

Implementation of active-reflective method to analyze students' creative, communication and self-confidence abilities in mathematics learning

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Abstract. Creative ability is important for facing competition in a world that more advanced because creativity is capital to face the challenges. In addition it required communication skills to convey the creativity that will give rise to confidence with capabilities. This research aims to know the ability of creativity, communication and self confidence of the students use active-reflective learning methods. This active-reflective learning methods belonged in a good criteria. The instruments used are the creative ability test, a test of the ability of communication and the sheets of measure students affective. The results showed that students have a creative and communication capability good enough with the ability to self confidence which is also good.

1. Introduction

Mathematics has characteristics as auxiliary science in everyday life and other sciences [1,2,3]. Mathematical creative ability is the ability that important in dealing with problems in everyday life [4,5], beside that it is important also to have the communication skills to deliver the creative ideas. With creative ability and good communication it will affect the confidence that good anyway.

Creative thinking is defined as the thinking that enables students to apply their imagination to generating ideas, questions and hypotheses, experimenting with alternatives, and to evaluating their own and their peers' ideas, final products and processes [6]. Creativity includes a high curiosity, imaginative, self-confident and has a resilience in achieving his wish. Indicators used to measure this capability is fluency that includes the ability to ask, flexibility that includes the ability to generate answers varied, the authenticity that includes the ability to think of a way that is unusual in the resolution of a problem and elaboration that includes the ability to develop an idea [4,7].

Mathematics is a language that must be passed through oral or writing so the others can receive it [8]. The indicators used to measure the ability of communication are revealed real objects, situations and happenings of everyday forms of mathematics, describing ideas and mathematical models in simple language, explain and make inquiries of Mathematics [4].

Self-confidence is a feeling of trust over the capabilities of self. thus, not feel anxious to act but remaining responsible [4]. In General, confidence also have significant influence towards mathematical communication skills [9].

Creative and communication abilities can be presented in the study of Mathematics by using active-reflective method that will guide students to actively thinking and doing things through contemplation and associate content with his experience. Step by step learning method is a reflective active-that is, constructs the mind with the topics and then reflect and connect with prior knowledge, raises new

problems associated with the topic, find a variety of information supporting the solution, seeking strategies to find their own process of solving problems, proving the answer solutions to drawn the conclusion that can be justified, and apply the results of the settlement on other situations [10].

Based on the background of the problem, we want to analyze the ability of students' mathematical creative and communication through math test using appropriate indicators creative and communication abilities and contains measures active-reflective method. As for the students' ability of self-confidence measured using a questionnaire assessment [4].

2. Method

This study uses qualitative research, data analysis consists of six steps [11]. The first step is process and prepare data for analysis, the second is read the entire data, the third is start all the coding of data, the fourth is implementing a process of coding to describe the realm, participants, categories and themes that will be analyzed, the fifth is applying the narrative approach in delivering the results of the analysis, and the last is interpret data. In the third and fourth step, we did not conduct it. This research was conducted in a small group that consists of five high school students as a subject of research. High school students were chosen because the material to be tested once they get before and ability who want to be analyzed is suitable for high school students.

The collection of data in this study uses mathematical creative ability test instrument, mathematical communication ability test instrument and question form. Mathematical creative ability test that consists of a single question about statistics is a test to find out the creative ability of students, then test the ability of mathematical communication consisting of one question which is also about statistics is a test to find out communication skills of students. As for the questionnaire is to know the ability of students' confidence [4].

3. Result and Discussion

This section presents the results of the analysis of the students' answers. Tests given are two problems that contain creative ability and communication ability that includes Statistical problem. The given problems are:

1. The following data for the number of passengers the train destination of Semarang from Bandung in May-December 2017 which in its entirety totalled 15.160 people with details as follows: in May passenger numbers as many as 1.750 people, in June as much as 2.210 people. Then in a row during July-November passenger numbers as many as 2.000 people, 1.985 people, 1.700 people, 1.545 people, 1.630 people. And the number of rest are passengers in December.
 - a. Is data enough to compile into the shape of the table? If enough, then finish. If not enough, please complete the data first then make a chart about such data with your way of own!
 - b. Make the information you can on the matter of being some form of presentation of the data in the statistics!
 - c. Assemble the three questions on the statistics relating to the data on the matter, then finish your one of them!
2. "Maju Jaya" and "Sedap Rasa" is two restaurants which are located side by side. At 08.00-11.00, both those restaurants sell breakfast be Bubur Ayam and Nasi Uduk. Then 12.00-14.00 lunch menu they sell in the form of Soto and Sate. Today, the number of shoppers at home eating "Maju Jaya" are as follows: 37 people buy Bubur Ayam, 56 people buy Nasi Uduk, 73 people buy Soto and 66 people buying Sate. While in a restaurant "Sedap Rasa", the number of purchasers as many as 238 people with details as follows: 49 people buy Bubur Ayam, 32 people buy Nasi Uduk, 65 people buying Sate and the rest bought Soto.
 - a. Let the data above into the shape of a table
 - b. Explain situations that are reflected in the table with your language!
 - c. Make two questions about statistics related to the data in the table that you created, and then finish up!

\Here are the answers of one of the students for the creative ability

Lembar Jawaban

Soal berikut mengenai materi Statistika.....
 Saya pernah mempelajari materi ini saat berada di jenjang sekolah SMP kelas 9.
 Saya mengetahui bahwa penyajian data dalam statistika dapat berupa tabel, diagram batang, diagram lingkaran, dan diagram garis.....
 Dan saya mengetahui di dalam statistika terdapat Rata-Rata (Mean), Modus, Median, Kuartal, persebaran, persebaran interkuartil.....

a. Apakah data cukup? Tidak
 Jika tidak, maka data yang kurang adalah data penumpang bulan Desember.
 Cara untuk melengkapi data tersebut adalah jumlah penumpang - keseratahan Mei - Desember.
 Apakah sekarang datanya sudah lengkap? Ya/Tidak
 Apakah kamu pernah melihat bentuk tabel? Ya/Tidak
 Jika pernah, maka tentu kamu bisa membuat tabel dengan caramu sendiri. Maka sekarang buatlah tabel mengenai data yang telah kamu lengkapi.

Data jumlah penumpang Semarang - Bandung

Bulan	Jumlah penumpang (orang)
Mei	1.750
Juni	2.210
Juli	2.000
Agustus	1.985
September	1.700
Oktober	1.545
November	1.430
Desember	2.340
Jumlah	15.160

Figure 1. Answer sheet 1 (a)

Apakah kamu masih ingat, selain tabel, cara untuk menyajikan data statistika adalah dengan menggunakan Diagram batang.....

Kemudian buatlah ketiga penyajian datanya di bawah sini

1. Dengan menggunakan Diagram batang.....

Figure 2. Answer sheet 1 (b)

2. Dengan menggunakan Diagram garis.....

jumlah penumpang

Figure 3. Answer sheet 1 (c)

c. Pertanyaan yang akan kamu buat adalah:

- Berapakah rata-rata penumpang kereta api Semarang - Bandung pada bulan Mei - Desember?
terdapat
- Pada bulan apakah ~~jumlah~~ jumlah penumpang ~~adalah~~ paling banyak?
terdapat
- Pada bulan apakah jumlah penumpang paling sedikit?
terdapat

Jawablah salah satunya!

1. $\bar{x} = \frac{15160}{8} = 1895$ orang

Figure 4. Answer sheet 1 (d)

Figure 1 shows that guided by active-reflective method, to the first questions that students can determine the topic of the given problem is a statistic that once they get in middle school. Based on question that asks to make the table, students learn that in addition to the table, the presentation of the data in the statistics may also use bar chart and line chart.

Then the students are directed again to observe the completeness of the data. Students said that the data in question is not yet complete. Students can mention that the missing data is the data of passengers in December. Then the students can determine how to complete the data, by subtracting the number of passengers from May to November from the total number of passengers that are known in the problem. Based on indicators of the ability of mathematical creative, the student has fulfilled the indicator of elaboration, which is able to supplement the data so that problems can be solved.

After that students are directed again to observe the completeness of the data, once stated that the data is complete, students create tables using his own way. After creating a table, students are re-directed to observe the suitability tables are made with data that has been completed. Based on mathematical indicators creative abilities, the student has met the indicator of authenticity, which is able to create a table in its own way.

Figure 2 and Figure 3 show that After declaring the conformity between tables with the data, students continue to answer the next question which is asked to present the same data in a statistically based on knowledge in addition to tables that have been made. Based on the answers, students are able to present

data using bar charts and line charts. Based on indicators of the ability of mathematical creative, students have met the indicator of fluency, which are able to make the resolution of the problem in different ways.

Figure 4 shows, the last data question that asked students to create three questions relating to statistics based on the data available, students are able to make these three questions and answer one of them. Based on indicators of the ability of mathematical creative, students already meet the indicators of Flexibility, which are able to compose various questions and solve them.

Here are the answers of one of the students for the communication ability

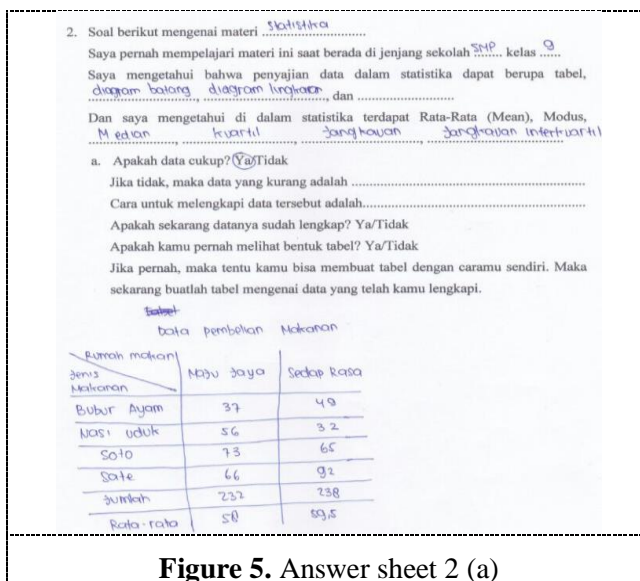


Figure 5. Answer sheet 2 (a)

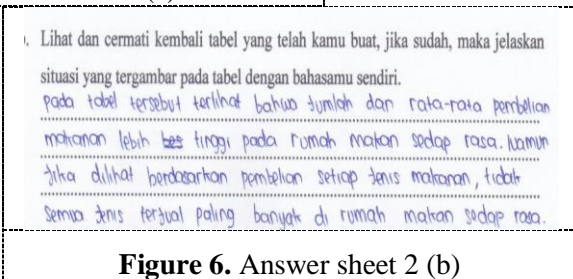


Figure 6. Answer sheet 2 (b)

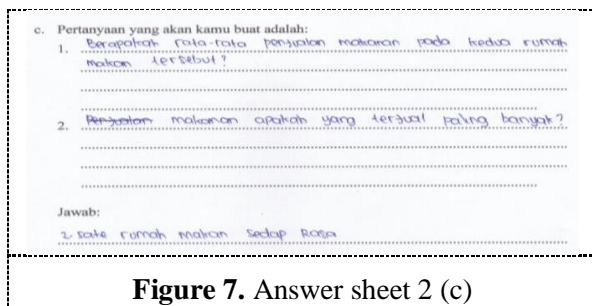


Figure 7. Answer sheet 2 (c)

Figure 5 shows that guided methods of active-reflective, on the second question, students can determine the topic of the given problem is a statistic ever obtained in junior high. Based on questions that asked to make tables, students learn that in addition to the table, the presentation of the data in the statistics may also use the histogram, bar chart and line chart. Then students directed again to monitor the completeness of the data. But in answer sheet student did not answer. Students are able to complete the data is less but not imprinted on the answer sheet.

First, students were asked to create tables based on the data available. Students are able to create tables in its own way. Based on indicators of mathematical communication ability, students already meet indicator was able to declare the situation and everyday events into the form of a mathematical model.

Figure 6 shows, after that students are directed to observe the table which he had created, then at the next question students are asked to explain the situation illustrated in the tables that have been made into its own language. Students are able to describe the tables that have been made into their own language.

Based on indicators of mathematical communication ability, students already meet the indicator capable of describing mathematical models into the language.

Figure 7 shows, the last questions, students asked to make two questions related to the created table and then complete the question. Students were able to make two questions referred and completed one. Based on indicators of mathematical communication skills, students already meet the indicators able to make math questions are studied.

Here are the results of analysis of students' self-confidence ability. The instrument used was a questionnaire containing eight positive statements and eight negative statements relating to confidence in learning mathematics. Students choose Ss (very often) at a positive statement, Ss (very often) on a negative statement, Sr (often) on four positive statements, Kd (sometimes) in the three positive statements, Kd (sometimes) on three negative statement, and Jr. (rarely) in the three negative statements, and Js (rarely) in a negative statement.

No.	Pendapat	Respon				
		Ss	Sr	Kd	Jr	Js
1.	Merasa yakin dengan jawaban sendiri saat mengerjakan soal matematika		✓			
2.	Merasa terganggu saat teman bertanya mengenai materi matematika kepada saya				✓	
3.	Merasa kesal saat orang lain mengomentari pekerjaan saya	✓				
4.	Gugup saat mengerjakan soal matematika di hadapan teman-teman			✓		
5.	Berusaha mengerjakan soal matematika sendiri tanpa bantuan orang lain	✓				
6.	Merasa malas untuk belajar matematika				✓	
7.	Mendengarkan dengan baik saat menerima kritikan atas pekerjaan saya			✓		
8.	Merasa ragu saat mengerjakan sendiri soal matematika yang diberikan guru			✓		
9.	Berani untuk bertanya kepada guru mengenai materi yang belum dipahami		✓			
10.	Merasa cemas saat diminta guru untuk mengungkapkan pendapat saat diskusi			✓		
11.	Selalu mengandalkan teman dalam mengerjakan soal matematika					✓
12.	Berani untuk mengemukakan pendapat pada saat diskusi kelas			✓		
13.	Mampu ketika diminta guru untuk mengerjakan soal matematika di papan tulis			✓		
14.	Bisa mengatur waktu untuk belajar matematika saat di rumah		✓			
15.	Merasa malu untuk bertanya saat saya belum memahami pelajaran di kelas				✓	
16.	Merasa senang saat menjelaskan materi matematika kepada teman yang bertanya		✓			

Figure 8. Questionnaire of Self-Confidence Ability

4. Conclusion

Based on this research can be concluded that (1) the creative abilities of students is good enough because students are able to meet all four indicators of creative mathematical abilities tested. (2) the communication abilities of students is good enough because the students were able to meet all three indicators mathematical communication abilities tested. (3) Active-reflective method can help students bring up creative ability and mathematical communication because students are directed to active and able to associate with the experience that can help in solving the problem. (4) the attitude of confidence of students are good in math lessons.

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6. References

- [1] Sumarmo U 2015 *Berpikir dan Disposisi Matematik Serta Pembelajarannya* (Bandung)
- [2] Redish EF and Kuo E 2014 Language of Physics, Language of Math: Disciplinary Culture and Dynamic Epistemology *Proceeding* (Cornell University Library)
- [3] Hoogland K et al 2016 *Studies in Educational Evaluation* **50** (Amsterdam: Elsevier)
- [4] Hendriana H, Rohaeti EE dan Sumarmo U 2017 *Hard Skills dan Soft Skills Matematik Siswa* (Bandung-Refika Aditama)
- [5] Valéria Švecová et al 2014 *Proc.Social and Behavioral Sciences* **116** (Amsterdam: Elsevier)
- [6] Kamplys P and Berki E 2014 Nurtury Creative Thinking *Educational Practices* **25** (France-International Academy of Education)
- [7] Hu R et al 2017 A Study on the Application of Creative Problem Solving Teaching to Statistics Teaching *EURASIA Journal of Mathematics Science and Technology Education*
- [8] Choridah DT 2013 *Peran Pembelajaran Berbasis Masalah untuk Meningkatkan Kemampuan Komunikasi dan Berpikir Kreatif serta Dsiposisi Matematis Siswa SMA Jurnal Ilmiah Program Studi Matematika STKIP Siliwangi Bandung* **2**
- [9] Ambarwati R, Dwijanto and Hendikawati P 2015 Keefektifan Model Project-Based Learning Berbasis GQM Terhadap Kemampuan Komunikasi Matematis dan Percaya Diri Siswa Kelas VII *Unnes Journal of Mathematics Education*
- [10] Yeni N 2017 Peningkatan Kemampuan Pemecahan Masalah, Komunikasi Matematis dan Self Confidence Siswa dengan Pembelajaran Metode Aktif-Reflektif *Tesis* (Bandung-Tidak diterbitkan)
- [11] Creswell JW 2017 *Research Design: Pendekatan Metode Kualitatif, Kuantitatif dan Campuran* (Yogyakarta-Pustaka Pelajar)