The Influence of the Implementation of the Jigsaw Cooperative Guided Inquiry Learning Model on the Science Process Skills of Junior High School Students in Banda Aceh

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Abstract: The purpose and objectives of this study were to determine the effect of the cooperative jigsaw guided inquiry learning model and the effect on students' learning achievement abilities and the correlation between the learning model and the initial abilities of junior high school students. The research design used was a posttest only control design with factorial. Data collection techniques used documentation in the form of students' initial achievement abilities, observation sheets and science process skills tests to measure their learning achievement. The results showed that the average score of the science process skills of the experimental class students was higher, namely 83.30 compared to the control class, namely 75.15. While the average score of the science process skills of students with high, medium, and low initial achievement abilities were 85.10, 81.15, and 76.20, respectively. The results of the data analysis showed that the use of the cooperative jigsaw guided inquiry learning model and initial achievement abilities had a significant effect on students' science process skills. No interaction was found between the learning model and students' achievement abilities on the science process skills of junior high school students in Banda Aceh.

Keywords: Guided inquiry; Junior high school students; Learning models; Process skills

Introduction

Science learning is formed and developed through a scientific process that is of great interest to high school students. In science learning, the scientific process must be developed for students as a meaningful experience. Science does not only prioritize results (products), but the process is also very important in building student knowledge. So, in science learning, students should be trained and educated to be skilled in obtaining and processing information through thinking activities by following scientific procedures, such as being skilled at observing, measuring, classifying, drawing conclusions, and communicating findings which are often called science process skills. Azzarkasyi et al. (2025) in his research stated that science process skills can develop if students play an active role in theoretical and practical activities in the laboratory. The selection of learning models affects the success of learning. If the learning model used involves the active role of students in the learning process, it will be able to improve students' science process skills. Based on a preliminary study

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conducted with science subject teachers of class VIII SMP Negeri 6 Banda Aceh, the inquiry learning model that makes students more active in the teaching and learning process is rarely used. As a result, students are passive in the learning process and students' science process skills do not develop. One of the obstacles faced in the inquiry-based learning process is the lack of teacher understanding of this learning model so that this learning method is rarely applied in science learning (Ibrahim et al., 2021). Science learning activities carried out only provide opportunities for students with high academic abilities to achieve satisfactory achievements, while students with low initial achievement abilities will lag behind in their achievements. Based on the results of interviews with science teachers at several junior high schools in the Banda Aceh area, there was an impact that occurred, namely a poor relationship between children with high abilities and children with low abilities, there was a gap. In conventional learning, students tend to compete to get high rankings and other awards. Students with low academic abilities inevitably have to be in a losing position more often, so efforts are needed to improve the science process skills of students with low academic abilities. A real solution to improve the achievement of children with low academic abilities is through cooperative learning because cooperative learning produces better learning outcomes (Marwan & Ibrahim, 2023).

Science learning activities carried out only provide opportunities for students with high academic abilities to achieve satisfactory achievements, while students with low initial achievement abilities will lag behind in their achievements. Based on the results of interviews with science subject teachers at several junior high schools in the Banda Aceh area, there was an impact that occurred, namely a poor relationship between children with high abilities and children with low abilities, there was a gap in learning. In conventional learning, students tend to compete to get high rankings and other awards. Students with low academic abilities inevitably have to be in a losing position more often, so efforts are needed to improve the science process skills of students with low academic abilities. A real solution to improve the achievement of children with low academic abilities is through cooperative learning because cooperative learning produces better learning achievements (Marwan & Ibrahim, 2023; Izzah et al., 2025). Based on the problems that have been described, it is hoped that the application of the guided inquiry learning model combined with cooperative jigsaw which includes study groups will encourage students to exchange ideas, knowledge and learning concepts. High-achieving students who have mastered science process skills provide tutorials or tutoring in group discussions to low-achieving students, so that through this process it is hoped that the gap in science process skills between students with high academic achievement and students with somewhat lower abilities can be reduced (Ibrahim et al., 2024; Marwan et al., 2024; Marzuki et al., 2023).

Based on the problems that have been described, the application of a guided inquiry learning model combined with cooperative jigsaw in which there are study groups will encourage students to exchange ideas, knowledge and new learning concepts (Rohmah & Hidayati, 2021). Students with high achievement skills who easily master science process skills provide learning tutorials in group discussions to students with low academic achievement, through this process it is hoped that the gap in science process skills between students with high achievement and students with low achievement can be reduced (Azwir et al., 2024).

Method

This type of research is Quasi experimental research with a Posttest only Control Group Design research design. This design consists of two groups, each of which is selected randomly. The group that is given treatment is called the experimental group and the group that is not given treatment is called the control group. Initial academic ability is categorized into three levels, namely high, medium, and low academic ability. Initial academic ability data is taken from the results of the Semester I exams of eighth grade students. The scale of measuring student academic ability is categorized based on the mean and standard deviation (Priadana & Sunarsi, 2021). The population in this study were all eight grade students at SMP Negeri 6 Banda Aceh in the 2024/2025 academic year. The technique used in sampling is the simple random sampling technique, namely the selection of sample members from the population is carried out randomly without considering the strata in the population. The sample in this study consisted of two classes, namely class VIII-3 as the control class and class VIII-6 as the experimental class. The next data collection technique is by testing which is used to obtain data on students' science process skills using a multiple-choice test with a total of twenty questions. The test instrument in this study must also be tested first to determine its feasibility in terms of validity, reliability, level of difficulty, and discrimination (Arikunto, 2021; Azzarkasyi et al., 2025; Propsom et al., 2023).

Initial stage analysis (prerequisite test) was conducted to determine whether the two classes (control class and experimental class) departed from the same initial conditions (homogeneous). The data used were the previous semester's exam scores for science subjects.

Result and Discussion

Based on the data we present from this study, it is in the form of learning outcome data for both sample groups, both the control class and the experimental class. Previously, the control group and the experimental group were divided into three groups based on initial academic ability, namely high academic ability, medium academic ability and low academic ability. In this study, there are three main hypotheses and to test the three hypotheses, two-way analysis of variance (two-way ANOVA) is used. The results of the two-way ANOVA calculation can be seen in Table 1.

Table 1. The Two-Way ANOVA Calculation

Saurce Variance	Test Statistic	FTable (0.05)
Line (A)	F_A = 11.10	F_{Table} = 4.11
Column (B)	F_B = 8.15	F_{Table} = 3.15
Interaction AB)	F_{AB} = 0.11	F_{Table} = 3.13

Description:
A : Learning model
B : Initial academic ability
AB : Relationship/interaction between learning model and initial academic ability

The Effect of the Jigsaw Cooperative Guided Inquiry Learning Model on Science Process Skills

Based on the results of the two-way ANOVA calculation in Table 1, F-count = 11.10 > Ftable = 4.11 was obtained. This shows that students' science process skills between classes using the jigsaw guided inquiry model and classes using conventional methods have significant differences. Data on students' science process skills were obtained through observation sheets and posttest scores. Science process skills that emphasize psychomotor use observation sheets and science process skills that emphasize cognitive use multiple-choice tests. Both data are combined and averaged to become one data on science process skills scores. The data were taken from two classes, one control class, namely class VIII-3 using a varied lecture method and one experimental class, namely class VIII-6 using the jigsaw cooperative guided inquiry learning model. The results of calculating the distribution of students' science process skills can be seen briefly in Table 2.

Table 2 shows that the average value of science process skills in the experimental class using guided inquiry is higher than the control class using a variety of lecture methods. This is supported by Brickman et al. (2009) in their journal that science process skills can develop if students actively participate in laboratory activities with inquiry learning. The science process

skills measured in this study include basic process skills and integrated process skills. Basic process skills consist of observing, communicating, and concluding. From the results of student assessments through observation sheets on the implementation of each aspect of science process skills, the results obtained are as shown in Figure 1.

Table 2. Latest Data Results of Students' Science Process Skills

Interval	Class Frequency Control	Class Frequency Experiment
66-69	2	1
70-73	4	0
74-77	6	2
78-81	8	4
82-85	5	9
86-89	5	9
90-93	0	3
Mean	79.03	83.7
Standart Deviation	5.99703	5.471872
Varience	35.96437	29.94138
Minimum	66	68
Maximum	89	92
N	30	30

Observation results in guided inquiry learning, students have ample opportunity to grow and improve science process skills through investigation activities such as those carried out by a scientist, namely making observations, formulating problems, making hypotheses, designing research to test hypotheses, collecting data and analyzing to draw conclusions. Each stage of guided inquiry teaches students about science process skills. This is supported by Azwir et al. (2024) who stated that the guided inquiry model is able to improve students' process skills. In jigsaw cooperative learning, teachers design students to learn in small groups. Learning designed by teachers through small groups will be more effective and make it easier for students to understand the subject matter. Jigsaw cooperative facilitates social communication between students with different academic abilities through peer tutorials. Students will better understand a material concept when they are in an environment of smarter peers (Anggraeni et al., 2025). Students understand the subject matter better because of the language of communication used by students in delivering the subject matter. Social interaction with other friends through group work also stimulates the formation of ideas and enriches children's mental development. The combination of guided inquiry learning syntax combined with jigsaw cooperative learning is able to

improve science process skills because in this learning students are conditioned to carry out scientific activities starting from planning experiments to carrying out experiments through teacher guidance. These scientific processes will foster students' scientific attitudes (Nurfadillah et al., 2023; Sumarni et al., 2021; Utami et al., 2020). Jigsaw cooperatives place students in small groups with different academic abilities, accommodating students to interact socially with their peers so that a peer tutorial process occurs where this process will help students with low and medium academic abilities, their scientific process skills approach the scientific process skills of students with high academic abilities.
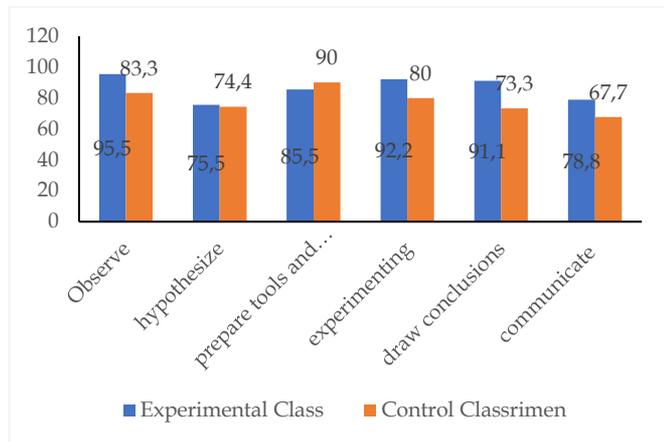

Figure 1. Comparison of scores for each aspect of science process skills

The Influence of Initial Academic Ability on Science Process

Based on the results of the two-way ANOVA calculation in table 1 in the section on the effect of students' initial academic abilities on science process skills, F_{count} = 8.5> F_{table} = 3.15 was obtained. This shows that there is a significant difference between students who have high, medium, and low academic abilities on science process skills. A comparison of science process skills in terms of high, medium and low initial academic abilities in the control and experimental classes can be seen in table 3.

Table 3. Average Based on Initial Academic Ability

Early Academic Ability	Average
Tall	87.00
Currently	81.00
Low	78.02

Based on Table 3, it shows that the average science process skills of students with high initial academic abilities in the experimental class are higher than the average of students with high initial academic abilities in the control class.

Students with moderate initial academic abilities in the experimental class also showed a higher average compared to the control class. The science process skills of students with low academic abilities in the experimental class also showed a higher average than the average science process skills of students with low initial academic abilities in the control class. A comparison of the average results of science process skills based on initial academic abilities in the control and experimental classes can be seen in Figure 2.
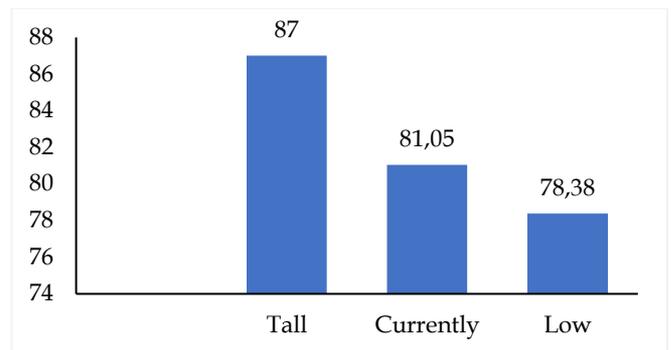

Figure 2. Comparison of Average KPS Values Reviewed from Initial Academic Ability

According to Marwan et al. (2023) and Suparya et al. (2022) view students' initial abilities are classified into three, namely upper, middle, and lower academic abilities. Upper academic students tend to have higher learning achievements compared to lower academic students. Ibrahim et al. (2022) stated that high-ability students are a number of students who have an initial condition higher than the class average, while low-ability students are a number of students who have an initial condition lower or equal to the class average. High-ability students have a better initial condition than low-ability students. This causes high-ability students to have more self-confidence compared to low-ability students. The learning model is one of the treatments in the form of external factors that can influence students' science process skills and academic ability is one of the internal factors that can influence students' science process skills (Nuraini et al., 2023).

Relationship between Learning Models and Initial Academic Ability Towards Science Process Skills

In the results of the two-way ANOVA calculation in table 1 to find out the relationship between learning models and initial academic abilities towards students' science process skills, F_{count} = 0.13 <F_{table} = 3.10 was obtained. The results of the ANOVA test showed that there was no interaction between the application of the learning model and initial academic abilities towards students' science process skills. This result means that there is no significant difference in each interaction of

the application of the learning model with students' initial academic abilities. So, there is no difference between the application of the guided inquiry model combined with cooperative jigsaw applied to students with low, medium, or high academic abilities with the conventional model applied to students with low, medium, or high academic abilities. Students who have low, medium, or high academic abilities can follow the inquiry learning model guided combined with cooperative jigsaw and conventional models and are able to improve their science process skills.

The learning model is one of the treatments in the form of external factors that can affect students' science process skills. While academic ability is one of the internal factors that can affect students' science process skills. Students' science process skills in the experimental group with the application of guided inquiry models combined with cooperative jigsaw are always higher than the science process skills of the control group with the application of conventional learning models, both in terms of high, medium and low academic abilities.

Conclusion

Based on the results of the study, it can be concluded that the guided inquiry learning model combined with jigsaw cooperative and initial academic abilities have an effect on the science process skills of junior high school students in grade VIII, and there is no interaction or relationship between the learning model and students' initial academic abilities on the science process skills of junior high school students in grade VIII. For further research, it is expected to try to combine the guided inquiry model with other cooperative learning, so that it is possible to get better results.

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