

The Correlation between Metacognitive Skills and Cognitive Learning Results with the Characters of Biology Students of Senior High Schools in Malang, Indonesia

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Abstract: The empowerment of students' potential should be made in relation with cognitive, affective, and psychomotor aspects. This empowerment will give a good effect on students, particularly related to the demands of the 21st century. The examples of the empowerment in the cognitive aspect are the empowerment of students' metacognitive skills and cognitive learning results. On the other hand, in relation with the affective domain, it can be done by empowering the student's character. The purpose of this research is to reveal the correlation between metacognitive skills and cognitive learning results with the student character. The method used in this research is a correlational research. The population of this research is class X students of senior high schools in Malang, Indonesia. The samples of this research are 165 students, divided into five learning strategies. The data are analyzed by using multiple linear regressions. The results of the analysis show that in the five learning strategies, it is proved that metacognitive skills and cognitive learning results have a correlation with the students' characters. The effective contribution of metacognitive skills and cognitive learning results in each learning strategy is less than 50%. Therefore, further investigations to reveal the reason of the relatively low contribution of metacognitive skills and cognitive learning results on students' character need to be carried out.

Keywords: Cognitive learning results, character, metacognitive skills, biology students.

INTRODUCTION

The purpose of education is said to be achieved when it can produce resilient and competitive output in the global life. In this connection the main purpose of modern education in the 21st century is not only to enrich the students with a vast amount of knowledge/facts in a particular field, but also to equip the students with the skills needed to become independent learners [1]. This is done in order that the students can achieve the academic success at schools and also the success after they graduate from schools. There is also opinion stating that independent learners are those who have cognitive and metacognitive abilities and the attitude needed to understand, monitor, and direct their own learning [2].

The students' cognitive skills and the other skills are essential to be empowered, especially to face the global competition in the 21st century nowadays. Those skills can be obtained from the cognitive, affective and psychomotor aspects. There are three components of student engagement at school that can be empowered covering emotional (psychological or affective), cognitive, and behavioral aspects [3].

Another opinion states that the cognitive aspect has six domains, starting from remembering, understanding, applying, analyzing, evaluating and creating [4]. The affective aspect is associated with emotions and feelings. It is related with the reception of a stimulus that evokes feelings and manifested in behavior. Furthermore, it is explained that affective domain includes receiving, responding, valuing, organizing and conceptualizing, characterizing by values [5]. On the other hand psychomotor aspect concerns with the mastery of physical skills, starting from the reflexive movement to show the appropriate body language [6]. Psychomotor domain includes reflective movement, fundamental movement, perceptual skills, physical abilities, skilled movement, and non-discursive communication.

As a key holder in realizing the ideals of a nation the task of educators is to train the three educational domains to the students through the learning processes. In creating lesson plans as well as in the efforts to provide a suitable learning environment for students, teachers need certain considerations based on the philosophical foundations of education [7]. One

theory of learning that facilitates the empowerment of cognitive, affective and psikomotor domains of the students is social-cognitive learning theory. In this connection it is stated that in the social-cognitive theory, the three domains and the environment have equal contributions to learning [8].

Cognitive and affective dimensions are two elements that have a reciprocal relationship which determines the learning success of the one student and the others [9]. Thus, the affective dimension can be used to support the cognitive dimension [10]. Another opinion states that the affective domain (feelings, emotions, and attitudes) tends to be less appreciated in learning when compared with the cognitive domain [11]. The lack of attention to the affective domain may affect the students' potential, which results in the low students' achievement, because the empowerment of affective domain in learning is not only to achieve the learning purpose related to the affective domain solely, but it can also be used to achieve the cognitive domain [12].

Previous researchers have found the correlation between metacognition and academic achievement [13]. Similar findings reported before revealing that metacognition has a significant correlation with students' academic achievement [14-16]. Furthermore, it is explained that the students who have good metacognitive knowledge and metacognitive skills will tend to become successful learners, because they can organize themselves in terms of learning, storing information, and making the best solution for every problem they encounter.

To predict the success of educational process in relation to the empowerment of the three domains, the research is conducted in order to reveal the correlation between metacognitive skills and cognitive achievement with the character of the students. Metacognitive skills and cognitive learning results in this research are positioned as predictors, representing cognitive aspects; and the character is positioned as criterion representing the affective domain.

The character of a student can be interpreted as a personality attached to a person [17]. Furthermore, it is also said that character is a part of the potential in a person, which must be fostered through education. Character education is an educational mission that leads to better moral changes. In this relation it is explained too that character education is not only to teach what is right as well as what is wrong to the child, but rather to instill good habits to children, so that they can understand, feel, and want to do good [17]. To instill character in a person requires the understanding of the good thing and the bad thing, the right thing and wrong thing. In relation to the process of understanding, good

cognitive ability is required within a person. Therefore, it can be concluded that the formation of character in a person can not be separated from his/her thinking process. The thinking process which is directed and trained will be able to form a good personality and character.

Metacognition is cognition about cognition [18]. Furthermore, it is said that metacognition is the ability to control cognitive ability. It is explained too that the control occurs through the actions and interactions between metacognitive knowledge, metacognitive experience, goal and actions or strategies. In other words, an individual who has good metacognitive knowledge will understand the demands to complete his or her task, and has the ability to select the best strategy to finish the tasks. Metacognition plays an important role in terms of communication, reading comprehension, language acquisition, social cognition, attention, self-control, memory, self-instruction, writing, problem solving, and personality development. Thus, metacognitive skills which are properly empowered will have good effects on the ability to manage and evaluate the cognitive process.

The correlation between metacognitive skills and cognitive learning results with the students' character on several learning strategies is important to be revealed in order to obtain the information related to how strong the correlation. The finding of the coefficient of determination will show how big metacognitive skills and cognitive learning results give contribution to the formation of students' character.

METHOD

This research aims at revealing the correlation between metacognitive skills and cognitive learning results with the character of the students. The problem of this research focused on the cognitive and affective aspects of the students. Based on the correlation between metacognitive skills and cognitive learning results with the students' character the contribution of metacognitive skill and cognitive learning results on students' character will be uncovered.

To reveal the correlation between metacognitive skills and cognitive learning results with the character of the students, the correlational research is conducted. The data collected in this research are the data of metacognitive skills, cognitive learning results and the students' character. The data of metacognitive skills are measured by using a rubric of metacognitive skills integrated with essay tests [19], and the data of cognitive learning results are measured by using a rubric of cognitive learning results, and the data of the students' character were measured by using a questionnaire [20].

The population of this research is all of the senior high school students in Malang. The samples used in this research are class X students of senior high schools in Malang, which are divided into 5 classes. Each class is taught by using a specific learning model (one class is taught by using Reciprocal Teaching learning model, two classes are taught by using Think Pair Share learning model, one class is taught by using Reciprocal Teaching combined with Think Pair Share, and one class is taught by using Reading questioning and Answering learning model). The total sample is 165 students of male and female students.

The data are analyzed by using inferential statistics using multiple linear regression analysis. Before the data are analyzed, the normality of the data is tested by using One-Sample Kolmogorov-Smirnov Test. The data are analyzed by using software SPSS Version 23. 00 for Windows and performed at the 5% significance level.

RESULTS

The summary of the results of multiple linear regression analysis of the correlation between metacognitive skills and cognitive learning results with students' character can be seen in Table 1.

Table 1: The Results of multiple Regression Analysis of the Correlation between metacognitive Skills and cognitive Learning Results with Students' Character

No.	Class	Sig.	Predictors Variable	RC (%)	EC (%)	Total EC (%)
1	X RT	0,026	Metacognitive skills	90.50	17.01	18.80
			Cognitive learning results	9.50	1.80	
2	X TPS	0,000	Metacognitive skills	5.62	2.12	37.80
			Cognitive learning results	94.38	35.68	
3	X RT + TPS	0.007	Metacognitive skills	43.63	13.70	31.40
			Cognitive learning results	56.37	17.70	
4	X RQA	0,029	Metacognitive skills	10.62	2.62	24.60
			Cognitive learning results	89.38	21.98	
5	TPS X 2*	0.016	Metacognitive skills	71.60	17.76	24.80
			Cognitive learning results	23.40	7.04	

Note * TPS learning model taught in a different class from the TPS class on no. 2

The results of multiple linear regression analysis related to the correlation between metacognitive skills and cognitive learning results with the students' character (Table 1) show that the significance value of all the correlation between metacognitive skills and cognitive learning results with the students' character is less than 0.05. This means that there is a significant positive correlation between metacognitive skills and cognitive learning results with the students' character at the five learning models.

In class X implementing RT learning model, the effective contribution of the two predictors is 18.80%; the effective contribution of metacognitive skills to the students' character is 17.01%, while the effective contribution of cognitive learning results to the students' character is 1.80%. In class X implementing TPS learning model, the effective contribution of the two predictors is 37.80%; the effective contribution of metacognitive skills to the students' character is 2.12%, while the effective contribution of cognitive learning results to the students' character is 35.68%. In class X implementing RT combined with TPS learning model, the effective contribution of the two predictors is 31.40%; the effective contribution of metacognitive skills to the students' character is 13.70%, while the effective contribution of cognitive learning results to the

students' character is 17.70%. In class X implementing RQA learning model, the effective contribution of the two predictors is 24.60%; the effective contribution of metacognitive skills to the students' character is 2.62%, and the effective contribution of cognitive learning results to the students' character is 21.98%. In class X implementing TPS learning model 2, the effective contribution of the two predictors is 24.80%; the effective contribution of metacognitive skills to the students' character is 17.76%, and the effective contribution of cognitive learning results to the students' character is 7.04%.

Thus, it can be seen that in each learning model, the effective contribution of the predictors varies. RT and TPS 2 learning models have quite similar effective contributions, that is, the greatest value of effective contribution is given by the metacognitive skill predictor. On the other hand, in the TPS and RQA learning models, the greatest effective contribution is given by the cognitive learning result predictor. Based on the results of five multiple regression analysis, it can be concluded that the total effective contribution to the criterion is in fact less than 50%; metacognitive skills altogether with cognitive learning results only give the effective contribution to student character less than 50%. Maybe it is too far from any expected results.

DISCUSSION

The results of the data analysis in relation with the five learning models show that there is a positive correlation between metacognitive skills and cognitive learning results with the students' character. There has been a research before studying the correlation between students' metacognition, attitude and academic achievement [1]. The findings of the research show that metacognition and attitude are proven as good predictors of students' academic achievement. Furthermore, it is explained too that no matter how skilled and how well the students' metacognition is, if the students do not have the intention/attitude to be actively involved in learning, they are considered as not activating their cognitive processes. Thus, the empowerment related to metacognition, cognition and attitudes needs to be optimized to achieve good academic success.

There are also two researches studying the correlation between metacognition and affective processes [21, 22]. The affective processes studied by one of the two researches are more related to a person's emotions. Furthermore another analysis suggests that metacognitive activities are directed at setting someone's cognitive activities and affective activities [23]. It will relate to a person's success in learning. For example, in relation to the task of learning, someone who uses his metacognitive skill will monitor his learning process, plan, analyze the learning difficulties and find out solutions to any of his learning problems.

There is also an explanation saying that the cognitive aspect in learning is associated with the person's thinking process, such as honing their knowledge, comprehension, application; while affective aspect is associated with feelings, emotions during the learning [24]. Another explanation say that it is very important to note that the self-regulating learning plays an important role in relation to the affective domain [25]. Furthermore it is explained that there are three components of self-regulated learning, namely expectancy, value, and affective components [26]. There are another explanation more state that in order to achieve good academic success, a student must be actively involved in the learning process, as well as must be able to plan, monitor, manage and control his/her cognitive processes, attitudes and behavior [2][27]. An ability of someone in controlling any of his/her cognitive processes requires metacognitive skills.

There is a reference states that metacognition is thinking about thinking [28]. In other words metacognition is a cognitive or mental activity that is important to solve problems [29]. There is another reference stating that metacognition is a fairly complex concept consisting of knowledge, beliefs, assessing

strategies, monitoring or controlling cognition [21]. Furthermore, it is explained that the role of metacognition is related to attention, examining, planning, thinking, defining strategies, and evaluating errors during work. In other words, by using metacognition, someone will be able to solve complex problems.

One of the characteristics of individuals which can influence their learning process is the attitude [1], because affective attitude is the predisposition to make certain choices or to behave in a certain way [30]. Attitude can cause changes in someone's behavior. As a component of the affective domain, attitude has a correlation with the cognitive, social and emotional orientation of students [31]. It has been revealed too that there is a positive correlation between students' attitudes and their academic achievement [32]. Furthermore, there is an argument saying that in order the students can achieve good academic success, they must demonstrate the regulation of cognition and behavior [27]. It is explained too that in order to become independent learners, someone must have metacognitive skills, and cognitive skills as well as a good attitude, so that the learning process runs effectively.

The results of the data analysis reveal that the magnitude of the effective contribution of the predictors (metacognitive skills and cognitive learning results) to the students' character is less than 50%. In RT and TPS 2 learning models, the greatest effective contribution to the student's character is given by the metacognitive skill predictor. On the other hand in RQA and TPS learning models, the greatest effective contribution to the student's character is given by cognitive learning result predictor. This results show an inconsistency of effective contribution of the predictors. In some learning activities, metacognitive skills tend to give the greatest contribution, while in some other learning activities, cognitive learning results tend to give the greatest effective contribution to the student's character.

The difference in the results may be caused by the use of the learning model implemented by the teachers during the learning process in the classroom. Different learning models will have a different syntax. This condition may cause the differences in the results of the empowerment of metacognitive skills, cognitive learning results and the students' characters. However, in this research the results of the TPS learning models in no. 2 and in no. 5, appear to be inconsistent. Thus, learning models are not the only factor causing the result inconsistency of this research; there are other factors which are not measured in this research which might have also affected the empowerment of metacognitive skills, cognitive learning results, and students' character.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of data analysis and discussion, it can be concluded that there is a correlation between metacognitive skills and cognitive learning results with the students' character in the five learning models implemented. The results of the multiple regression analysis show that effective contribution of metacognitive skills and cognitive learning results to the students' character in each learning model respectively is 18.8%, 37.8%, 31.4%, 24.6% and 24.8%. It can be concluded that the contribution of the predictor variables (metacognitive skills and cognitive learning results) to the students' character is still relatively low (less than 50%). Based on the results of this research, it becomes imperative to make improvements in learning which aims to hone the students' skills in all the cognitive, affective and psychomotoric aspects.

This research is only limited to the samples at the level of senior high school students. To obtain more information through empirical data, similar research should also be conducted on the students who are at the elementary school level and junior high school level, or even at the university level. In addition to metacognitive skills, cognitive learning result, and students' character, the other variables which are still associated with the students' cognitive, affective, and psychomotor aspects need to be examined too.

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