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The Effect of HOTS Learning and Self Regulation on Cognitive Ability at SMK Negeri 1 Modoinding

Henry J.D. Tamboto[1], Gilly M Tiwow[2,] Lenny L Evinita[3]
Universitas Negeri Manado[1,2,3]
Jl. Kampus Unima Kec. Tondano Selatan, Kab. Minahasa, Sulawesi Utara, Indonesia
Correspondenc Email: htamboto@unima.ac.id

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ABSTRACT

To realize learning in the 21st century, teachers must have good process skills learning. The development of HOTS learning is one of the ways to improve the quality of learning and the quality of graduates. The purpose of this study is to determine the effect of HOTS learning and student self-regulation on the cognitive abilities of students of SMK Negeri 1 Modoinding. This study used a survey method and a sample of 125 students. The data were collected using a questionnaire and documentation techniques. The results of the study were analyzed using statistical regression tests. The results showed that HOTS learning significantly affects the students' cognitive abilities. Furthermore, self-regulation also affects students' cognitive abilities and HOTS learning, and students' self-regulation simultaneously affects the cognitive abilities of students of SMK Negeri 1 Modoinding.

Keywords: Cognitive Ability, HOTS Learning, Self-regulation.

INTRODUCTION

The problem of education quality in Indonesia is still interesting, and it is necessary to think about providing input to improve the condition of national education. In Law No. 20 of 2003, article 1 states:

> Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious and spiritual strength, self-control, personality, intelligence, noble character, and skills needed by society, nation, and state.

Considering the current state of national education, despite 11 curriculum changes (Widyastono, Hasan, Suryani, & Winataputra, 2014), academic performance still struggles behind other countries in the quality issue. In fact, for the Southeast Asia region alone, the position of the quality of our nation's national education is still lagging behind the quality of other countries such as Malaysia and Singapore (Republika, 2021). This led to Koomen and Zoanetti's (as cited in Suhendro, Sugandi, & Ruhimat, 2021) statement, which said that the education system has to cope with the modern era. Thus, the teachers have to adapt to contemporary or various tools in order to evaluate the students learning process. This is important because in 21st era is considered a modern era that demands students to be proactive and have the ability to think critically.

The mismatched preceptors with effective subjects cause gaps in public and indigenous education quality. The teacher's education in low-quality schools is similar to low-quality preceptors, lack of equal distribution of professional preceptors in seminaries, lack of learning installations and structure, and lack of applicability of class to employment. Other gaps are the lack of concern for the parents of scholars on education, scholars' warrant of provocation in literacy, the negative impact of electronic bias in the form of cellphones(social media and games), lack of collaboration or cooperation between members of the education element, both preceptors, scholars, and other stakeholders.

The teacher, as an educator, teacher, mentor, and director, they are trained to provide an assessment of each student in the learning process. Students need to get strong motivation from the education system to become critical thinkers on a problem, so it is necessary to master problem-solving techniques using Higher Order Thinking Skills (HOTS). A derivative of the learning method initiated by Benjamin Bloom through the theory of "Bloom's Taxonomy". Therefore, it is necessary to change the way students think by stimulating their thinking to become more critical and creative.

Students are also expected to collaborate with teachers to face and resolve problems in learning. Students are expected to be able to adapt and regulate their learning styles. In this case, there needs to be self-regulation or one's self-regulation (the process by which individuals systematically direct their thoughts, feelings, and actions to goals) (Schunk & Zimmerman, 2012). In cognitive abilities, students are demanded to think, remember, understand, analyze, create, solve problems, and make decisions. This is related to cognitive abilities, namely appearances that can be discovered as the results of activities or processes of obtaining knowledge/information through experience (Sudijono, 2013).

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LITERATURE REVIEW

Cognitive Ability

Therefore, there is a need to stimulate memory-related aspects in mental processes that are mental and relate to abilities in the form of general recognition characterized by the representation of objects in a person's mental image. Responses, ideas, and values are personal cognitive processes.

According to Sudijono (2013), the definition of cognitive domain is a domain that includes mental (brain) activities. Thus, cognitive factors have an important role in successful learning because most activities in learning are always related to remembering and thinking. Therefore, related to student achievement is a cognitive ability that involves cognition.

According to Winkel (1996), he states that one of the cognitive learning characteristics can be known from its representation that represents the object encounters (it can be in the form of a person, object, or event). Thus, they are described or presented in a person through responses, ideas, or symbols, all of which are mental things.

Cognitive abilities can be observed as the results of activities or processes of acquiring knowledge through experience (Sudijono, 2013). Thus cognitive ability is the appearance of mental activity (brain) to get a piece of new knowledge from experience. Furthermore, the mental activity uses existing rules and concepts, which are later on represented through responses, ideas, or symbols.

The study of the cognitive domain includes the knowledge dimension category and the cognitive dimension category. The knowledge dimension reflects scientific concepts through the teaching and learning process. In this connection, Bloom argues that the taxonomy of the cognitive domain includes six levels of thinking processes (Sudijono, 2013):

a. Knowledge could be a person's ability to recall or acknowledge names, terms, ideas, symptoms, and formulas without expecting the power to use them.
b. Comprehension is a person's ability to know something after they understand and remember it. This means understanding is acknowledging certain information and being able to explain it in your own way. For example, a student in the class can categorize to understand when he/she is able to describe and present specific information with his/her language. Comprehension is a higher level of thinking ability that is more complex than memorization.
c. Application is a person's ability to use general concepts, procedures, principles, formulas, and theories in new and concrete things. This application is a thinking method at a better level than understanding.
d. The analysis includes the capability to solve the problem and able to make other people understand well about that matter.
e. Synthesis is a person's ability to explain or describe a material or condition with a detailed explanation. It can understand the relationship logically and develop a structured or new pattern. The synthesis level is higher than the analysis.
f. Evaluation is categories highest level of thinking in the cognitive domain. Evaluation is a person's ability to judge a situation, value, or idea. For example, when one person faces several choices, he can choose the best one following existing standards or criteria to solve the problem.

High Order Thinking Skill (HOTS)

High Order Thinking Skill (HOTS) is a complicated process of how a person is able to describe a theory, create a conclusion, analyze, and establish relationships that involve the most basic mental activities. According to Gunawan (2012), Higher Order Thinking Skills (HOTS) is a thinking process that requires students to manipulate information and ideas in a certain way that gives them new understanding and implications. Meanwhile, according to Ernawati (2017), Higher Order Thinking Skills (HOTS) are not only about memorizing information or knowledge but also interpreting it and knowing its real meaning. Therefore, it requires a lot of process and practice in order to analyze it. For instance, students need to analyze and synthesize to create innovative and visionary ideas.

Higher Order Thinking Skills (HOTS) are not just remembering, restating, and referring without processing the idea/information but thinking and examining information critically and creatively. Another definition from Ernawati (2017) states that Higher order thinking ability is the ability to be able to understand the learning process with this learning approach emphasizing students' understanding and reasoning. Krathwohl (as cited in Lewy, 2009) states that indicators to measure order thinking skills include: analyzing, evaluating, and creating. In addition, Krulik and Rudnick (1999) said thinking skills consist of four levels: memorizing, thinking, critical thinking, and creative thinking.

In terms of higher-order thinking skills, Suastra, Tika, and Kariasa (2007) said that students should be given the following opportunities to train in higher-order thinking competencies. First, asking questions that encourage students to think during the teaching and learning process. Second, reading books that encourage further study. Third, modifying or rejecting the original suggestion from friends, teachers, or textbooks. Fourth, do not hesitate to propose substitute assignments that have creative and critical potential. Fifth, receiving the same recognition for creative and critical thinking as for learning outcomes in the form of remembering. Finally, giving answers that are not exactly the same as those in the book, but the concept or principle is correct.

Self-Regulation

Efforts made by someone to regulate, determine and control behavior in achieving goals are important for someone related to how individually regulate everything they do. Puspawardani (2019) said that self-regulation is the ability to plan, guide, and monitor behavior flexibly in various circumstances to achieve goals. Individuals with high self-regulation abilities are able to plan life goals flexibly in various circumstances. In addition, individuals can direct their behavior according to the goals to be achieved and monitor their behavior to keep them on the right path.

Furthermore, Kowalski, and Leary (as cited in Azhari & Mirza, 2016) state that Self-regulation is the ability to change responses such as controlling impulses in the form of behavioral impulses, restraining desires, controlling thoughts and emotions. Meanwhile, according to Baumeister and Heatherthon (as cited in Azhari & Mirza, 2016), self-regulation is a person's attempt to control himself so that his behavior does not go out of the norm with the same result. Friedman and Schustock (as cited in Pisani, 2017) state that self-regulation is an individual process to the achievement of targets and control attitudes. It evaluates the success of achieving targets and gives self-esteem for the goals that have been achieved.

Thus it can be said that self-regulation is an individual's ability in the form of the ability to think, and with this ability, the individual can manipulate his environment. Self-regulation

can also be defined as the ability to plan, guide, and monitor behavior flexibly in various circumstances to achieve goals and change responses and control them so as not to cross the norm, such as controlling behavioral impulses, planning, guiding, monitoring behavior, desires as well as controlling thoughts and emotions in order to manage the achievement of targets.

According to Bandura (in Alwisol, 2009), self-regulation will be a reactive and proactive strategy. Reactive strategies are used to achieve goals, but when those goals are almost achieved, proactive strategies will set new, higher goals. Through a proactive strategy, individuals will motivate and direct their behavior, creating an imbalance to mobilize their abilities and efforts to achieve goals based on the anticipation needed. According to Bandura (as cited in Feist, 2010), self-regulation includes observation, the Judgmental process (assessment process), and the response process (reaction). Furthermore, it is said that the self-regulation dimension, according to Pichardo (in Puspawardani, 2019), consists of setting goals, perseverance (persistence), decision-making, and learning from mistakes.

RESEARCH METHOD

In conducting this study, the researchers used a descriptive quantitative approach. According to Sugiyono (2018), quantitative research is the process of collecting and analyzing numerical data. First, the data is displayed in the form of numbers, and then it is measured using statistics as a computational testing tool. The data collection method is collected from the documentation method, which includes data collection from theory dan data collection from previous research, journal, and books.

This research was conducted by using purposive sampling with several consideration criteria. The population used was 181 students of SMK Negeri 1 Modoinding. Determination of the sample using the formula from Slovin and obtained n = 125. Furthermore, the researchers use a double correlation coefficient test to analyze this study deeper.

Double Correlation Coefficient Test

Determining the multiple correlation coefficient is carried out to determine the strength of the relationship between HOTS learning and self-regulation on students' cognitive abilities using the formula:

$$r_{x1x2.y}=\sqrt{\frac{b1.\sum x1y+b2.\sum x2y}{\sum y^2}} = r_{x1x2.y}$$

RESULTS

The result of this study, according to the Hypothesis testing:
a. Hypothesis Testing the effect of HOTS X1 learning on students' cognitive abilities (Y) obtained a regression equation Y= 21,359 + 0,536X1,

From these results, the learning of HOTS (X1) has an effect on the cognitive abilities of students of SMK Negeri 1 Modoinding.

The coefficient test of the HOTS learning determinant on students' cognitive abilities is $KD=r^2$ x 100% = $0,646^2$ x 100% = 41,8% Thus, the contribution of HOTS learning to

cognitive abilities is 41,8%. Significance test obtained t table < t count or 1,979 < 9,390 means that there is a significant effect of HOTS learning on cognitive abilities.

b. Testing the hypothesis of the effect of Self-Regulation X2 on students' cognitive abilities (Y), obtained the regression equation Y= 12,109 + 0,689X2. Thus, Self-regulation affects students' cognitive abilities.

Determinant test KD=r^2 x 100%= $0,662^2$ x 100% = 43,8% Thus, the contribution of Self-Regulation (X2) to students' cognitive abilities is 43,8%. T-test to see the effect of Self-Regulation X2 on students' cognitive abilities, t table < t count or 1,979 < 9,799 it means that the effect of Self-regulation X2 on cognitive abilities is significant.

c. Testing the hypothesis of the effect of HOTS learning and self-regulation on students' cognitive abilities, obtained multiple regression equations :$Y = a + b_1 X_1 + b_2 X_2$ = 5,213+0,365 X_1 + 0,487 X_2, multiple regression equation is obtained Y= 5,213+0,365 X_1 + 0,487 X_2 it means that HOTS learning and self-regulation have an effect on students' cognitive abilities.

Double Correlation Coefficient Test
Determining the multivariate analysis constant is disbursed to work out the strength of the link between HOTS learning and self-regulation on students' psychological feature talents exploitation the formula:

$$r_{x1x2.y}=\sqrt{\frac{b1.\sum x1y+b2.\sum x2y}{\sum y^2}} = r_{x1x2.y}=0,771$$

The results of the correlation coefficient analysis are in the interval 0.60 - 0.771, which means a strong relationship between HOTS learning and self-regulation on students' cognitive abilities.

1. Determine the coefficient of the determinant
   KD= r^2x100%=$0,771^2$ x100%=59,5%; thus, the large contribution of HOTS learning and self-regulation to students' cognitive abilities is 59,5%.

2. Significant test (f test)
   The f-test was conducted to see whether HOTS learning and self-regulation on students' cognitive abilities were significant using the following formula:
   Using the formula: $\mathrm{f\,count} = \frac{R^2(n-k-1)}{k(1-R^2)}$ = 89,236
   F table = α = 0,05; db1 = 2; db2= 122
   Ftabel= 3,071

The calculated F results of 89.236 > F table of 3.071 mean that the effect of HOTS learning and self-regulation on students' cognitive abilities is significant at 59.5%, and 40.5% is influenced by other variables not examined in this study.

DISCUSSION

The effect of HOTS learning (X1) on students' cognitive abilities (Y) shows a strong relationship between HOTS learning and students' cognitive abilities. In terms of implementing HOTS learning, where higher-order thinking skills are an ability to be able to understand the learning process with an approach that emphasizes student understanding and reasoning. In line with Krathwohl in Lewy (2009), the more students are involved in learning by analyzing, evaluating, and creating, it is hoped that their cognitive abilities will increase in the form of learning outcomes and learning achievements.

In the 21st century, HOTS learning is one of the important requirements that cannot be undertaken. Even so, Trilling and Fadel (2009) added that several skills are needed, such as critical thinking and problem-solving, communication, collaboration, creativity, and innovation. By applying (HOTS) to the learning process, it is contemplated to create and develop students' critical thinking. Moreover, it aims to make the students able to solve the problem at a given time. Not only that, but it also hopes they can improve their cognitive abilities in learning achievement. If the HOTS learning increases, students' cognitive abilities at SMK Negeri 1 Modoinidng will also increase as well. This is supported by the results of research by Naen, Wariani, Hayon, and Bria (2020), which found that HOTS learning affects learning outcomes. They also added that the learning outcomes include cognitive, affective, and psychomotor.

Effect of Self-Regulation (X2) on Students' Cognitive Abilities (Y)

The analysis results regarding the effect of Self-Regulation on students' cognitive abilities show a positive relationship between Self-Regulation and students' cognitive abilities. Moreover, earning independence has a significant effect on students' cognitive abilities. The better the students' self-regulation, the cognitive abilities of students at SMK Negeri 1 Modoinding increase. Students, as individuals, expect to be more independent and responsible in learning. Therefore, students need to adapt and control themselves to changes in the social environment and other psychological factors such as emotions. This situation becomes important for every student because in learning to achieve learning achievement or high cognitive abilities, students are expected to be committed to regulating their behavior so that they remain focused on positive activities. Therefore, by doing self-regulation, students can achieve high cognitive abilities. The results of this study support the findings from (Ruban, McCoach, McGuire, & Reis, 2003), who say that with good self-regulation, individuals will carry out academic activities better than individuals with poor self-regulation. Thus it can be said that self-regulation affects students' cognitive abilities, so it can be concluded that students who have good self-regulation have better cognitive abilities.

The Effect of HOTS Learning (X1) and Self-Regulation (X2) on Students' Cognitive Abilities

According to the analysis regarding HOTS Learning (X1) and Self-Regulation (X2) on students' cognitive abilities, it can be said that there is a significant influence between HOTS Learning (X1) on students' cognitive abilities and Self-Regulation (X2) in SMK Negeri 1 Modoinding. Thus, the researchers conclude if HOTS Learning (X1) and Self-Regulation (X2) increase, the student's cognitive abilities at SMK Negeri 1 Modoinding will also increase. This result is related to Alam's (2019) research, and he said that using higher-order thinking can help a person to recognize complex problems such as in the environment, health, science, and technology in any aspect of life.

CONCLUSION

According to the results and the explanation in the discussion, it can be concluded that HOTS learning has a significant effect on the cognitive abilities of students at SMK Negeri 1 Modoinding. In another way, a better implementation of HOTS learning can improve students' cognitive abilities. Moreover, the students' self-regulation has a significant effect on students' cognitive abilities at SMK Negeri 1 Modoinding. The results show that if students' self-regulation is getting better and more positive, it will be followed by an increase in students' cognitive abilities. Furthermore, there is a jointly significant effect between HOTS learning and self-regulation on the cognitive abilities of students at SMK Negeri 1 Modoinding. In this case, the better the implementation of HOTS learning and students' self-regulation, the better the cognitive abilities of students.

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DECLARATION OF CONFLICTING INTERESTS
The authors declared no potential conflicts of interest.

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