

Implementation of Constructivist-Metacognitive Learning Based on Character Education on Student's Metacognitive Ability

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DOI: 10.18326/hipotenusa.v4i1.7243

Article submitted : April 20, 2022
Article revised : May 25, 2022
Article accepted : June 1, 2022

Abstract

This study aims to determine how much influence the implementation of constructivist-metacognitive learning based on character education has on students' metacognitive abilities in mathematics. The research approach carried out in this study is quasi-experimental, where the population in this study is class VII students of SMP Negeri 5 Wonomulyo, by taking simple random sampling samples obtained in this study are students of class VII A as the experimental class and class VII B as control class. The instrument used in carrying out the research is a student's metacognitive ability test. The metacognitive ability data obtained were analyzed using descriptive and inferential analysis, descriptive analysis showed that the students' metacognitive ability data were in the high category, while the results of the inferential analysis for the prerequisite test were obtained that the data were normally distributed and homogeneous, then continued with independent sample t-data analysis. The test shows that the average metacognitive ability of students with the application of constructivist metacognitive learning based on character education is greater than the average metacognitive ability of students without the application of constructivist-metacognitive learning based on character education. So it can be concluded that the application of constructivist-metacognitive learning in mathematics learning is effective in improving students' metacognitive abilities.

Keywords: *constructivist-metacognitive, character education, metacognitive ability*

INTRODUCTION

Mathematics is one of the subjects that are less attractive to students (Firdaus, 2019; Herzamzam, 2018). This also happens to Class VII students of SMP Negeri 5 Wonomulyo. Based on the results of interviews with mathematics teachers at the school, it was found that students tended to not be able to do math problems correctly, this can



be seen from the data from the math test results obtained an average value of 65.67 with an average value below the KKM 75. This is because students tend not to be able to relate contextual problems to mathematics, so students feel a lack of benefits in studying mathematics. The selection of the right learning model is also rarely implemented in learning, teachers tend to carry out teacher-centered learning, even though the government has launched a curriculum that encourages teachers to implement student-centered learning.

One alternative that can improve student understanding is through student-centered learning. In student-centered learning, students are the owners of their learning (Lee & Hannafin, 2016). According to Harmon (Wahyuni, 2021) student-centered learning is learning where students carry out activities together or individually in order to solve problems, become active participants during learning, not passive who only receive information.

Student-centered learning is highly recommended to be carried out considering that through student-centered learning, opportunities and facilities are obtained to build knowledge independently so that students will gain in-depth understanding which will have an impact on improving the quality of students (Andrianti, 2014). Student-centered learning environments provide interactive, complimentary activities that enable individuals to address their unique learning interests and needs (Lathika, 2016). Student-centered learning is about getting students thinking, talking and doing in that they are positioned and cognitively active participants who are entitled to disciplinary knowledge (Hoidn & Reusser, 2021).

Metacognitive skills as one of the life skills need to be empowered in students, with the hope that students will be able to master concepts better so that they can improve learning outcomes and improve the quality of education (Sholihah et al., 2016). Metacognition is a person's awareness of how he learns, the ability to assess the difficulty of a problem, the ability to observe his level of understanding, the ability to use various information to achieve goals, and the ability to assess the progress of his own learning (Lestari et al., 2019). Metacognitive skills can improve student learning and understanding (Zubaidah, 2016). Metacognitive skills in the learning process are characterized by a person's ability to make a pleasant experience with what will be done, monitor progress in learning, and evaluate learning outcomes (Supriatna & Alawiyah,

2019). Metacognitive knowledge and skills can be honed and developed through learning teaching materials in order to support the success of a learning. The teaching materials used should be interesting and able to hone students' metacognitive knowledge and skills, an alternative that can be done is by using activity-based teaching materials, one of which is constructivist-metacognitive-based teaching materials, where students can construct their own knowledge and can practice metacognition skills owned (Hapsari & Widodo, 2016).

Constructivist-based learning views learning is not a memorizing process, but a process of constructing knowledge. In the process of constructing knowledge, students are required to be able to formulate hypotheses, test hypotheses, manipulate objects, solve problems, dialogue, research, seek answers, express ideas, ask questions, and reflect on themselves (Prayitno & Sugiharto, 2017). Constructivist-metacognitive learning was developed by integrating Piaget's personal constructivist character, Vygotsky's socioculturalism, and strengthened by metacognitive strategies. In constructivist-metacognitive-based learning students will be guided to plan, monitor, and evaluate the achievement of learning objectives and strategies as a representation of the character of metacognitive strategies (Prayitno, 2014). The characteristics of constructivist-metacognitive-based teaching materials are (a) presented with certain themes, (b) the teaching materials used will be more meaningful for students due to the knowledge construction process carried out by students and connecting them with other concepts that have been previously understood, (c) improving students' thinking skills and mastery of concepts, (d) training independent learning, and (e) emphasizing student self-monitoring and responsibility, so that they can plan, monitor, and evaluate learning objectives (Hapsari & Widodo, 2016).

The advantage of constructivist-metacognitive-based learning is that it can empower students' thinking skills, namely metacognition skills. Students are required to find and construct their own knowledge through constructivist activities. This knowledge construction activity will help students to know their cognition position in constructing knowledge, so that students' metacognitive skills are empowered through self-reflection, re-planning, re-monitoring, and re-evaluating their learning activities (Anggraeni et al., 2016). Based on the results of research conducted in 2016 it was concluded that the use

of constructivist-metacognitive-based teaching materials in increasing metacognitive knowledge and skills met the effective criteria (Hapsari & Widodo, 2016).

In addition, character education is also one of the most important things for teachers to carry out in the classroom, considering that along with the times and the shift in eastern culture with the internalization of western culture, it is not uncommon for students to behave less in accordance with proper Indonesian culture, with a shift in values. These cultural values are very important for teachers to provide character education to students that can be done during class learning. Character is the behavioral values of a person or group of people related to God Almighty, oneself, fellow human beings, the environment, and nationality which are manifested in thoughts, attitudes, feelings, words, and actions based on religious norms, laws, governance. manners, culture, and customs (Sudarsana, 2015). Character can also be interpreted the same as morals and character (Laksana, 2016). People who have character are people who have personality, behavior, character, and character so that in other words character is a characteristic that distinguishes a person from others (Handayani, 2016).

Character education in students can be instilled through the example of the academic community through disciplined, creative, and critical behavior, besides that character education is integrated into the courses taught (Widayanti & Hakim, 2017). Based on the understanding of character education that has been described, it can be concluded that character education is an effort made in shaping the human personality for the better which needs to be instilled from an early age to adulthood. Character education is very important so it should be integrated in learning activities.

The results of research conducted in 2016 concluded that the implementation of metacognitive-based learning tools can develop students' independent character (Mursali, 2015). Metacognition is the ability to think where the object is the thought process itself. In the context of learning, students understand how to learn, know their learning abilities, and know how the best learning strategies are carried out. Metacognition as a form of ability to know one's own abilities so that what is done can be controlled. Students who have metacognitive abilities are aware of their strengths and limitations in learning. That is, students know the mistakes they have made, they are aware and try to fix them (Sastrawati et al., 2011).

Schoenfeld stated that problem solving is a process from understanding to planning problem solving and implementing it. Awareness in solving problems is very important because with this awareness it can be known whether the completion process used is correct and the extent of its truth, and can be evaluated where the error lies whether the error lies in a conceptual or procedural error. This awareness is referred to as metacognition (Amir & Kusuma W, 2018).

Metacognition is different from cognition, for example, the ability to read a question is different from monitoring understanding of the question. It is called metacognition when students try to reflect on the cognitive processes they do. Thus the activities of planning the approach given in learning tasks, monitoring abilities, and evaluating planning are the natural properties of metacognition (Widadah et al., 2013).

Anderson & Karthwohl stated that metacognitive knowledge is knowledge or one's self-awareness about the ability that cognition has. Flavell states that metacognition consists of two, namely metacognitive knowledge and metacognitive experience. Metacognitive knowledge relates to personal variables, task variables, and strategy variables, while metacognitive experience relates to the use of strategies or can be called metacognitive settings (Alfiyah. N & Siswono. T.Y.E, 2014). Metacognitive ability indicators are presented in table 1 as follows:

Table 1. Indicators of Student Metacognition Skills in the Steps of Problem Solving

Metacognition Skills	Indicator
Developing Planning	<ul style="list-style-type: none"> a. Write down what you know and ask b. Able to set goals c. Able to get the solution d. Able to find the relationship with problems that have been solved e. Know the reasons for using written notation
Implementation Monitoring	<ul style="list-style-type: none"> a. Convinced of the correctness of the steps used b. Setting results c. Carry out the procedure steadily d. Check the correctness of the steps taken e. See a different way f. Analysis of the suitability of planning and implementation of completion
Evaluating Action	<ul style="list-style-type: none"> a. Check the advantages and disadvantages of the steps that have been taken b. Doing it in a different way c. Can apply the steps used for other problems

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- d. Pay attention to your own way of working
 - e. Evaluating goal achievement
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METHOD

This study uses a quantitative approach with the type of experimental research with a Quasi Experimental Design. This research has a control group, but does not fully function to control external variables that affect the implementation of the experiment (Sugiyono, 2016).

The quasi-experimental design used is a nonequivalent control group design. This study will use two class groups, namely the experimental class group and the control class group. In the experimental class, treatment will be given (X1), namely a constructivist-metacognitive learning model based on character education and in the control class it will be applied (X2), namely without constructivist-metacognitive learning based on character education.

Table 2. Nonequivalent Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	O ₁	X ₁	O ₂
Control	O ₁	X ₂	O ₂

Information :

X1: Constructivist-metacognitive learning based on education character

X2: Learning without constructivist-metacognitive learning based on character education.

O1: pretest

O2: posttest.

The population in this study were all students of class VII SMP Negeri 5 Wonomulyo, with simple random sampling technique obtained a sample of Class VIIA consisting of 23 students as the experimental class and class VII B as the control class consisting of 24 students.

The procedure in this study is divided into 3 stages, namely: the preparation stage, the implementation stage, and the data collection stage. The three stages are described as follows:

1. Preparation stage

This section will discuss the stages of preparation in research, including the following:

- a) Prepare learning tools (RPP)
- b) Prepare the instrument, the instrument used is a student's metacognitive ability test which has previously been tested for validity and reliability. The validity test was carried out using the product moment correlation technique with the results obtained that all questions were valid. Meanwhile, the reliability test was carried out using the Spearman Brown technique with a value of 0.863 which is greater than 0.70 which means that the test instrument used is reliable.

c) Determine the sample

2. Implementation stage

In this section, we will discuss the implementation stages in the research, including the following:

- a) Before carrying out learning, students in the experimental class and control class were given a pretest consisting of 6 questions that measured students' cognitive abilities.
- b) Implementation of learning, applying constructivist-metacognitive learning in the experimental class, and without the application of constructivist-metacognitive learning in the control class.
- c) At the end of the research, each student in the experimental class and control class was given a posttest with the same form as the questions given in the pretest.

3. Data analysis and conclusions stage, in this section data analysis is carried out on the data obtained

Data about students' metacognitive abilities were obtained through the students' metacognitive ability test sheets given before and after the implementation of learning. The test sheet is made by referring to the indicators of students' metacognitive abilities.

Descriptive statistical data analysis aims to describe the cognitive learning outcomes of mathematics obtained after following all subject matter in both the experimental class and the control class which consists of the average value (mean), median, mode, standard deviation, and variance.

Inferential data analysis used the independent sample t-test test technique on the posttest scores in the control class and the experimental class, which previously had prerequisite tests related to normality and homogeneity tests of posttest data.

RESULTS AND DISCUSSION

Descriptive data analysis was carried out on the metacognitive ability scores of students in the experimental class and control class, the presentation of which can be seen in table 3 below:

Table 3. Pretest Score Data for Experiment Class and Control Class

Data	Experiment Class	Control Class
Maximum	42	41
Minimum	9	7
Mean	21,0000	20,1667
Median	20,0000	20,0000
Mode	23,00	13,00
Standar deviation	7,18584	8,11154
Variancy	51,636	65,797

Based on the pretest data table of students in the experimental class and control class, the average metacognitive ability of students in the experimental class is higher than the average metacognitive ability of students in the control class. Meanwhile, data on students' metacognitive abilities after the application of constructivist-metacognitive learning based on character education is presented in the following table:

Table 4. Posttest Score Data for Experiment Class and Control Class

Data	Experiment Class	Control Class
Maximum	97	96
Minimum	64	43
Mean	80,8696	64,8333
Median	81,0000	61,0000
Mode	70,00	61,00
Standar deviation	10,35859	15,34719
Variancy	107,300	235,536

Based on the posttest data table of students in the experimental class and control class, the average metacognitive ability of students in the experimental class is higher than the average metacognitive ability of students in the control class.

The results of the inferential analysis that begins with the prerequisite test, namely the posttest normality test in the experimental class and control class, whose test results are presented in table 5 below:

Table 5. Normality Test Calculation Results

Number	Class	Sample	Sig.	Result
1	Experiment	23	0,165	Normal distribution
2	Control	24	0,076	Normal distribution

Having concluded that the data is normally distributed, then proceed with the homogeneity test. The homogeneity test was conducted to determine the homogeneity of the two samples, namely the experimental class and the control class. To test the homogeneity of the data, the researcher used the help of the SPSS 20 application. The results of the homogeneity test of the data for the control class and the experimental class were as follows:

Table 6. Homogeneity Test Calculation Results

Test	Sig.	Result
<i>Postest</i>	0.242	Homogent

Based on table 6, the result of posttest at experiment class and control class is homogeneous. it was found that the students' metacognitive ability data was homogeneous and could be continued at the hypothesis testing stage. The following are the results obtained from the calculation of the hypothesis test.

Table 7. Hypothesis Test Calculation Results

Independent Samples Test				
Levene's Test for t-test for Equality of Means				
Equality of Variances				
		Sig.	Df	Sig. (2-tailed)
Hasil	Equal variances assumed	.242	45	.000

Based on table 7, the results of the Sig (2-tailed) experimental class and control class are 0.000 which is smaller than the 0.05 significance level, which means that the average value of the experimental class is higher than the average value of the control class after being given treatment. So, it can be concluded that the metacognitive ability of students who get constructivist-metacognitive learning based on character education is higher than without the application of constructivist-metacognitive learning based on

character education. This is in line with the results of research conducted by Hapsari & Widodo (2016) which concluded that metacognitive constructivist-based teaching materials are effective for improving students' metacognitive skills.

CONCLUSION

The metacognitive ability of students who are taught by applying constructivist-metacognitive learning based on character education is higher than the metacognitive ability of students who are taught without applying constructivist-metacognitive learning based on character education. This shows that the application of constructivist-metacognitive learning based on character education is effective in improving students' metacognitive abilities.

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