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The Effect of the Inquiry Learning Model on Students' Metacognition Awareness

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Abstract
This study aims to determine the effect of inquiry learning models on the students' metacognition awareness in senior high school. Metacognition awareness in this study consists of eight components, namely (1) declarative knowledge, (2) procedural knowledge, (3) conditional knowledge, (4) planning, (5) information management system, (6) monitoring, (7) evaluation, and (8) debugging. This research is a quasi-experimental research with one group pretest-posttest design. The sample in this study were 25 students of science in Madrasah Aliyah Negeri 3 Lombok Tengah chosen using the saturated sample technique. Metacognition Awerness Inventory (MAI) is used to collect metacognition awareness data of students who are analyzed using paired t-test and Wilcoxon test samples. The results showed that students' metacognition awareness for all indicators was stated to increase ($p < 0.05$) after learning using inquiry learning models. Based on these results, it can be concluded that the inquiry learning model influences the metacognition awareness of secondary school students.

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INTRODUCTION

Louca (2003) classifies metacognition into four categories, namely (1) metacognition knowledge (also called metacognition awareness), (2) metacognition regulation is a learning experience through a series of activities that help students control learning, (3) metacognition skills refer to awareness of the control process such as planning, monitoring process progress, effort allocation, use of strategies and regulation of cognition, and (4) metacognition experiences are experiences that have a relationship with the activities being carried out, and ongoing cognitive efforts. On the other hand, Hacker et al. (2009) divides metacognition into three types of thinking, namely (1) metacognition knowledge, (2) metacognition skills, and (3) metacognition experiences. Flavell (1970) divides the component of metacognition into three parts, namely (1) knowledge and beliefs about cognition, (2) cognition monitoring, and (3) cognitive regulation. Metacognition includes knowledge of strategies and tasks. Anderson & Karthwohl (2010) emphasize the category of metacognition as students' knowledge of learning and thinking strategies (strategic knowledge), student's knowledge of cognitive tasks, when and why to use various strategies (knowledge of cognitive tasks), and knowledge about self in relation to the cognitive and motivational components of performance (self-knowledge).

Based on this description, metacognition awareness is one of the important components in metacognition. Metacognition awareness is associated with activities that help a person control his thoughts and learning (Schraw, 1995: 2006; Schraw et al., 2012).

Metacognition awareness has three core indicators in cognitive regulation namely planning, examination, and evaluation (Jakobs & Paris, 1987; Kluwe, 1987). McCormick (2003) states that many adults appear to have more knowledge about their cognition than children and adolescents, although many adults cannot explain skills and performance and often fail to use specific knowledge sources when given a spontaneous framework. Experts state that adults tend to be weak in monitoring (monitoring) when faced with real conditions (Pressley & Harris, 2006), so indicators such as information management and debugging need to be considered (Schraw et al., 2012). Niedringhaus (2010) states that a student with metacognitive awareness will have knowledge about how to think and be able to control his learning. Knowledge of how to think will include knowledge about learning preferences, strengths, weaknesses, what knowledge must be obtained, and the best way to obtain that knowledge. So, metacognition awareness is a process that students do naturally to gain knowledge through a process of self-regulation to achieve goals. Indicators of metacognition awareness consist of: 1) knowledge about cognition including declarative, procedural and conditional knowledge whose description has been described in the previous section; 2) cognitive regulation includes the ability to plan, information management, monitoring, debugging, and evaluating.

The results of previous studies related to metacognition awareness was conveyed by Muhali (2013) who found that overall student metacognition awareness on each indicator was in the poor category with an average percentage of students' metacognition awareness of 35.66%. Tosun and Senocak (2013) found that students generally had low metacognition awareness in the categories (1) cognitive monitoring, (2) cognitive regulation, and, (3) cognitive regulation. Furthermore Asy'ari et al (2019) recommend to maximize the process of regulation of cognition in the aspects of information management system (IMS), monitoring (M), evaluation (E), and debugging (D) and metacognition awareness can be learned using inquiry learning models.

Inquiry learning has the potential to train or foster students' thinking skills (Arends, 2012). Wenning & Rebecca (2006) explain inquiry learning as the best way to understand content or material in science. Students learn how to ask questions and use evidence to answer these questions. In the process of inquiry learning, students learn to formulate or plan observations / experiments, and gather evidence from a variety of sources, develop explanations based on the data found, and convey and defend the conclusions of their observations. The inquiry learning model according to Arends (2012) has 6 (six) syntaxes in learning activities, namely (1) Gain attention and explain the inquiry process, (2) Present the inquiry problem or discrepant event, (3) Have students formulate hypotheses to explain the problem or event, (4) Encourage students to collect data to test the hypothesis, (5) Formulate explanations and / or conclusions, and (6) Reflect on the problem situation and the thinking processes used to inquire into it. Nur et al (1998) explain some of the advantages of using inquiry learning, namely (1) that knowledge lasts longer, (2) the results of inquiry learning have a better transfer effect, and (3) increase students' reasoning in the ability to think freely.

Based on the description, it is very important to increase metacognition awareness of prospective teachers, remembering that metacognition awareness is one of the basic capital or intellectual capital that is very important for everyone and is a fundamental part of human maturity so it is important to be taught at every level of education. This study aims to describe the effect of the use of inquiry learning models on the metacognition awareness of prospective teachers. Metacognition awareness in this study consists of eight components, namely (1) declarative knowledge, (2) procedural knowledge, (3) conditional knowledge, (4) planning, (5) information management system, (6) monitoring, (7) evaluation, and (8) debugging.

METHOD

This research is a quasi-experimental study with one group pretest-posttest design (Figure 1) to evaluate the effect of inquiry learning models on students' metacognition awareness.

O_1	X	O_2
Pretest	*Treatment*	*Posttest*

Figure 1. Research design (Fraenkel et al., 2011).

Where: O1 = students 'metacognition awareness data before learning, O2 = students' metacognition awareness data after learning, and X = treatment with inquiry learning models in learning.

The research sample consisted of 25 students in the natural sciences class at Madrasah Aliyah Negeri 3 Lombok Tengah in academic year 2018/2019, who were selected using saturated sampling. Metacognition Awerness Inventory (MAI) (Schraw & Dennison, 1994) is used to collect students' metacognition awareness data before and after learning. IBM SPSS software is used for the analysis of research data with two types of tests, namely the paired t-test sample for students with normal distribution of metacognition awareness data and the Wilcoxon test performed for indicators of metacognition awareness which are otherwise not normally distributed.

RESULTS AND DISCUSSION

The distribution of pre-test and post-test metacognition awareness of students was tested using the Kolmogorov-Smirnov test for all indicators of metacognition awareness identified in this study. The metacognitive awareness indicators of students identified in this study consisted of eight indicators namely (1) declarative knowledge, (2) procedural knowledge, (3) conditional knowledge, (4) planning, (5) information management system, (6) monitoring, (7) evaluation, and (8) debugging. The results of the distribution of students' metacognition awareness data are presented in Table 1.

Table 1. Test results of students' metacognition awareness data distribution.

Item	Test	N	Metacognition Awareness							
			p							
			DK	PK	CK	P	IMS	M	D	E
Pretest-posttest	pre-test	25	.382	.105	.729	.564	.476	.267	.328	.308
	post-test	25	.009	.152	.040	.071	.379	.396	.026	.176

Based on Table 1 it is known that the pre-test awareness metacognition data of students is normally distributed (p> 0.05) on all indicators, while the post-test awareness metacognition awareness of students is not normally distributed (p <0.05) on the indicators DK, CK, and D. Paired t-test sample tests were conducted to determine the effect of inquiry learning models on student awareness of the indicators that were declared normally distributed, while the Wilcoxon test was conducted for indicators of metacognition awareness that were otherwise not normally distributed. Paired t-test sample results are presented in Table 2, while Wilcoxon test results are presented in Table 3.

Table 2. Test results for paired sample t-test for metacognition awareness

Pair	N	Metacognition awareness				
		Mean	Std. Error Mean	t	df	p
PK	25	1.40800	.06878	20.471	24	.000
P	25	1.40000	.04554	30.741	24	.000
M	25	1.37480	.04545	30.251	24	.000
IMS	25	1.36160	.04451	30.590	24	.000
E	25	1.40600	.05163	27.232	24	.000

Table 3. Results of the Wilcoxon metacognition awareness test

Metacognition awareness	N	z	p
DK	25	-4.399	0.000
CK	25	-4.383	0.000
D	25	-4.397	0.000

Based on Table 2 it can be seen that the t value of students' metacognition awareness for five indicators of metacognition awareness with degrees of freedom df = 24 in a row t = 20,471; t = 30,741; t = 30,251; t = 30,590; and t = 27,232, with a significance value of p <.05 (significant category). Table 4 shows that the Z values for the three indicators of metacognition awareness were -4.399, -4.383, and -4.397, respectively, with a significance level of p <.05. These results indicate that the inquiry learning model has an impact on students' meta-technician awareness for all indicators studied.

The results showed that the inquiry learning model affected the metacognition awareness of students. These results are relevant considering the superiority of inquiry learning is the emphasis on learning processes that are oriented towards the construction of knowledge freely so that the transfer of information or knowledge is more effective which causes knowledge to last longer (Nur, 2011) which refers to diverse ways such as making explanations based on evidence obtained from the results of investigations for the development of knowledge and understanding of scientific ideas, as well as an understanding of how to study nature (Weening & Rebecca, 2006). Activities that involve observation, ask questions, examine sources of information to confirm what is already known, plan investigations, carry out experiments, use tools to collect, analyze and interpret data, propose answers, explanations, and predictions, and communicate results (Hussain, et al., 2011) which is a characteristic of inquiry learning model that is very relevant as an effort to increase students' metacognition awareness (Asy'ari et al., 2019). Yuliati et al (2018) states that inquiry-based learning emphasizes student involvement in formulating problems, investigating broadly and then building understanding, understanding and new knowledge then can be applied to other problems and may produce some type of action in solving problems. Kuhlthau and Todd (2007) stated that the inquiry learning model in its implementation facilitates students to build deep knowledge and understanding related to subject matter in this research, fluid material is declared effective in increasing metacognition knowledge and metacognition awareness with medium / moderate n-gain category. The inquiry learning processes are carefully planned and monitored carefully, but still equip and direct students in free learning. In line with the statement, Arends (2012); Suardana et al. (2018); Artayasa et al. (2018), states the inquiry learning model not only helps students to improve their understanding of the material or concepts taught / learned, but also helps students to develop higher-level thinking skills through inquiry activities.

CONCLUSION

This research has achieved the goals that have been formulated to describe the effect of inquiry learning models on students' metacognition awareness. Based on the results of the study, it can be concluded that the inquiry learning model influences students' metacognition awareness.

RECOMENDATION

Need further research related to the identification of students' initial metacognition awareness using more samples considering the sample of this study is still very small.

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