posttest score was 69.3. These results indicate that the guided inquiry learning model and the PBL learning model can improve students' learning outcomes and science process skills.

KEYWORDS

Guided inquiry
PBL
Science process skills

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1. Introduction

Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 22 of 2016 stated that educational system in teaching would be held interactively, inspiring, fun, testing for inspiring students to participate actively and give their enough space for encourage, imaginative and independently adjust students' talent and physical and mental progress. Curriculum center stated that through science learning, students were not only to study logistical data as fact, principle, concept or law in form of declarative knowledge. Meanwhile, they also learnt about how to get real data, techniques or procedures and technology, work as procedural data, including the tendency to work scientifically by applying scientific strategy and attitude(Ariani. I. et al., 2019).

Scientific behavior, process or science strategy or result of science's product is very necessary as the science teaching component. Therefore, science teaching process and assessment process must be including three aspects in an integrated and balanced manner (Ermininingsih et al., 2013). Science skill process in learning is an important category, because of increasing the students's skill science process, learning system would never appearance the final result, but also the process (Abdurohman et al., 2020). The students would be able to comprehend the theory, because they were as the necessary person in learning system, so that the science skill process would be created(Juniati & Widiana, 2017).

Science skill process was the full of science skill coordinate (including mental or psychomotoric) it could to use or found out the concept, principle, theory or attempt the reveal (Harahap & Harahap, 2021:144). According to Masitoh (2017) there are some things that affect to science skill process that should committed by students. The things that affect the science skill process was the difference of student's genetic skills, teacher quality, and the differences of teacher's learning technique in learning process. Science skill process had mental or science skills, manual and interactive. The appropriate method to increased student's science skills process were changing the learning technique and using conventional method in learning method more creative, students be able to comprehend the theory, because they as main important in learning process, so the science skill indicators process also be created (Neng Wulan Evi Juliani, 2020); (Meo et al., 2021).

The Junior high school of 5 South Dusun (in Indonesia called by SMPN 5 Dusun Selatan) was a general school that learning technique still use conventional strategy, it was still utilize speaking, conversation, question and answer some questions from science book. The things make students' low motivation in learning, so students' achievement in learning still in low category. Conventional learning method with assume that was not interesting in science subject especially in environmental pollution material. In previous studied the result of environmental pollution material was very low category and it was not accordance with the minimum mastery criteria (in Indonesia called by KKM) determined by school. The minimum mastery criteria score was 65. The students are one of main factor in increasing the results of learning process, that's why the application of design learning should in the right way.

Indicators of students' science process skills that had not developed during science learning was the observe skill, in general it showed that some students who be able to observe accurately. Classifying skills in the learning system only a few students could classify accurately. The students' communication skills were still very lacking when the presentation begin. Because of that, the students could not explain from their practice that they ever did. Predictive skills of students were still lacking, because they could not predict accurately. Students' concluding skills were still very lacking, considering that they had not been able to conclude a learning result or an event. The students' scientific process skills that had not developed were due to the environmental presentation material that could not be done directly (practicum), due to the limitations of the practicum tools owned by the school, which resulted in the inability to carry out the practicum. Thus, it made students' learning achievement decreases and students were not actively involved in the learning process.

The current situation was not accordance with what is desired in the implementation of the 2013 Curriculum learning which used learning standard focused on students and developing students' creativity (Ibrahim, 2019). Based on resulted of study from (Nonci et al., 2018) with the title "The Influence of PBL and Guided Inquiry Learning Models on Science Process Skills on Pollution and Natural Destruction Materials at SMP Muhammadiyah 7 Yogyakarta". It showed that there was difference between the students' result in using guided inquiry and PBL learning model. The use of guided inquiry learning models can develop students' scientific processing skills. It could according to (Azizah et al., n.d.) which stated that the use of guided inquiry learning models can develop students' science process skills. Thus, because the learning model asked and trained students to develop the science process skills and deal with (Sanjaya, 2015) problems given by the teacher. In addition, it was stated that the using appropriate guided inquiry learning model, it could help students by developing science process skills and reasoning levels that can determine students, so they will get ideas and can overcome problems and will affect better learning outcomes. In addition, it was important to make classroom learning takes place effectively, with the aim that learning targets can be achieved by applying the guided inquiry learning model and the PBL learning model, such as the results of research (Rohmatin, Suwanto, Nugroho, 2021) that PBL is to improve learning outcomes in biology learning.

Based on explained above, the researcher trying to solve the problems of science process skills of students at SMPN 5 Dusun Selatan. The researcher interesting to compare the students' science skill process who are taught using the guided inquiry learning model and those taught using the PBL

learning model. This study aims to determine whether the guided inquiry learning model and the PBL learning model affect the students' science process skills. This study also aims to determine the differences in the science process skills of students who are taught using the guided inquiry learning model and the PBL learning model.

2. Method

The researcher used comparative quantitative method. The research design was using Nondomized Control Group Pretest-Posttest Design. In this design the groups are not random, but it is using by VII of A class and VII of B class. The sample of this research was all of students in VII Class at SMPN 5 Dusun Selatan. Data collections were using observation and objective test. Observations were carried out on students directly using observation guidelines with a rating scale range of 1-3 during learning activity where the learning model used was guided inquiry and PBL, so that data on the results of the assessment of students' science process skills were obtained. The objective test in the form of multiple choice questions was given to measure the initial skills (pre-test) and final skills (post-test) of students about environmental pollution, in order to obtain data from the resulted students' learning outcomes.

3. Result and Discussion

Data collection were using pre-test and post-test, the application of learning using the guided inquiry learning model and the PBL learning model, as well as data on science process skills that had been carried out in two class group, it had two class, it was VII-A class and VII-B class. the application of the guided inquiry learning model and the PBL learning model, each group were given a pre-test to determine the skills basic (pre-test) students about environmental pollution by answering 25 questions. After that, the researcher and students carried out the teaching and learning process using the guided inquiry learning model in VII-A class and the PBL learning model in VII-B class. After the learning process of environmental material had finished, each group would given by a post-test which aims to determine the improvement of students' objective skills on environmental material. Then, the post-test questions were using the same questions at the pre-test with the same amount. The resulted of this study were also of from data analysis which included the calculation of the N-gain test, homogeneity test, hypothesis test and normality test.

3.1 Students' Science Process Skills using Guided Inquiry Learning Model

Observation Science Process Skill. The science process skills observed in this research included five aspects, there were: observing, communicating, classifying, predicting, and concluding. The data collection of students' science process skills was carried out by taking data from VII-A class. The resulted of the analysis of students' science process skill could be seen in Table 1

The average resulted of the students' science process skill showed a very good category. These resulted indicate to influence of the learning model used on the students' science process skill. The learning process with the guided inquiry learning model used the help of student worksheets (in Indonesia called by LKPD) which were arranged to the learning steps of the guided inquiry learning model so the learning process was more focused. In practiced, students were guided to complete the LKPD, so students were active and ask questions to complete the LKPD. The resulted of the discussion on the LKPD that have been carried out were presented during the learning process. Therefore, the students felt an active role in the learning process.

Table 1. Result of the science process skills assessment guided inquiry class

No	Students' aspects of science skill process	Score (%)	Category
1	Observation	84,5 %	Very Good
2	Communication	92%	Very Good
3	Classification	99%	Very Good
4	Prediction	100%	Very Good
5	Conclusion	92%	Very Good
Average		92 %	Very Good

Note: Very Good 80 – 100, Good 60 -79, Fair 40 -59, 20 -39 Poor, 0,00-20 Very Poor. (Arikunto, 2006)

Based on result data it known that the students' score of science skills process who used the guided inquiry learning model has low in conclusions' score around 82% in very good category and the science skills process in predictions' score around 100% in very good category.

The result of this study showed that the guided inquiry learning model gave positive to students' VII-A Class in science skill process. This can be happened because of the guided inquiry learning model sue for students' active participating in science investigation. Students had to increase curiosity and develop. Guided inquiry had to emphasize for students, it gave the chance to students for exploration and gave certain directions, so the new area could be explored in good way. The aims of general guided inquiry model to helped students develop the intellectual skill and other skills, such as asking and finding (looking for) the answer and their curious, learning model Inquiry exercise, student wanted to ask why an event happened, then students carry out activity, looking for answers, process data logically, until the students' intellectual development strategies that can be used to find out why a phenomenon can occur (Apriana & Anwar, 2017:142); (Liwa Ilhamdi et al., 2020); (Dwi Apriliani et al., 2019).

The Implementation of Inquiry Learning Model. The assessment used in the teachers' manage learning activities using a guided inquiry learning model on environmental pollution material was assessed using an observation sheet (observe). The observation sheet used was consulted and approved by expert lecturers before being used to collect research data. Observation of the application of the guided inquiry learning model was carried out by one person at the learning process.

The assessment in guided inquiry learning had some aspects that had been explained on observation sheet. This data was from the observation sheet using the Guttman Scale, specifically 1 for "Yes" and 0 for "No", the average data was shown in percentage form (%) in table 2 below:

Table 2. Implementation Percentage Score of Inquiry Model Learning

<i>Learning Model</i>	<i>Score</i>	<i>Category</i>
Guided Inquiry	81%	Very Good

Based on table 2, it showed that result data of the overall applicability of the guided inquiry learning model was 81%, it showed that the implementation of learning in VII-A class was included in the very good category or it could be the implementation of the guided inquiry learning model in accordance with the learning steps in the RPP (guided inquiry syntax). The guided inquiry learning model in this study had not been carried out ideally, it was due to the limited learning time.

3.2 Science Process Skills Using the PBL Learning Model

Observation Science Process Skill. The science process skills observed in this study there were five aspects: observing, communicating, classifying, predicting, and concluding. The data retrieval of students' science process skills was carried out by taking data from VII-B Class. The results students' examination of science process skills could be seen in table 3 below.

The average of students' science skill was 96% in very good category. These results indicate the influence of the learning model used on the students' science process skills. The learning system with the PBL learning model, educators (teachers) utilize the help of student worksheets (LKPD) which were arranged based on the learning stages of the PBL learning model so that students were more actively involved in the learning process. In exercise, students were directed to complete the LKPD so that students actively develop and ask questions to complete the LKPD. The resulted that were filled out in the completed LKPD was presented during the lesson.

Table 3 Results of PBL Class Science Process Skills Assesment

<i>No</i>	<i>Students' aspects of science skill process</i>	<i>Score (%)</i>	<i>Category</i>
1	Observation	98%	Very Good
2	Communication	93%	Very Good
3	Classification	98%	Very Good
4	Prediction	100%	Very Good
5	Conclusion	94%	Very Good
Average		96 %	Very Good

Note: Very Good 80 – 100, Good 60 -79, Fair 40 -59, 20 -39 Poor, 0,00-20 Very Poor. (Arikunto, 2006)

Based on the data collected, it was known that the value of the science process skills of students who used the PBL learning model had the lowest skill score on communication skills with an average value of 93% including the good category and the highest score on process skills on predicting skills with an average value 100% included in very good category.

The results showed that the PBL learning model gave positive results to the students' science process skills of VII-B class. This could be happened because the PBL learning model was a strategy that focused on students and in teaching contained things to be done. The used of the PBL learning model in the study room coordinates students with critical thinking skills carefully and through a logistical system. The PBL learning model could gave a positive value to students' science process skills of VII-B class. Because the PBL learning model was be able to provide extraordinary opportunities for students to get real experience during learning. According to Wahyudi (2015: 5) the PBL learning model had an effect on the average science process skills of students. PBL was very good for further developing students' science process skills because conventional learning did not require students' science process skills.

The Implementation of the PBL Learning Model. The assessment used in the teachers' application in managing learning used the PBL learning model on environmental pollution material, it was using observation sheets (observer). The observation sheet used was consulted and approved by expert lecturers before being used to collect research data. The implementation of the PBL learning model is carried out by one observer when the learning process.

The assessment of the implementation of the PBL learning model includes several aspects that have been described on the observation sheet. The data presented was data that had been averaged from the results that have been given by the observer. This data was data from the observation sheet using the Guttman Scale, for a specific 1 for "Yes" and 0 for "No", the average value was shown in levels (%) in Table 4 below.

Table 4 The Percentage Value of PBL Model Learning Implementation

Learning Model	Score	Category
Guided Inquiry	82 %	Very Good

Based on table 4 above, it could be seen that the data on the results of the PBL learning model activities by educators as a whole was 82%, which meant that the implementation of learning in VII-B class was included in the good category or it could be said that the implementation of learning was in accordance with the learning steps in the RPP (PBL syntax).

3.3 The Differences in Students' Science Process Skills Using the Guided Inquiry Learning Model and PBL Learning Model

The Descriptive Data of Pre-test and Post-test Guided Inquiry Class. Based on the average calculation of pre-test and post-test, it could be seen in table 4.

Table 4 Data of Pre-test dan Post-test Guided Inquiry Class

No	Description	Guided Inquiry	
		Pre-test	Post-test
1	Minimum Score	12	52
2	Maximum Score	64	88
3	Average (mean)	39	68

Based on calculation data on table 4 before the applied of learning guided inquiry model, students' pre-test score in very low score was 12 and for the high score was 64 and the average or mean was 39. After the guided inquiry learning model was applied, the students' scores increased with an average score of 68. The lowest score was 52 and the highest score was 88.

Results of Pre-test and Post-test Descriptive Data in PBL Class. Based on calculation data, the average of pre-test and post-test could be seen in table 5.

Tabel 5. Data of pre-test and post-test PBL Class

No	Description	PBL	
		Pre-test	Post-test
1	Minimum Score	12	56
2	Maximum Score	68	92
3	Average (mean)	40,4	69,3

Based on data table 4.5 above before PBL learning model applied, pre-test score in very low score was 12 and in very high score was 68 and the average or mean was 40.4. After the PBL learning applied, students' score increased with an average 69.3. In very low score was 56 and the high score was 92.

The differences in the objective test of students' science process skills using the guided inquiry learning model and the PBL learning model. The hypothesis test of the students' science process skills used the guided inquiry learning model and the PBL learning model was tested using the t-test: Two-Sample Assuaming Equal Variance. This test aims to determine whether the guided inquiry learning model and the PBL learning model affect the science process skills of seventh grade students of SMPN 5 Dusun Selatan on environmental pollution material. The calculation results for the two classes could be seen in Table 6.

Table 6 The hypothesis test of students' science process skill

T-test	T _{value}	T _{Table}	Conclusion
The value of the science process skills of students with guided inquiry learning models and PBL	-2,334	1.679	Ho accepted and Ha rejected.

It could be seen in table 6 above that hypothesis test there was in students' science process skills after being taught using the guided inquiry learning model and the PBL learning model. Both of these models involve students to conduct experiments, so that students carry out direct learning which is easier to instill the ideas given, as Subagyo et al. in Aresa Okta Ibrahim (2019), it was learning science with an approach to mastering science with approach to science process skills, it was very important to be applied because it involved students to be active and develop student learning outcomes.

The difference in the use of the two models occurs for several reasons, (1) on the grounds that the guided inquiry learning model and the PBL learning model are learning models that have never been used in SMPN 5 Dusun Selatan, so that students were still confused in their implementation (2) the two learning models which in its implementation there was cooperation between individuals in a group (3) observers in terms of science skills so that the implementation was not ideal.

It could see that the science skills presentage showed that PBL learning model more high than guided inquiry learning. The difference science skills process got 4% these happened because of active role in practicum activities to collect data obtained to complete the LKPD sheet. In addition, students got proper learning and experience. According to book Preparation of Materials for the Preparation of Materials for the Implementation of the 2013 Education Program (2014; 23).

4. Conclusion

Based on the result study and data analysis, it concluded that guided inquiry learning model and PBL learning model had significant effects to students' science skills process. The difference science skills process showed that guided inquiry learning model had an average as 92% meanwhile PBL learning model had an average as 96%. These showed that students' science skills process had been taught by using guided inquiry learning model and PBL learning model had difference as 4%.

The suggestions for teacher using guided inquiry learning and PBL learning because for the learning method was more develop the students' science skills process. This learning method can be arranged students' knowledge based on their experience.

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