



Metacognition and Self-Efficacy: How to Improve These Variables in Learning Process?

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Abstract

Metacognition and self-efficacy are two important variables that can affect the success of students in completing their learning process. Metacognition can be interpreted as the ability to understand what we know, as well as how we manage and organize our thought processes to maximize the learning process. The self-efficacy is a person's internal strength and confidence in their ability to make decisions that affect the quality of their learning. This study aims to find alternative strategies to improve these two variables. A total of 62 undergraduate students are the subjects of this study. The instrument used to explore metacognition ability is the Metacognitive Awareness Inventory (MAI), and for self-efficacy measurement, the Motivated Strategies for Learning Questionnaire (MSLQ) manual is used. The result of the study shows that the KWL strategy can be applied to improve students' metacognition and self-efficacy.

Keywords: Metacognition, self-efficacy, improvement, learning process

1. INTRODUCTION

Science is a field of knowledge that can be studied through the process of studying phenomena and facts as knowledge content, and in this process high-level thinking abilities are required, such as logical thinking, problem solving, analytical thinking, creative thinking, and reflective thinking, in addition to social abilities such as collaboration and communication. In its implementation, these high-level thinking abilities do not stand alone, but are comprehensively integrated with each other in understanding scientific phenomena. To explore scientific phenomena scientifically not only requires cognitive, attitudinal and psychomotor skills, but also requires metacognitive abilities, as well as self-confidence and independence (self-efficacy) in carrying out exploration, to support the cognitive abilities possessed [1] [2] [3].

[1] & [2] define metacognitive abilities as the ability to understand what we know, how we learn what we already know, and how we manage and organize our thinking processes to maximize the learning process. Metacognitive abilities allow a person to take responsibility for their own learning. This involves being aware of how they learn, evaluating their learning needs, generating strategies to meet those needs, then implementing the planned strategies.

[4], and [5] state that the metacognitive process includes two things to make it

easy to understand and comprehend, namely 1) cognitive knowledge, and 2) cognitive regulation. Knowledge about cognition includes three components, namely knowledge about (a) factors that influence a person's performance; (b) various types of strategies used in learning process; (c) what strategies are appropriate to apply in certain learning situations. The regulation of cognition also includes three aspects, (a) setting goals and planning their achievement; (b) carry out monitoring and control of learning; and (c) carry out self-evaluation of the strategies implemented and the results achieved. [6] stated that the process that includes metacognitive functions includes three aspects, namely knowledge, monitoring and control. Metacognitive knowledge is an information processing process that will be applied when someone thinks about ideas, facts and basic concepts. Metacognitive monitoring is the ability to monitor and evaluate cognitive activity. Metacognitive control is the ability to regulate cognitive activities to be carried out.

Self-efficacy is a person's internal strength and self-confidence in his ability to make decisions that affect the quality of his performance [7]. A person's self-efficacy contributes to the way they think, and motivates them to behave in certain ways. Bandura (1997) stated that self-efficacy can influence a person's four behavioral processes, namely cognitive ability, motivation, attitude, and selection in decision making [8] [9]. Self-efficacy includes planning processes, discipline, organization, active participation in the learning process, concentration in improving abilities, and self-motivation.

Self-efficacy can initiate cognitive abilities, and someone will even be motivated to improve the quality of their performance. Katelhut's (2007) research results show that through science learning, self-efficacy can motivate someone to carry out the inquiry process optimally. [8] also supports this statement. In his research, it can be described that self-efficacy can increase achievement in science content. Self-efficacy also has a positive impact on self-regulated abilities [10]. Self-regulation abilities play an important role in controlling students' abilities. Students' high self-efficacy can make a positive contribution to their cognitive development. Qualified cognitive abilities can have an effect on the ability to observe, define questions or problems, analyze theoretically, formulate hypotheses (deductive thinking), plan experiments and collect data, carry out experiments or exploration, make decisions or conclusions (inductive thinking), and carry out evaluations. and publications [11].

Learners often show increased self-confidence as they build metacognitive skills. When people build metacognitive abilities, a process of reflection and reconstruction of knowledge or understanding of a phenomenon occurs. The results of knowledge reconstruction have a positive impact on a person's self-efficacy (confidence), which can ensure that the person has been able to find the correct knowledge. As self-confidence grows, motivation will also grow to study broader phenomena. Research results have shown that metacognition and self-efficacy contribute positively to a person's learning success [12] [13]. The main problem is

how could we improve metacognitive and self-efficacy in learning process.

2. METHOD

We have conducted limited research on the application of Formative KWL strategy to improve students' metacognitive abilities and self-efficacy. The Formative KWL strategy consists of three stages, "What did you know?" "What do you want to know?" and "What have you learned". The research design applied was Pretest-Posttest One Shot Case Study, with Pretest-KWL 1-KWL 2-Posttest stages. Research was carried out in Cell Biology (33 students) and Biomolecular (29 students) courses. Students' metacognitive abilities were measured before and after lectures using the Metacognitive Awareness Inventory (MAI) instrument, which includes aspects of (1) cognitive knowledge and (2) cognitive regulation. As for measuring students' self-efficacy, Motivated Strategies for Learning Questionnaire (MSLQ) manual was used in Self-Efficacy for Learning and Performance component.

3. RESULT AND DISCUSSION

The results of processed data for students' metacognitive abilities and self-efficacy can be seen in Figure 1 and Figure 2.

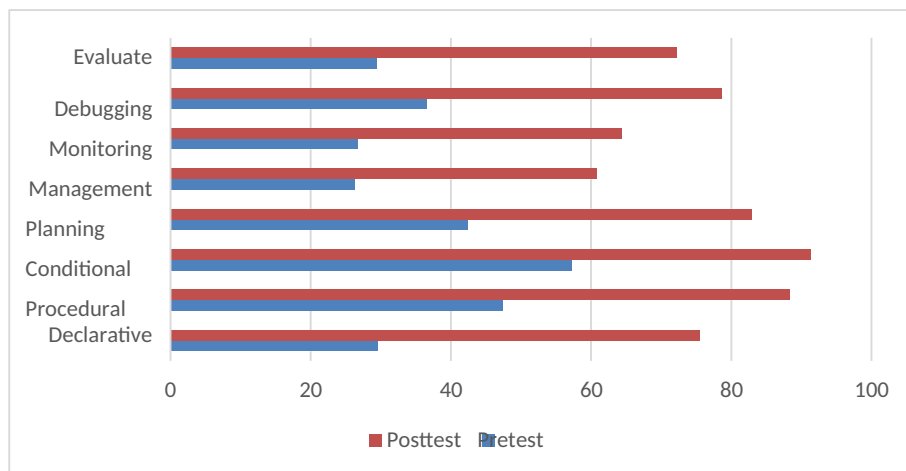


Figure 1. Pretest and posttest results of student metacognitive abilities

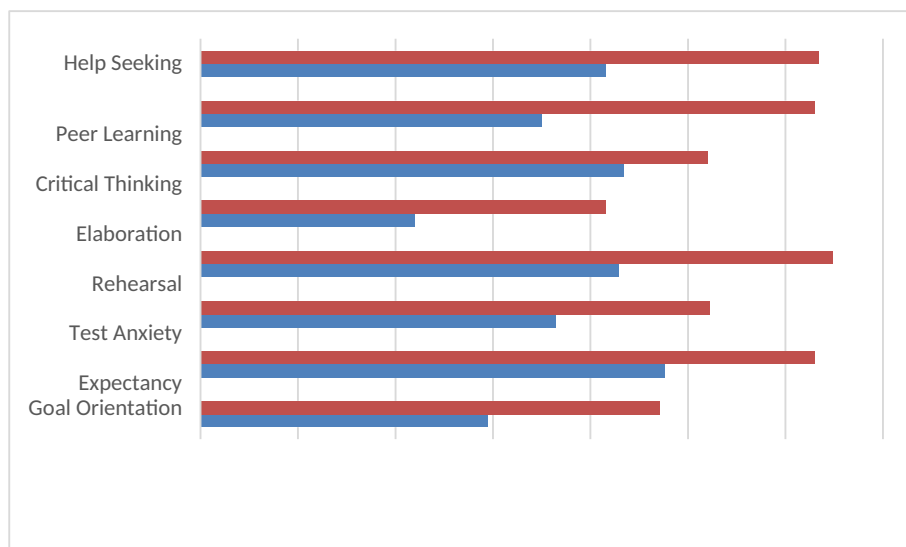


Figure 2. Pretest and posttest results of student self-efficacy

Based on the data in the graph, it can be stated that all aspects tend to increase and reach a score above 70, but in the metacognitive ability aspect of managing strategies and reorganizing strategies the increase does not reach a score of 70. Likewise, in the self-efficacy aspect, you can achieve the best results and understand the concept-complex concept. This can be interpreted as meaning that improvements in these aspects have not reached the minimum standards that students should have.

The implementation of the developed Formative-KWL strategy has had a positive effect on students' metacognitive abilities and self-efficacy while attending lectures. There are four main treatments for implementing the Formative KWL strategy in this research. First, this strategy allows students to understand their abilities, by identifying the knowledge and understanding they have acquired before attending lectures. Second, this strategy provides students with the opportunity to explore further what they have understood. Students can open up wider discourse and knowledge regarding the material they have understood and will be discussed in lectures. Third, at the end of the lecture, students are given the opportunity to measure what competencies they have learned and mastered during the lecture process. Fourth, this strategy is carried out formatively, meaning it is carried out periodically according to the lecture teaching material. This allows students to strengthen their competencies in stages. The KWL strategy has an effect on motivation and the development of self-assessment abilities

Students' metacognitive abilities during the lecture process can develop when students are given the opportunity and practice. This is confirmed by the acquisition of data on metacognitive aspects identified through this study, namely knowledge about cognition and cognitive regulation. The development of students' cognitive knowledge, namely declarative, procedural and conditional knowledge, can be seen significantly with a striking increase in scores obtained for each aspect, before and after lectures. Likewise, the development of cognitive regulation abilities shown by students in the aspects of planning, strategic management, monitoring, strategy restructuring and evaluation. However, in the aspect of strategic management and strategy resetting, the scores obtained after lectures still do not meet the standards. This is caused by students not being used to determining good learning strategies, and rearranging the learning strategies that have been carried out. Students tend to learn if they are given assignments, tests, or discuss problems independently. Students should be able to consciously determine their learning strategies and reflect on the strategies they have implemented.

Metacognition describes a person's awareness of how and how that person learns and achieves learning goals. Awareness of learning is an important factor in efforts to increase critical thinking and creativity, as well as building self-confidence [14] Awareness of preparing to pay attention during lectures, taking notes on important

things, and following class discussions well are important factors that can influence learning success. Students who have metacognitive awareness have the ability to plan, implement and monitor their learning, so they can improve their abilities and performance [4] [15]. Metacognition is an important structure in cognition that can influence the success of a person's learning process [16].

The results of this research also show the development of students' metacognitive abilities in carrying out reflective thinking to understand deficiencies or lack of understanding of material. This is in accordance with [17] statement, which states that metacognitive awareness is the ability to reflect in thinking and develop problem solving abilities to overcome learning difficulties. Students' abilities in aspects of knowledge about cognition, such as realizing and understanding their initial knowledge, the relevance of their initial knowledge to the material being studied, and the desire to deepen lecture material describes the logical consequences of a mental process.

[6] emphasized that metacognitive abilities can lead a person to lifelong learning abilities, which require self-direction and self-regulation. Self-direction ability is a result obtained through a person's habit of making decisions regarding the knowledge they will learn. Self-regulation is the activity of mentally regulating how a person achieves their learning goals through planning, monitoring, focusing and conscious effort. The habit of controlling the way of thinking in the intellectual process provides a great opportunity for students to review the knowledge that has been built.

The results of the study also describe the development of student self-efficacy at the end of the lecture. Of the eight aspects measured in student self-efficacy, there are two aspects whose improvement has not reached the expected standard, namely the aspect of self-confidence in being able to achieve the best results and understanding complex concepts. Based on the analysis of the data obtained, students tend to have less confidence in their abilities to achieve their best. Likewise, with the aspect of understanding complex concepts. This should be controlled and changed by motivating the mindset to achieve the best. Habits of thinking and behavior may be the cause. Students are not yet accustomed to the self-evaluation and self-regulation that they should be able to do. Students tend to attend lectures without targets. This can cause students to lack self-confidence and as a consequence students have difficulty understanding complex knowledge.

Self-efficacy can be initiated from several sources, including experience, mastery of teaching material, and social recognition. Learning experiences can make someone more confident in their knowledge. Experience resulting from observations of a phenomenon can also provide motivation to identify and explore knowledge. Mastery of teaching material, being able to answer questions well and correctly, success in applying concepts in everyday life are variables that can grow self-confidence [18]. Social recognition of one's knowledge and opinions also have a positive effect on growing self-efficacy [19] [20]. Self-efficacy is related to academic

success. Students who have confidence in their abilities are more able to answer independently with appropriate responses than students who are less confident in their abilities.

4. CONCLUSION

Metacognitive abilities and self-efficacy are closely related to student learning success. These two abilities can be trained by students during the learning process. By providing opportunities for students to self-regulate their cognitive abilities, understand what they have understood, and always be trained to carry out self-reflection on their learning process, these activities can contribute positively to their learning achievement process. The results of limited formal studies have shown that the development and implementation of Formative-KWL learning strategies has a positive effect on the development of students' metacognitive abilities and self-efficacy in learning science. The predictor aspects measured experienced an increase in scores after the lecture. Increasing metacognitive abilities and self-efficacy contributes to student learning outcomes.

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