ANALYSIS OF MATHEMATICS LITERACY, LEARNING CONSTRUCTIVISM AND CHARACTER EDUCATION

(Case Studies on XI Class of SMK Roudlotus Saidiyyah Semarang, Indonesia)

Rusmining[1], S. B. Waluya[1, 2], and Sugianto[3]

[1] Mathematics Education Study Program, Postgraduate Program, Semarang State University, Indonesia

[3]Science Study Program, Postgraduate Program, Semarang State University, Indonesia

[2] Corresponding author: s.b.waluya.math.unnes@gmail.com

Phone: +628157793646

Abstract

The research questions are: (1) how the mathematics literacy skills of the student on XI Class of SMK Roudlotus Saidiyyah Semarang on sequence and series material? (2) How the characteristics of mathematical learning in XI Class of SMK Roudlotus Saidiyyah Semarang based on the aspects of constructivism learning? (3) How the characteristics of learning mathematics XI Class of SMK Roudlotus Saidiyyah Semarang based on the aspects of character education? This study is used a qualitative approach with the method of documentations, observations, and interviews. The results showed that 12.5% of students were at level 3 with a score of 482-544 range, 33.33% of students at level 2 with a score range of 420-482, 8.33% of students at level 1 with a range of scores 358- 420, and as much as 45.83% of students are below level 1 with a score of less than 358. Based on the research results, it was concluded that the mathematics literacy skills XI Class of the student of SMK Roudlotus Saidiyyah Semarang still low, not all of the values of constructivism learning is reflected in the learning, and the character of the most prominent student responsibility rather than the character's curiosity, independent and creative.

Keywords: mathematics literacy, constructivism learning, character education

1. Introduction

One of the problems facing the education sector in Indonesia today is the poor quality of learning at every level of the education aspect. This is reflected in the relatively low average national test scores of students who achieved particular mathematics courses (Zubaidah, 2006).

One indicator that shows the quality of education in this country tends to be low is the result of an international assessment of student achievement. The results of the Programme for International Student Assessment (PISA) shows that in 2012, Indonesia suffered downgrades that ranks 64 of 65 countries with participants gaining an average score 375. Mathematics problems in

the PISA study more mathematics literacy measure the ability to reason, argue and problem solving (OECD. 2010).

Ojose (2011) defines mathematics literacy as the knowledge to know and apply the basic mathematics in our daily lives. According to Stacey (2010), mathematics literacy as a student's ability to identify and understand the role of mathematics in real life. Draper (2002), and Wong (2005) also said that mathematics literacy is the knowledge to identify and apply mathematics in everyday life. Mathematics literacy is an issue in society that should be able to access quality public education for mathematical thinking (Brewley, 2012).

The constructivists argue not just learn to memorize, but students must construct their own knowledge, and then give meaning to that knowledge. According to Draper (2002), constructivism is a philosophy or a belief that their knowledge based creative learner interaction with the environment, including interaction with other people. Suparno (1997) said that the principles of constructivism are often taken: (1) knowledge is actively constructed by the student, (2) the pressure is on students' learning process, (3) teaching is to help students learn, (4) pressure in the process of learning more on process rather than on learning outcomes, (5) curriculum emphasizes student participation, and (6) the teacher is the facilitator.

Nizarwati (2009) has showed that the constructivist approach to learning mathematics using effectively improve student learning activities. Lasati (2007) said that the constructivist approach is considered effective because it exceeds a predetermined standard effectiveness.

In spite of various shortcomings in the practice of education in Indonesia, character building is also included in the material to be taught and mastered and realized by students in daily life. Freud (in Soedarsono, 2008) said that the character is a collection of values that manifests itself in a power struggle that underlies the system of thought, attitudes, and behaviors. The development of character education is very strategic to the viability and superiority of the nation in the future. Therefore, to be carried out jointly by all teachers and school leaders, through all subjects, and become a fundamental part of the school culture. The characters are referred to in this research is curiosity, independent, creative, and responsibility.

2. Methods

The aims of this research are: describes the literacy skills on XI class of SMK Roudlotus Saidiyyah Semarang on the material sequence and series; describes learning mathematics on XI class of SMK

Roudlotus Saidiyyah Semarang review of aspects of constructivism and aspects of character education.

Data was collected by observation, interviews, and documentation. The study also involved instrument are considered by expert judgment that validates it in the form of sheets of observation, interview, and mathematics literacy test.

The method of collection data in qualitative research is valid if there is no difference between the reported researches with what actually happens to the object under study (Sugiyono, 2010: 365). Researchers use triangulation techniques of data collection techniques. Researchers used interview techniques to check the data with direct observation and documentation.

3. Results and Discussion

The results of this studied are describing students' mathematics literacy skills, describing mathematics learning defines learning in terms of aspects of constructivism which includes the learning and teaching process, as well as describing mathematics learning in terms of aspects of character education on XI class of SMK Roudlotus Saidiyyah Semarang. The details results are given as follows.

1) The ability of mathematics literacy on XI class of SMK Roudlotus Saidiyyah Semarang is very low. Based on the test results of material about mathematics literacy on sequence and series obtained the following results.
   a) Three students of 24 students or 12.5% were in level 3, with a score range of 482-544. At level 3, students can carry out the procedure properly, including procedures that require decisions sequentially. They can select and apply simple problem solving strategies. Communication capabilities, mathematizing, and devising strategic for solving problems students already good, but the reasoning ability of students is still low.
   b) Eight students from 24 students or 33.33% at level 2, with a score range of 420-482. At level 2, students can work on the basic algorithm, using the formula, carry out the procedure, or a simple convention. They are able to reason directly and do a literal interpretation. Ability representation, communication, using symbolic, formal and technical language and operations, as well as the student's argument is good enough, but the students have not been able to make problem-solving strategies.
   c) Two students of 24 students or 8.33% at the level 1, with a score range of 358-420. At level 1, students can answer the questions that context is common and known as well as all the

relevant information available to the obvious question. They can identify the information and complete the routine procedures according to explicit instruction. They can take action in accordance with the given stimuli. Capability that stands out is communication and mathematizing.

d) Eleven students from 24 students or 45.83% are under level 1, with a score of less than 358 At this level, students are not able to perform mathematical operations correctly. However, they are not able to use their math skills to solve the easiest PISA. The most prominent is the ability of communication, the students were able to write the note on the matter.

2) The ability of the mathematics literacy of students in this study in terms of content components and process components.

a) The ability of the mathematics literacy of students in component form of the completeness of the content of teaching materials gained an average score of 2.58, meaning that students have the materials /teaching materials that are less complete. Conversely, students who have little material/ teaching materials to complete the material enrichment. Students rely more on math textbooks than they should record their own material in the record books. This indicates that the component content in the learning of mathematics in schools is still low.

b) The ability of the mathematics literacy of students in the component processes from the aspects of communication, among others: the average score communication skills in discussion is 3.29, meaning that students are quite active catapult ideas during the discussion. Average score of communication skills in the presentation was 2.95, meaning that students are less active presentation, the presentation was dominated by clever students in the classroom. Communication skills in answering questions earn an average score of 2.91, meaning that students are still less communicative in answering questions. The average scores for communication skills in asking questions is equal to 2.83, meaning that students are still less communicative in asking questions. The question is usually dominated by students who are good in the classroom.

c) The ability of students classified mathematizing still lacking is only obtained an average score of 2.71, meaning that students have not been able to transform the problems of the real world into the form of mathematical or otherwise interpret the results or mathematical models to the original problem.

d) Ability to obtain representation an average score of 3.08, meaning that students are quite capable of making a representation of a problem, such as selecting and using the formula correctly.

e) The ability of reasoning and argument gained an average score of 2.54, meaning that the students' ability to reason and give reasons still low. The ability of students is rooted in the ability to think logically to perform an analysis of information to produce a reasoned conclusion.

f) The ability of devising strategies for solving problems gets an average score of 2.83, meaning that students have not been able to write problem-solving strategies to the problems given, students have not been able to complete the strategy well.

g) The ability of using symbolic, formal and technical language and operations gained an average score of 3.16, meaning that students are quite capable to write and use mathematical symbols appropriately and correctly. Students are quite capable of using a formal language in solving a given problem correctly and appropriately.

h) The ability to acquire the tools of mathematics using an average score of 3.16, meaning that students are quite capable of using mathematical tools, such as mathematical operations (addition, subtraction, multiplication, division) to solve the problems correctly.

The mathematics literacy skills of students based on mathematics literacy indicator scores are presented in Figure 1.

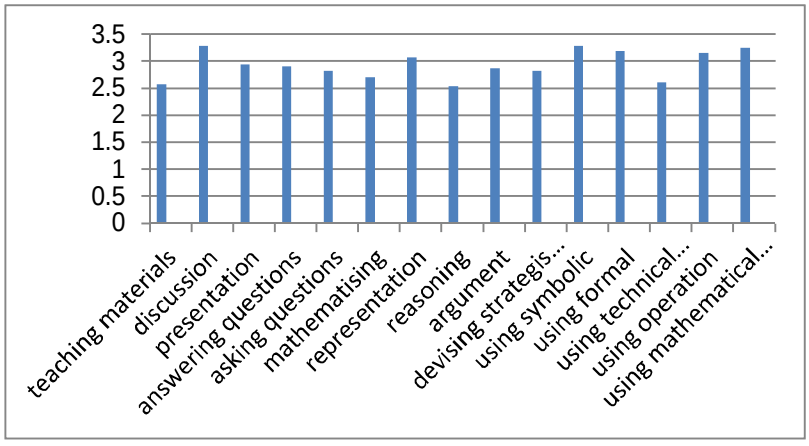

Figure 1. Compare of Mathematics Literacy Indicator Scores

3) Learning mathematics XI class of SMK Roudlotus Saidiyyah Semarang review of aspects of constructivism already run the basic principles of constructivism, namely the provision of assistance (scaffolding) and cooperative learning. Not all of the principles of constructivism is

reflected in the implementation of learning mathematics. The teacher explains the material is still active, inactive students construct their own knowledge. Students have not been able to construct knowledge for themselves. Pressure in learning more on learning outcomes, not the process of learning. Learning does not take advantage of a variety of media so that learning becomes less effective. However, for the other principles of constructivism are already reflected in the learning activities, i.e. the pressure in the learning process lies in the students, the teacher requires students to be active discussion and presentation. Teacher teaching with the aim to help students learn. The curriculum emphasizes the active participation of students, and the teacher acting as a facilitator while students learn.

4) The device has been prepared by teacher in sequence and series of learning materials including: syllabus, lesson plans, teaching materials, and assessment of learning. Among learning device that has been created by teachers, instructional media has a low score, because teachers do not make media sequence and series of learning materials. Learning assessment prepared by the teacher in the form of homework assignments and daily test. However, teachers do not make answer keys and scoring guidelines systematically, and clear. Therefore, the sequence and series of learning materials is less complete and clear. The average score of the syllabus, lesson plans, teaching materials, instructional media, learning and assessment are presented in Table 1.

Table 1. Average Score of Learning Device

Learning Device	Average Score
Syllabus	3,41
Lesson Plans	4,33
Instructional Materials	4
Instructional Media	1
Asesment of Learning	3,81

The average score of the learning device is presented in Figure 2.

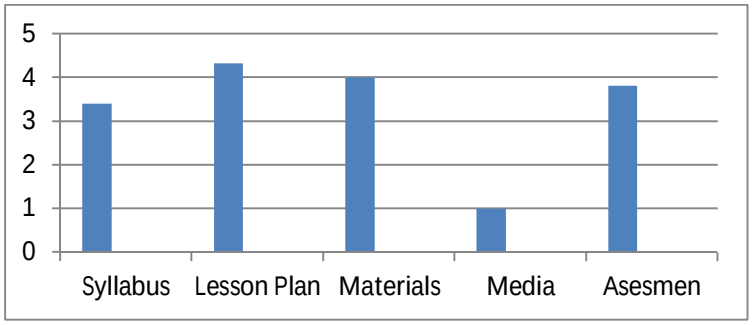

Figure 2. Compare of average score of the learning device

5) Learning mathematics on XI class of SMK Roudlotus Saidiyyah Semarang has led to the development of character education values. Value of the character is written clearly on the syllabus and lesson plans. In doing so, character education is integrated with the learning process. From the observations, the average score obtained character curiosity of 3.02, independent character by 2.63, the creative character of 2.57 and 3.86 for the character of responsibility. The most prominent character is a student responsibility. This is one of the effects of boarding school-based education that promotes religious character and responsibility. While the character of independent and creative students is still low due to the mathematical skills of students is still low. The average score of student character are presented in Table 2.

Table 2. The average score of student character

Students Character	Average Score of Students
Curiosity	3,02
Independent	2,63
Creative	2,57
Responsibilities	3,86

The analysis of the observation of the student's character is presented in Figure 3.

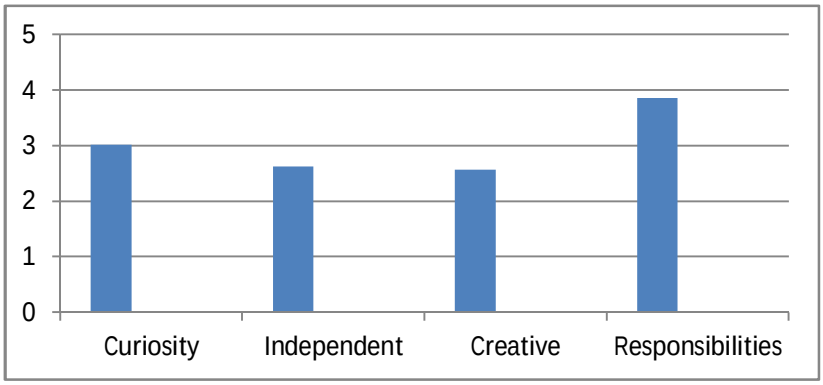

Figure 3. Compare of Average Score of Student Character

4. Conclusions and Remarks

Conclusions

Based on the results of research and discussion, it can be concluded as follows.

1) The ability of mathematics literacy XI class of SMK Roudlotus Saidiyyah Semarang very low. 12.5% of students are at level 3, with a score range of 482-544, 33.33% of students are at level 2, with a score range of 420-482, 8.33% of students are at level 1, with a score range of 358-420 , and 45.83% of students are below level 1, with a score of less than 358.
2) The ability of the mathematics literacy of students in component form of the completeness of the content of teaching materials gained an average score of 2.58, meaning that students have the materials/teaching materials that are less complete.
3) In the process components of mathematics literacy, the ability mathematizing, reasoning and argument, and devising strategies for solving problems scored lower than other aspects of the process components. This means that students' ability to create mathematical models, the ability to reason and argumentation, as well as the ability to create a problem-solving strategy is still low.
4) Not all of the principles of constructivism is reflected in the implementation of learning mathematics on XI class of SMK Roudlotus Saidiyyah Semarang. The teacher explains the material is still active, inactive students construct their own knowledge. Students have not been able to construct knowledge for themselves. Pressure in learning more on learning outcomes, not the process of learning.
5) Learning mathematics on XI class of SMK Roudlotus Saidiyyah Semarang has led to the development of character education values. Value of the character is written clearly on the syllabus and lesson plans. In doing so, character education is integrated with the learning process. Character responsibility of the student's most prominent character than a curiosity, independent, and creative.

Remaks

Based on the above research conclusions, the following suggestions can be given as follows.

1) Teachers should integrate learning into constructivism learning devices, especially in the learning activities. The basic concept of constructivism in the form of assistance (scaffolding) and cooperative learning should be written clearly and systematically on learning activities, especially in the core part of learning.

2) Teachers should provide insight into the problems of mathematics literacy to students and familiarize train students to work on the problems of mathematics literacy. Teachers should give more a matter of reasoning, argumentation, and problem solving to students, so that students' mathematics literacy skills to reach the maximum level.
3) Teachers should integrate character education in learning, from lesson planning, lesson implementation, and evaluation of learning. In the lesson plan, teachers should incorporate character education into the core of learning, especially in the learning activities. In the implementation of learning, teachers should familiarize students to be active in learning activities. While on the evaluation of learning, the teacher should prepare an appropriate evaluation tools, such as the assignment of the individual / group and daily tests to establish the character of curiosity, independent, creative, and student responsibility.

Acknowledgement. The Authors would like to thank to Y.L. Sukestiyarno for his contribution to this paper. This research is supported by Hibah Riset Desentralisasi Tim Pascasarjana Ditjen-Dikti-Indonesia, Tahun 2014.

References

Brewley, D. S. (2012). "College Mathematics Literacy Workers of The Young People's Project Chicago: A Community of Practice". *Journal of Urban Mathematics Education,* Vol. 5 No. 1, pp. 44-54.

Draper, R. J. (2002). School Mathematics Reform, Constructivism, and Literacy: A Case for Literacy Instruction in The Reform-Oriented Math Classroom. *Journal of Adolescent & Adult Literacy*, Vol. 46 No. 6.

Lasati, D. (2007). Penerapan Pendekatan Konstruktivisme pada Pembelajaran Teorema Phytagoras di Kelas 8 SMP. *Jurnal Pendidikan Inovatif,* Vol. 3 No.1, pp. 47-50.

Nizarwati. (2009). Pengembangan Perangkat Pembelajaran Berorientasi Konstruktivisme untuk Mengajarkan Konsep Perbandingan Trigonometri Siswa Kelas X SMA. *Jurnal Pendidikan Matematika*, Vol. 3 No. 2 pp. 57-72.

OECD. (2010). *The Programme for International Student Assessment (PISA). http://www.oecd.org/dataoecd/61/15/46241909.pdf* (downloaded 5 October 2013).

Ojose, B. (2011). Mathematics Literacy: Are We Able To Put The Mathematics We Learn Into Everiday Use?. *Journal of Mathematics Education,* Vol. 4 No.1, pp. 89-100.

Soedarsono, S. (2008). *Membangun Kembali Jati Diri Bangsa. Peran Penting Karakter dan Hasrat untuk Berubah*. Jakarta: PT Elex Media Komputindo kelompok Kompas Gramedia.

Stacey, K. (2010). Mathematical and Scientific Literacy Around The World. *Journal of Science and Mathematics Education in Southeast Asia,* Vol. 33 No. 1, pp. 1-16.

Sugiyono. (2010). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D.* Bandung: Alfabeta.

Suparno, P. (1997). *Filsafat Konstruktivisme dalam Pendidikan*. Yogyakarta: Kanisius.

Wong, P. (2005). Mathematical Literacy of Hong Kong's 15 Year Old Students in PISA. *Education Journal,* Vol. 32 No. 1.

Zubaidah. (2006). Efek Pembelajaran Konstruktivisme Melalui Pembelajaran Matematika di SMP. *Jurnal Pendidikan,* Vo. 7 No. 2, pp 89-100.