

Secondary School Students' Character Values in Mathematics

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Abstract: Character values in learning process are not only a responsibility of specific subjects such as civic education and religious subject. Mathematics is one of compulsory subject that can inculcate character values in secondary school students. This study is a qualitative research which aims to describe students' character values in solving problems about linear equations. The research subjects were eighth grade students in Palembang. The instrument used was students' worksheet, observation, and interview which were analysed descriptively. The results of data analysis showed that the character values that appear in linear equation material are hard work, curiosity, communicative, and thorough. Those values appear because 3 topics in linear equation material namely graph, gradient and line are interrelated so that these cause students to work hard in solving linear equation problems, actively to express their opinions in the discussion and to ask each other because the steps of the student worksheet provided.

1 INTRODUCTION

Basically, the purpose of education is to foster humans into true human beings who are noble characters both thoughts and feelings or in other words that it humanizes humans (Olim, 2010). One way to shape the nature of self as an intelligent and autonomous human being who are able to do the best for themselves and the environment, is character education (Hidayati, 2018). It is a source for soft skills such as politeness, harmony and progress. This is also the forerunner to obtain number of hard skills such as vocational skills supporting self-confidence and meaningfulness in life (Islami, 2016). Character values should be instilled in students so that they are able to apply in their lives both in their families, schools, communities and countries so that they can make a positive contribution to their environment (Hamzah, 2017). Character education can be integrated in learning on each subject including Mathematics. Teaching mathematics is not only about transferring mathematical knowledge but also building and sculpting characters (Aisyah, 2014).

Many prior studies mentioned that character values are important to be internalized into teaching and learning activity (Marlina, 2016; Rahima, 2018; Wahyu, 2018, Wisudariani, 2018). According to (Hidayati, 2018), character values need to be internalized since early childhood education.

Furthermore, in his study, Putra used traditional games in non formal educational institution to develop students' character values (Putra, 2018). The other one also used history of physics as media in his instructional activities to internalize character values in physics education (Hindarto, 2018). In mathematics education, most of mathematics teachers are infrequently aware of teaching values either explicitly or implicitly although they mostly appear implicitly in mathematical instructional activity (Bishop, 1999). There are several character values that can be developed through mathematics learning, namely discipline, honesty, hard work, creative, curiosity, independent, communicative and responsibility (Aisyah, 2014). However, there were still less studies describing what kind of character values that appear in mathematics teaching and learning. It makes a gap between teacher's understanding and teacher's efforts to inculcate character values to their students if teachers never know what students' character values that appear when instructional activities happen. Thus, this study purposed to give description about students' character values in mathematical instructional activities.

2 METHOD

This study is a qualitative research that aims to describe secondary school students' character values through mathematics. It is a kind of studies that investigate the quality of materials, activities, situations or relationships (Edo, 2013). The study was conducted in SMPN 17 Palembang which involved 32 eighth grade students.

The procedure in this study consists of 3 stages, including the preparation stage, namely preparing and compiling research instruments in the form of lesson plan, student worksheet and observation sheet; the implementation stage which is carried out 3 times; and the data analysis stage. Data in this study were obtained through student worksheet, observation, and interview. Student worksheet is used to obtain any students' Hard Work value and Careful value. Observation is used to obtain Hard Work value, Curiosity value, Communicative value and Thorough value. Interview is used to support data collected from student worksheet and observation.

3 RESULTS AND DISCUSSION

At preparation stage, teacher designed lesson plan and student worksheet for 3 meetings before having her class. Then, at the next stage, teacher did instructional activities based on lesson plan that was made and gave students worksheet containing some mathematical problems to students. The mathematical topic studied for those 3 meetings was about linear equation. During learning process, students were observed to figure out what character values that appear both when they work individual or work in group. The instruments used were student worksheet, observation and interview. At the next stage, after data were collected then the data were analysed. These followings are description about the character values that appear when teaching and learning linear equation happened in the class.

At the first meeting, students were given student worksheet containing about drawing a graph of a linear equation on the coordinate axis. Then, they were asked to solve all of mathematical problems given. Below is one of the students' work in the first meeting.

Student's work in Figure 1 shows that he did calculation correctly. He could find out the corresponding pairs of x and y by doing substitution the value of x or y . The way students did calculation

without errors shows that there is a thorough value in his performance.

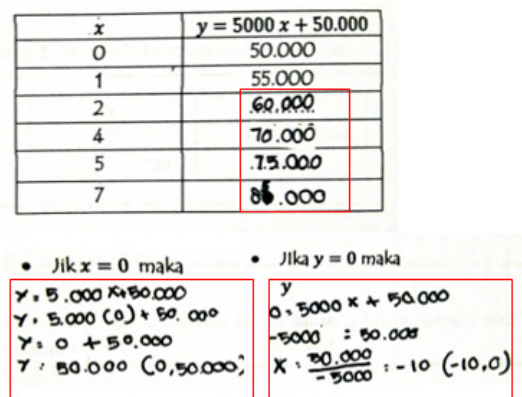


Figure 1: Students' work in calculating x and y values.

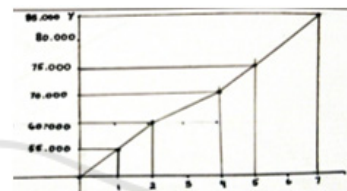


Figure 2: Students' work in drawing graph of linear equation.

Figure 2 shows that the student filled in all the blanks in the table so that he could draw a graph based on the requested equation. The number in the table, he got from calculation showed in figure 1. From what he did, it shows that there was hard work value in his learning process since he tried to solve the problem until he got the results.

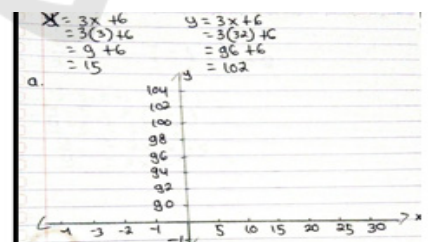


Figure 3: Students N's work on linear equation problem

However, there was also students who did not work on all the problems given and did not find the result. One of them is showed in figure 3. It shows that hard work value did not appear in student N's learning process.

In the next meeting, students learn about determining gradien of linear equation. Similar with the first meeting, students were given some

mathematical problems related to gradien and were asked to solve them.

Jawab:

$A(-3, 4), D(4, -2)$

$MBC = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{4 - (-2)}{4 - (-3)}$

$= \frac{4 + 2}{4 + 3}$

$= \frac{6}{7}$

Figure 4: Students' work in determining gradien

From Figure 4, it can be seen that students were careful in working on questions. In the red box the student used mathematical symbols correctly and performed the calculation operation properly and correctly. This indicates that there was a thorough value in their learning process because there was no mistakes in their work.

$X = 1 \Rightarrow Y = 250.000.000 - 100.000.000 X$

$Y = 250.000.000 - 100.000.000 (1)$

$= 250.000.000 - 100.000.000$

$= 150.000.000$

$X = 2 \Rightarrow Y = 100.000.000 - 100.000.000 X$

$= 100.000.000 - 100.000.000 (2)$

$= 100.000.000 - 200.000.000$

$= -100.000.000$

$= (2, -100.000.000)$

Figure 5: Students' work in determining gradien

In Figure 5, it shows that the student was not careful in solving mathematical problem in the worksheet. He made mistake in rewriting linear equation form.

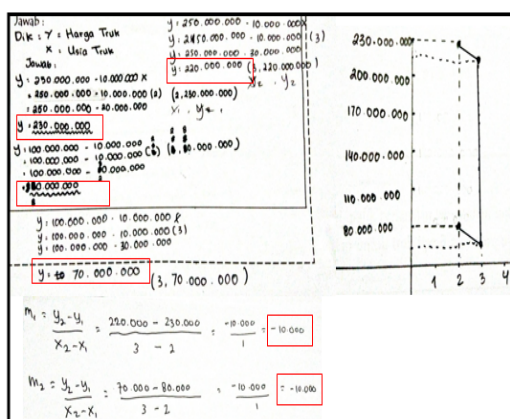


Figure 6: Student D's work on linear equation problem

Figure 6 shows that student D worked on all steps on student worksheet to find the results even though there are results that are not right. This shows that there is a value of hard work on the student D because he worked on all the problems given and not easily gave up in solving each problem until he found the results.

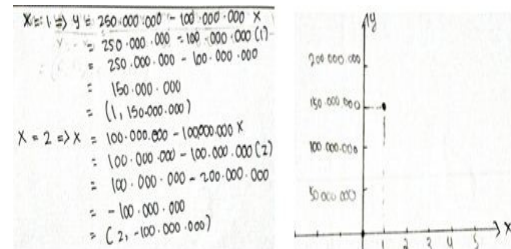


Figure 7: Students' work in linear equation problem

Students' work on Figure 7 shows that the student did not draw graph of linear equation in the worksheet. This indicates that there was no hard work value in his performance learning process.

After students learnt about drawing graph and determining gradien of linear equation, they discussed about how to determine linear equation. One of them was about determining linear equation if two points were known.

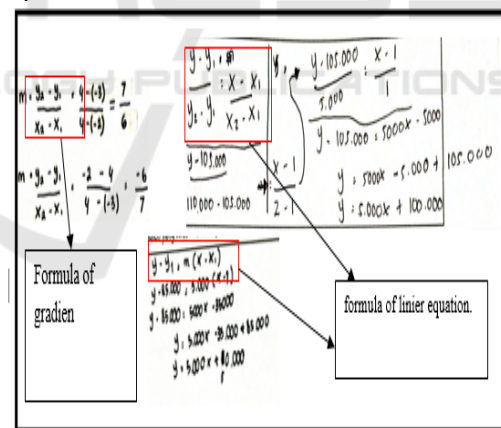


Figure 8: Students D's worksheet in determining linear equation.

It can be seen from figure 8, in working on linear equation problem, students need formulas to solve the problem. Thus, students must find out the formula in order to complete it. The emergence of curiosity is supported by the result of the following interview.

Teacher: When you work on the worksheet, did you open the book?

Student D: Yes mam, I opened a math book, and also when you explained on the board I noted it in the notebook so I looked at the notebook too.

Teacher: Did you also ask me too?

Student D: Yes Mam, sometimes I knew the formula but I didn't know how to use it.

From interview above, it can be seen that student D tried to find out how to solve the problems on the student worksheet. Student D also used books as a source to find out the information sought. In addition, Student D also asked the teacher how to use the formulas obtained. Based on all results of observations and interviews described above, it can be seen that student D raises the indicator of curiosity values.

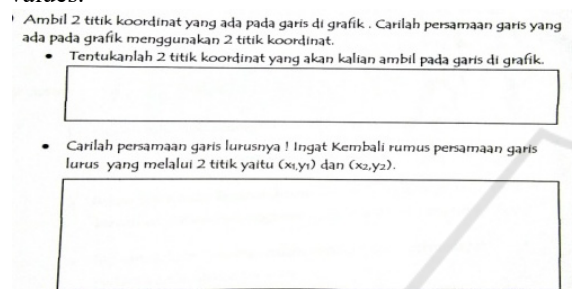


Figure 9: Students' work in determining linear equation.

There as also students that had no curiosity value in there learning process showed in figure 9. That students did not solve mathematical problem in the worksheet. It because they did not know the formula of linear equation and did not ask teacher. It was also supported by the following interview.

Teacher: Did you post question when you solved the problem in this worksheet ?

Student N: No, I did not mam. I do not dare to do that.

Teacher: If so, did you ask a friend or open a book?

Subjek N: No, I did not.

According to interview above, student N did not ask the teacher, friend or looked a mathematical book. This indicates that student N did not try to find out how to solve the problem . It shows that curiosity value did not appear in his learning process.

$$\begin{aligned}
 y_2 - y_1 &= m(x - x_1) \\
 y - 105.000 &= 5000(x - 1) \\
 y - 105.000 &= 5000x - 5.000 \\
 y &= 5000x - 5.000 + 105.000 \\
 y &= 5000x + 100.000
 \end{aligned}$$

Figure 10: Students' work in determining linear equation.

In Figure 10, it can be seen that students was correct in looking for results of operations. In addition, they were also correct in writing mathematical symbols. It can be said that students were careful in solving the problem given.

$$\begin{aligned}
 y - y_1 &= m(x - x_1) \\
 y - 5 &= 2(x - 1) \\
 y - 5 &= 2x - 2 \\
 y &= 2x - 2 + 5 \\
 y &= 2x + 3
 \end{aligned}$$

Figure 11: Student P's thorough value in determining linear equation

Figure 11 shows that student P made mistake in counting. Student P was not accurate in multiplying so the result was wrong. This shows that thorough value did not appear in his work in determining linear equation.

From mathematical instruction activitiesdone from the first meeting until the third meeting that discussed about graph, gradien, and linear equation. Character values that appeared in those mathematical instruction activities were hard work value, thorough value, curiosity value, and communicative value.

According to (Bishop, 1999), hard work means the spirit of never giving up and following strong and steady beliefs in achieving dreams and ideals. To see the character value of hard work on linear equation material, it can be seen from the students' work in solving problems where students do not easily give up in finding the correct results.

Thorough is an attitude in carrying out investigation, analysing data, and drawing conclusions (Aisyah, 2014). Thorough value on linear equation material can be seen when students were correct in using mathematical formulas, not careless in performing operations, and not mistaken in writing symbols or mathematical notation. The value of thorough is important in mathematics because mathematics is a subject that uses many symbols and operations. Linear equation material is a material that uses formulas and symbols such as gradient symbols, gradient formulas, and linear equation.

Curiosity is an attitude and action of students who have a strong desire to know, to explore, and to investigate deeply and widely something that is learned, seen, and heard and they tries to dig it not only from one source (Aisyah, 2016). The value of curiosity in linear equation material can be seen when students ask the teacher or friend how to solve the

problems in the linear equation material such as how to draw graphs, how to find gradients, and how to find linear equation. Besides asking the group of teachers and friends, students also use some learning resources or look back at the material that has been studied that relates to linear equation such as algebraic material and Cartesian coordinate material.

Communicative value is an attitude or action that relates to other people in which there is easy-to-understand communication so that a pleasant atmosphere in collaboration (Chin, 2001). The value of communicative characters in linear equation and algebra operations can be seen when students actively answer when the teacher asks, students actively discuss with their friends in completing group assignments and express their opinions on the issues discussed. In teaching and learning linear equation, teacher asked students to make groups to work on student worksheet. Then, they discussed with their group. When working on student worksheet, student D discussed with his group friends. In addition, student D also helped when his friend was in distress, student D helped his friend to understand the steps of student worksheet. Then, when teacher asked students to come forward in discussing what was done in the student worksheet, student D volunteered to write or give an opinion about the issues discussed. Based on all results of observations described, it can be seen that student D raises communicative value indicators.

There are 3 main topics in linear equation material namely graph, gradient and linear equation. In the matter of linear equations, geometry is studied with algebra as a calculation tool. To study gradients, students must master the arithmetic operations on integers and fractions. To draw graphics, students must master the location of points on the Cartesian plane and the relation and function. To determine linear equation, students need mastery of algebraic operations and the completion of one variable linear equations. From the results, it was found that in studying linear equation, the character values that often arises were work hard and communicative value. This is because 3 topics in linear equation material are interrelated so that there are so many questions and more steps that must be done. This causes students to work hard in solving linear equation problems. In this case, students will actively express their opinions in the discussion and ask each other because the steps of the student worksheet work on linear equation. In addition, linear equation material is quite difficult because it deals with graphs, cartesian fields, and algebra. Because cartesian and algebraic coordinates have been studied before

entering the material of linear equation, students feel familiar with linear equation material so that students become more active in expressing their opinions.

5 CONCLUSIONS

In this study, it can be concluded that the material of mathematics subjects affects character values that appear. In the material of linear equation there were four character-values that appear, namely the character value of hard work, curiosity, communicative and thorough. This happened since 3 topics in linear equation material namely graph, gradient and linear equation are interrelated.

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