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Analysis of Metacognitive Skills Through Guided Inquiry Learning on the Material of Plant Structure and Function for Class VIII

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Abstract

Metacognitive skills help students think, manage their knowledge, analyze and solve problems, understand their learning methods and strategies, and think critically. Guided inquiry learning trains students to think critically, analyze, evaluate, and build information based on their acquired knowledge. This study aims to investigate students' metacognitive skills through guided inquiry learning on the material of Plant Structure and Function. The type of research used is Pre-Experiment with One-Group Pretest-posttest design. The sampling technique used saturated samples with a sample size of 19 students. The research instruments used were pretest and posttest questions on metacognitive skills with planning, monitoring, and evaluation indicators. Data analysis used the Wilcoxon non-parametric test. The results of the increase in cognitive skills in the pretest and posttest were indicated by the N-gain value of 0.59 with the Medium category. The results of the data analysis obtained the Asymp value, sig < 0.5, which is 0.00, which means that HI is accepted. This shows that learning using guided inquiry can affect students' metacognitive skills.

Keywords: guided inquiry, metacognitive skills, structure and function of plant

INTRODUCTION

Science subjects are a strategic suggestion in developing the profile of Pancasila students (Kemdikbudristek, 2022), including independence. The independence of students in the Pancasila student profile has two elements, namely 1) understanding themselves and the situations they face; 2) self-regulation. The sub-elements of each element consist of recognizing the qualities and interests of themselves and the challenges they face; developing self-reflection; emotional regulation; setting learning goals, achievements, and self-development and strategic plans to achieve them; showing initiative and working independently; developing self-control and discipline; being confident, resilient, and adaptive. This attitude of student independence is closely related to metacognitive skills. Metacognitive skills involve the process of thinking to plan, monitor, and reflect on solving problems (Arum, 2017). The planning process is developing a plan for an Action; monitoring is monitoring the Action plan; and reflection is evaluating the plan of action (Yamin, 2013).

Metacognitive strategies refer to ways of increasing awareness of the thinking process during learning, which forms metacognitive skills (Arum, 2017). These skills involve the processing of students' knowledge, including planning, monitoring, and evaluation, and have important relevance to independence in learning (Schraw & Moshman, 1995). According to Susantini (2005) found that with metacognitive skills, students can develop independent learning abilities, instill an honest attitude, and formulate goals to improve learning outcomes. In science learning, the involvement of

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metacognitive skills helps overcome difficulties in solving problems, guides students in understanding the right way to learn, and encourages critical thinking (Arends, 2007) .
The suboptimal achievement of students' metacognitive abilities can occur due to the selection of inappropriate learning models. The application of appropriate learning models can increase effectiveness and efficiency in learning (Slameto, 2010). The reality that often occurs in the field is that there are still many conventional teaching models that are still applied by teachers who are less varied. In addition, there is a lack of maximum utilization of the abilities possessed by students. (Aqib, 2003). Therefore, it is necessary to use the right learning model, varied and able to train students' abilities optimally so as to improve the quality of student education. As taught in the stages of the guided inquiry model (Damayanti, 2015).

According to Aisyah & Ridlo (2015), to develop students' metacognitive skills, a learning model is needed that allows the development of these skills. The guided inquiry learning model is one example of a learning model that provides opportunities for students to practice metacognitive skills. This finding is in line with Damayanti's study (2015), which showed an increase in students' metacognitive skills through the application of the guided inquiry learning model. According to Gusmaneli (2010) emphasized that the use of guided inquiry learning models can improve student learning achievement. In this context, students are trained to develop creative and critical thinking skills at the stages of the guided inquiry model. This finding is in line with Sya'bania et al. (2020), which noted an increase in student learning outcomes after implementing the guided inquiry learning model.

One of the learning models that can be used in science learning that can improve high-level thinking skills is guided inquiry learning. The guided inquiry learning model is a very suitable choice for classes with students of various ability levels (Trianto, 2009). The learning process through guided inquiry using a scientific approach can improve critical and creative reasoning skills in processing and managing information, both qualitative and quantitative objectively, building relationships between various information, conducting analysis, conducting evaluations, drawing conclusions, and applying what is learned in new situations, while developing science inquiry skills, improving intellectual aspects, emotional potential and holistic thinking skills, as well as learning enthusiasm (Kemdikbudristek, 2022; Aprilianti & Sugiarto, 2014; Gulo, 2004). The guided inquiry learning model is a model that is characterized by the start of an investigation to answer teacher questions or find solutions to problems given to students. (Sudjana, 2005). The guided inquiry learning model can be applied in science materials, including concepts, principles, procedures, and facts, such as in learning the structure and function of plants (Anam, 2016). This process involves learning stages, such as orientation, problem presentation, hypothesis formulation, data collection, hypothesis testing, and conclusion formulation (Suwasono, 2011). Overall, this model encourages students to actively design, complete experiments, collect, analyze data, and draw conclusions with a focus on problem solving (Budiyono & Hartini, 2016). In this study, the implementation of guided inquiry learning on the structure and function of tissues was carried out. According to Nurhasikin et al. (2019), students face difficulties in understanding the material on the structure and function of plant tissues because there are too many concepts to understand, especially related to the structure and function of each tissue. Students' difficulties lie in remembering concepts, especially the differences between various plant tissues. where the questions used in this study were questions that had been validated by previous researchers (Putri, 2023). Referring to the previous explanation, the study will focus on the effect of the Guided Inquiry Learning Model on Metacognitive Skills in the material on the Structure and Function of Plant Tissues in grade VIII of junior high school.

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METHODS

This research was conducted in September to November of the 2023/2024 academic year at SMP Shailendra located at Bagus Kuning, Plaju, Palembang. The type of research is Pre-Experimental with Only One-Group Pretest - posttest design (Sugiyono, 2016). The sampling technique used total sampling, namely all members of the population were used as samples for one class with 19 students (Sugiyono, 2016).

The research instrument was a pretest and posttest on metacognitive skills. with indicators: planning, monitoring, and evaluation (Corebima, 2009), as many as 35 items. The design of this research can be presented in the following image (Ningsih et al., 2017).

Table 1. Only One-Group Pretest - Posttest Design

O_1	X	O_2
Pretest	Treatment by applying a guided inquiry learning model	Posttest

Data analysis techniques for normality testing using Shapiro-Wilk test with Asymp.sig value <0.05 if the data is not normally distributed. For non-parametric hypothesis testing using the Wilcoxon Signed Ranks Test. This test is conducted to analyze the results of paired research and determine whether there is a significant difference or not. H_0 is rejected if the Asymp.sig value> 0.05, while H_1 is accepted if the Asymp.sig value <0.05 (Solidayah et al., 2015). The hypotheses in this study are:

H_0 : There is no difference in metacognitive skills results before and after conducting guided inquiry model learning.

H_1 : There is a difference in metacognitive skills results before and after conducting guided inquiry model learning.

RESULTS AND DISCUSSION

Students' metacognitive skills can be assessed through the analysis of students' answers to multiple-choice questions given before and after the implementation of the guided inquiry learning model. Table 2 shows an increase in the average posttest score compared to the students' pretest on the material on plant structure and function. The n-gain results show a value of 0.59 with a moderate category. The results of the pretest data normality test show that the data is normally distributed, while the posttest results show that the data is not normally distributed (Table 3). The results of the non-parametric hypothesis test using the Wilcoxon Test significance value (sig) of 0.00 < 0.05, H_1 is accepted. This shows that there is a significant influence of the application of the guided inquiry learning model on students' metacognitive skills. (Table 3)

Table 2. Average Pretest, Posttest, and n-gain of Metacognitive Skills

Aspect		***Pretest***	***Posttest***	***n-gain***	***n-gain* category**
	Average value	44.84	78.21	0.59	Currently
Aspects of metacognitive skills	Planning	39.47	68.42	0.48	Currently
	Monitoring	50.00	74.21	0.48	Currently
	Evaluation	41.57	74.39	0.56	Currently

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Table 3 Normality and hypotesis Test

		Sig	Information
Shairo Wilk Normality Test	*Pretest*	0.06	Normal
	Posttest	0.00	Abnormal
Wilcoxon Signed Ranks Test Statistic Results	*Posttest-pretest*	0.00	H_1 accepted

Based on the research results, it was found that there were differences in students' metacognitive skills before and after the implementation of guided inquiry learning. This can be seen from the posttest scores of each metacognitive aspect experiencing an increase. These aspects include planning, monitoring and evaluation (Table 2). According to Aisyah & Ridlo (2015), to develop students' metacognitive skills, a learning model is needed that allows the development of these skills. The guided inquiry learning model is one example of a learning model that provides opportunities for students to practice metacognitive skills. This finding is in line with Damayanti's study (2015), which showed an increase in students' metacognitive skills through the application of the guided inquiry learning model. According to Gusmaneli (2010) emphasized that the use of guided inquiry learning models can improve student learning achievement. In this context, students are trained to develop creative and critical thinking skills at the stages of the guided inquiry model. This finding is in line with Sya'bania et al. (2020), which noted an increase in student learning outcomes after implementing the guided inquiry learning model.

The planning aspect has increased, this is related to the implementation of the steps or syntax of guided inquiry. (Lovisia, 2018). The process begins with orientation, where students watch a learning video about the structure and function of roots, stems, and leaves that is equipped with pictures and questions. At the stage of formulating the problem, students receive guidance from the teacher to identify problems related to how to determine the parts of the structure and function of plants, and are encouraged to discuss and convey ideas. The next step is to formulate a hypothesis, where the teacher guides students in collecting information and asking questions about the problem. Students are also guided in establishing a hypothesis, for example that if the light intensity increases in plants, it can be assumed that the structure and function of photosynthetic pigments such as chlorophyll will be modified to improve the photosynthesis process.

According to Aprilianti & Sugiarto (2014), stated that the ability of students to formulate hypotheses, as temporary answers, plays a role in improving their planning skills. Students will not face difficulties in formulating hypotheses if they have a broad understanding of the core of the problem. This ability aims to find solutions to a problem, and students who can put forward hypotheses well are assumed to have good planning skills as well. Students will gain strong planning skills if they are able to recognize learning objectives, record information known from questions, and identify sources to obtain information that is not yet known. A similar opinion was expressed by Damayanti (2015), who emphasized that the orientation, problem formulation, and hypothesis formulation stages reflect metacognitive skills in the planning aspect.

The skill aspect increased in the posttest , and this was influenced by the implementation of guided inquiry in the classroom learning process (Ningsih et al., 2017). which is included in the monitoring aspect, includes the stages of conducting experiments, collecting data, and analyzing data. Before entering this stage, students have been given an explanation by the teacher. At the stage of conducting experiments, the teacher gives students the opportunity to determine or identify the parts of the structure and function of plants shown in the picture.

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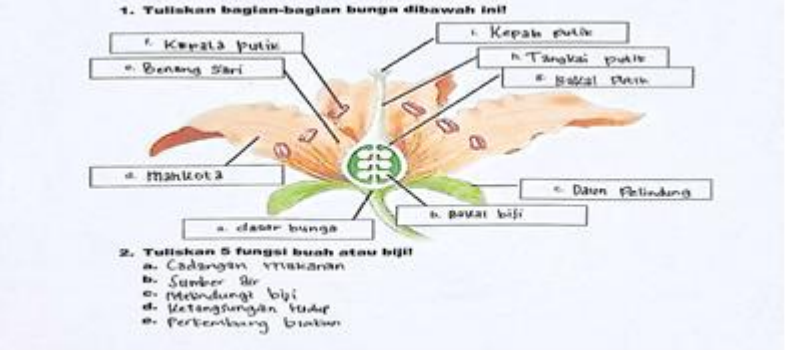

Figure 1. Student identification activities

Through data analysis activities, students are trained to monitor technological developments inspired by the structure and function of plants in learning, by asking themselves and expressing them in their own words to gain a deep understanding of the material being studied (Sartika, 2015). This finding is in line with the research of Eriawati and Khairil (2013) which noted the development of metacognitive applications in monitoring skills. According to Damayanti (2015), the guided inquiry stages that are considered effective in training students' monitoring skills involve conducting experiments, collecting data, and analyzing data.

Evaluation skill aspects increased during posttest in the context of inquiry, evaluative activities include the stage of drawing conclusions where students are trained to formulate conclusions based on the results of experiments and data analysis. According to Rosyida et al. (2016), one of the stages in the evaluation aspect is drawing conclusions. This stage is designed to encourage students to obtain information and take lessons from experiences and learning activities that have just been completed. According to Kristina (2018), the guided inquiry stage which is considered effective in training students' evaluation skills is drawing conclusions because at this stage the core of many materials.

The limitation of this study is that the sample used is very small so it cannot represent the entire population in metacognitive skills. More samples and time are needed to be able to generalize the research results on metacognitive skills.

CONCLUSION

Based on the results obtained, it can be concluded that there is an influence of the guided inquiry learning model on students' metacognitive skills in understanding the material on the structure and function of plants in class VIII of SMP Shailendra Palembang. It can be seen from the average n-gain value of 0.59, which is categorized as a moderate level. The Wilcoxon hypothesis test produces an Asymp. sig value of 0.00, indicating that HI is accepted, indicating a significant influence.

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