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ANALYSIS OF MATHEMATICAL COMMUNICATION ABILITY BASED ON LEARNING ACTIVITY AND GENDER OF MTS STUDENTS

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Abstract
This study aims to analyze mathematical communication skills based on learning activity and gender of MTs students. The research method used is a descriptive qualitative method. The total population in this study were 27 students of class VIII, consisting of 9 male students and 18 female students. This subject selection process uses the Wright Maps table in the Winsteps application. The selected subjects are 5 people consisting of 1 student who has high learning activity, 2 students who have medium learning activity, and 2 students who have low learning activity. Each level of learning activity consists of male and female gender. Selected subjects are given a description test and interview questions to analyze their mathematical communication skills. The results showed that male students have better mathematical communication skills than female students. Overall, students with male gender are able to fulfill two out of three indicators of mathematical communication skills. While students with female gender are only able to fulfill one of the three indicators of mathematical communication skills.

Keywords: Mathematical Communication Ability, Learning Activity, Gender.

INTRODUCTION

Mathematics is an abstract science that plays an important role in education (Purnama & Afriansyah, 2016). In order to achieve the desired learning objectives, mathematics learning needs to be developed, one of which is with the abilities that exist in students. According to *the National Council of Teachers of Mathematics* (Rahmawati et al., 2019) Competency standards in learning mathematics are: problem solving *(problem solving)*, mathematical *communication (communication)*, mathematical *reasoning (reasoning)*, relationships in mathematics *(connection)*, and mathematical *representation (representation)*. One of the objectives of learning mathematics is so that students can develop their mathematical communication skills clearly and effectively (Robiah et al., 2019). The learning process will run optimally if the teacher and students establish good communication. Therefore, communication skills are an important component that students must have in learning. Communication can be interpreted as an activity of delivering information either directly or indirectly that involves human relations with the environment. Communication is the foundation of teaching and learning (Alfirahmadita & Maarif, 2020). Communication can be used as a connector in mathematical concepts (Perbowo et al., 2020). The communication aspect is very necessary when learning takes place so that students can find concepts, describe, and build ideas coherently (Fauziah et al., 2018). Mathematical communication skills help students in expressing ideas or ideas they have in dealing with a mathematical problem (Rachmadini et al., 2018). Students will be able to solve problems well if they have good communication skills. Mathematical communication skills can also make students able to identify problems, design solutions, carry out completion steps, and draw conclusions from a problem (Yerizon et al., 2019). Students' understanding of learning materials can be measured by mathematical communication skills. In addition, mathematical communication skills are able to provide rational reasons in solving problems, stating a problem into a mathematical model, and describing ideas or ideas in the form of statements (Hendriana & Kadarisma, 2019). Based on the statements described above, for students mathematical communication skills play a very important role in everyday life, especially in communicating ideas or ideas in solving mathematical problems. But in reality students ' mathematical communication skills in education are still at a low level (Deswita et al., 2018; Hikmawati et al., 2019; Juhrani et al., 2017; Nurlaila et al., 2018).

One of the important factors that are thought to affect students' mathematical communication skills is the active learning of students in the ongoing learning process. Active learning is a student's effort in realizing teaching and learning activities. Student activity can be seen from the curiosity of students in getting information from anywhere, the focus of students in learning, and the readiness of students to express their opinions (Putri et al., 2019). Active learning is important in learning activities. Self-confidence is one of the factors that cause students to have active learning. This is in line with the opinion (Achmad et al., 2020) that when students' curiosity is high, they will actively ask questions in learning activities so that learning achievement will increase. According to the results of Firdawati and Hidayat's research, it is concluded that with active learning, students will understand concepts and other abilities including mathematical communication skills (Halimah & Rahmi, 2020). There are many benefits for students if they are active in class, for example, they will become people who take initiative in the future and can solve problems and many problems that occur.

Another factor that influences mathematical communication skills is gender. Gender is a term that refers to the differences between men and women that are socially formed and are innate from God. Gender can distinguish students' mathematical communication skills. According to research conducted by Amir (Babys, 2020) shows that there are differences in students' mathematical abilities that come from the gender aspect. The difference lies in the ability of students to solve spatial problems, namely male students are superior to women. Many female students do not explore their ability to think spatially. Mathematics is a subject that can develop students' brains. Many students find mathematics difficult because they have high anxiety (Luthfiyah & Hadi, 2021). Based on the results of research conducted by Suswigi, it was found that male students were classified as having mathematical communication skills with an average of 65.73% compared to female students who had an average mathematical communication ability of 57.47%. Therefore, with the development of students' brain abilities, mathematical abilities will also develop, one of which is mathematical communication skills. Based on this statement, the researcher is interested in conducting research related to the Analysis of Mathematical Communication Ability Based on Learning Activity and Gender of MTs Students. The purpose of this study is to analyze mathematical communication skills based on learning activity and gender of MTs students.

METHODS

Qualitative descriptive research is the method used in this study. According to (Halimah & Rahmi, 2020) descriptive is a research method that describes an event in depth. Qualitative research is a collection of scientific data that aims to understand the phenomena that occur by

research subjects, where the researcher is the key instrument (Sidiq & Choiri, 2019). Researchers have roles as planners, data collectors, analyzers to report writers.
This research was conducted around April in the even semester of the 2021/2022 academic year in class VIII of MTs Negeri 18 Jakarta. The subjects in this study were 27 people and the subjects interviewed were 5 people. Determination of research subjects is based on the results of student learning activity questionnaires. This study uses instruments in the form of learning activity questionnaires, mathematical communication skills test questions, and interviews. The instrument was first validated by 3 expert validators. After that the question items are corrected (revised) according to the advice of the expert validator. The instrument used in this study is an instrument that has received validation and is declared suitable for use by expert validators.

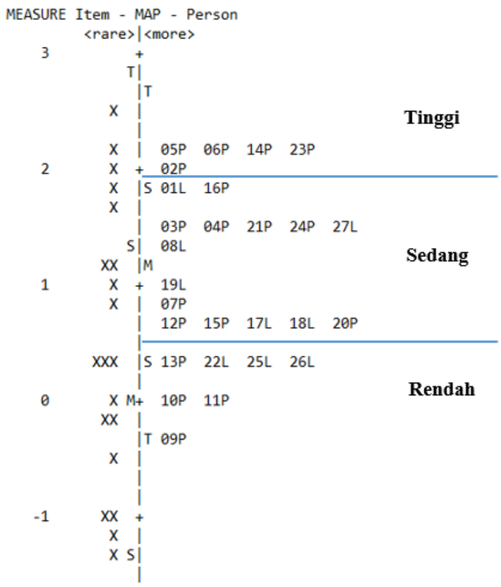
The procedure used is that students are given a learning activity questionnaire. The questionnaire consisted of 25 statements which included 19 positive statements and 6 negative statements. The data obtained was inputted into Ms.Excel, then analyzed by Rasch Model using *WinSteps software* and *Wright Maps was obtained* to determine students consisting of high, medium, and low categories (Figure 1). Five selected subjects were then given a mathematical communication skill test and interviewed. The test of mathematical communication skills used in the form of a description test on statistical material. The test contains 6 questions based on indicators of mathematical communication skills, namely *written text* , *drawing* , and *mathematical expressions.* After that, students were interviewed by researchers who aimed to get in-depth information related to the test questions that were done. The interview process was carried out using *Zoom Meeting.*

RESULTS AND DISCUSSION

Result

The results of the learning activity questionnaire were analyzed using the Rasch Model using the WinSteps software. The following is the result of Wright Maps as shown in Figure 1.

Figure 1. Wright Maps Learning Activities



The results of the learning activity category based on Figure 1 show that 5 female students are in the high category, 6 male students and 9 female students are in the medium category, and 3 male students and 4 female students are in the low category. Furthermore, based on the results of the questionnaire, 2 subjects were selected which included men and women from each level of learning activity. However, in the high category, it is seen that there are no male students who have high learning activities.

Furthermore, the results of the mathematical communication ability test that has been done by five selected students are as follows:

Table 1. Score of students' mathematical communication skills

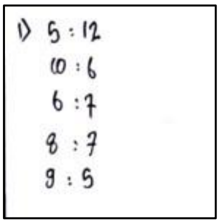
No.	Name	Category	Type Sex	Score						Total score that obtained
				Written text		*Drawing*		*Mathematical expressions*		
				1	2	3	4	5	6	
1.	SIA	Tinggi	P	1	0	2	1	1	1	6
2.	MRF	Sedang	L	3	4	4	3	3	2	19
3.	ADS	Sedang	P	1	1	2	1	0	2	7
4.	NAR	Rendah	L	2	2	3	3	2	2	14
5.	CAN	Rendah	P	1	0	2	1	2	2	8

Discussion

Subjects with high learning activity

SIA subjects are female students who have high learning activities. Below are SIA's answers to the description test questions:

Figure 2. SIA's answer to question number 1

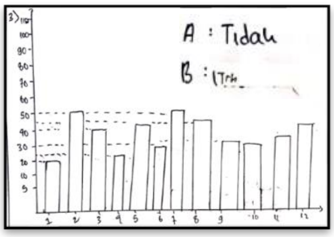


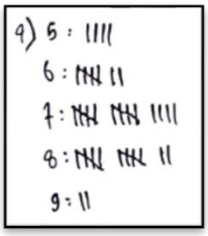
From Figure 2, it can be seen that the SIA only writes down data from the images in the problem, the SIA does not solve the questions properly. In the results of the interview, SIA explained that he only understood a little of the meaning of question number 1. The following is a snippet of the interview conducted.

Researcher : Do you understand about No.1?
Subject (SIA) : Little understanding, Sis.
Researcher : If you understand, can you try to rephrase question No. 1 in your own words?
Subject (SIA) : Write down how many students each grade has, then look for which grade has the highest number of students.

So it can be concluded that only a few female students who have high learning activity are able to answer from the correct explanation on the *written text indicator.*

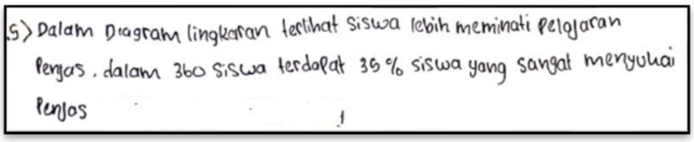
Figure 3. SIA's answers to questions number 3 and 4





For number 3, it appears that the SIA only answers part of the questions in the problem and is incomplete in completing the calculations. In the results of the interview, SIA also stated that he only drew a bar chart and did not complete the calculations.
drawing indicator does not make a table and only writes down the frequency line. This was also conveyed in the interview, the following are excerpts of the interviews conducted:
Researcher : Do you understand about No.4?
Subject (SIA) : Don't understand, Sis.
Researcher : If you don't understand it, which part makes you confused?
Subject (SIA) : I understand that only the lower part, when I read the follow-up questions, I was asked to count the number of students who passed, whether to calculate the average first or what, I was confused.

Figure 4. SIA's answer to question number 5

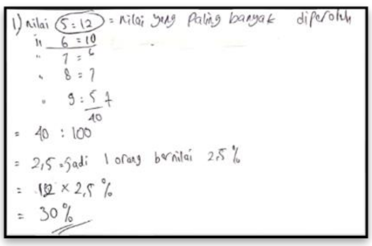


From Figure 4, it can be seen that SIA does not understand question number 5. On the *mathematical expression indicator* , SIA writes conclusions, but it is not in accordance with the question. He also conveyed this in the interview process:
Researcher : Do you understand about No.5?
Subject (SIA) : Don't understand, Sis.
Researcher : If you don't understand it, what makes you confused?
Subject (SIA) : There, I was asked to conclude, I was confused to conclude in terms of looking at pictures or using calculations as well.

Subjects with moderate learning activity

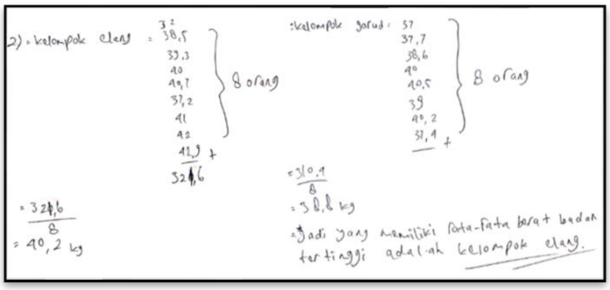
MRF subjects are male students who have moderate learning activities. Below are MRF's answers to the description test questions:

Figure 5. MRF's answer to question number 1



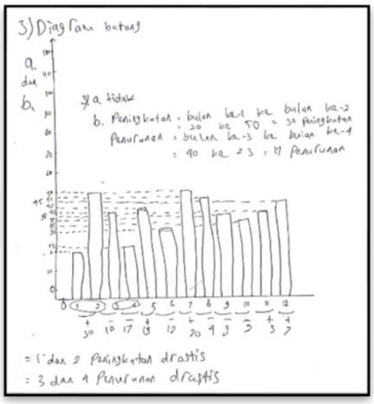
From Figure 5, it can be seen that MRF can state problems and create mathematical models well. It's just that there is a slight error in the percentage calculation. During the interview process, MRF was very convinced in finish question number 1, MRF also admits understand question as well as explain results the answer with very good .

Figure 6. MRF's answer to question number 2



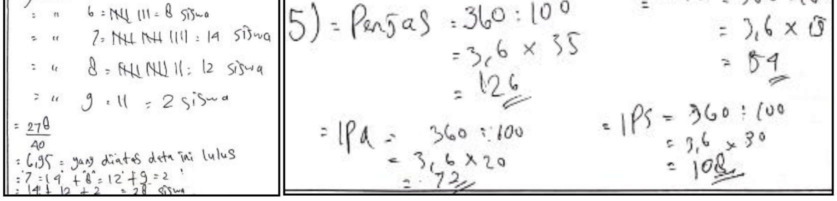
From Figure 6, it can be seen that MRF is very confident in answering questions. MRF answered with a clear and logically structured explanation and did not make any mistakes in the calculations. During the interview process, MRF understands question as well as explain results the answer with very good . So it can be concluded that the rest of the men who have moderate learning activities are able to answer *written text indicators.*

Figure 7. MRF's answer to question number 3



drawing indicator answers questions completely and correctly in expressing mathematical ideas in the form of bar charts with mathematical concepts and performing precise calculations. In the results of the interview, MRF explained the results of the answers very well without the slightest nervousness.

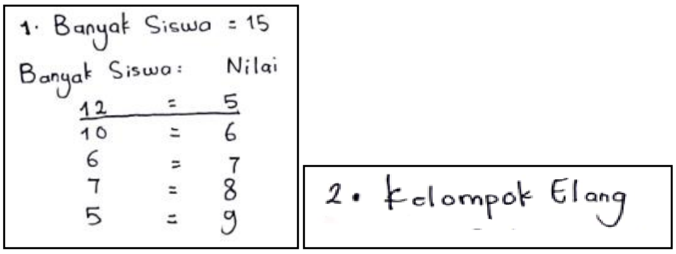
Figure 8. MRF answers to questions number 4 and 5



For number 4, it can be seen that the MRF is incomplete in making tables, besides that the MRF is also a little less precise in calculations. Even though there were errors in the calculations, MRF answered the questions in the right way. During the interview process, MRF was very confident in explaining the results of the work. For number 5, MRF is sufficient to meet the *mathematical expression indicator.* MRF is able to answer the completion steps correctly. It's just that the MRF did not write down the final conclusions that were asked in the questions. In the interview results, MRF did not find it difficult to solve the questions and was very detailed in explaining the results of the work.

ADS subjects are female students who have moderate learning activities. Below are ADS answers to the description test questions:

Figure 9. ADS answers to questions number 1 and 2

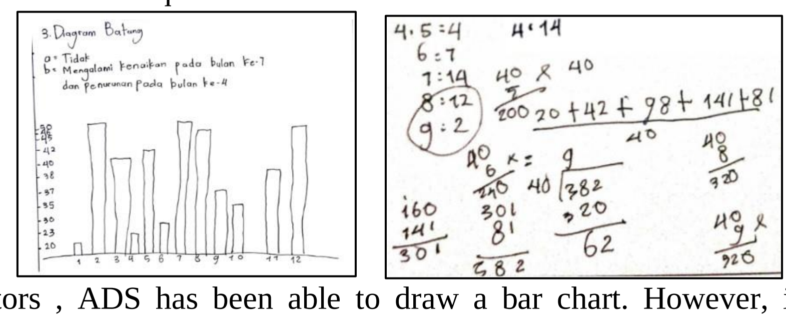


For number 1, ADS only writes data from the pictures in the question, ADS does not solve the question properly. In the results of the interview, ADS explained that he did not understand the meaning of question number 1. In the *written text indicator*, ADS had not been able to state the problem using calculations, he was only slightly able to answer from the correct explanation.
For number 2, ADS only writes the final answer without writing down the completion steps. However, during the interview process, ADS said that he wrote down the method on his scribbled paper, because he was not sure so he didn't write it on the answer sheet. ADS is able to explain well the process even though there are errors in calculations. This is reinforced by the interview process conducted:

Researcher : Restate question no.2 in your own words

Subject (ADS) : There are 8 in total, then add and divide by 8, whichever is higher.

Figure 10. ADS answers to questions 3 and 4

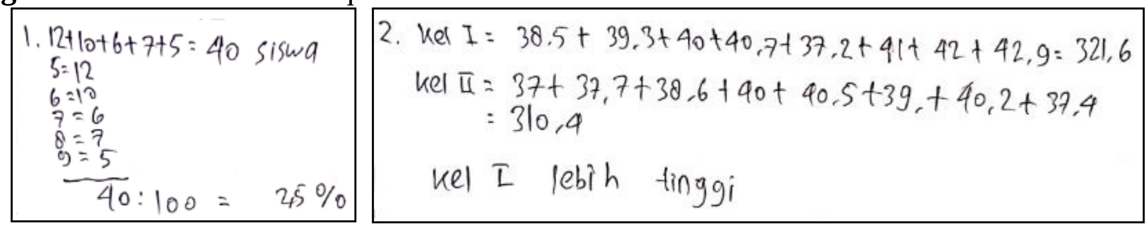


drawing indicators , ADS has been able to draw a bar chart. However, in answering the questions asked, ADS was only able to answer part of the problem solving. ADS does not display calculations in answering questions. Based on the results of the interview, ADS stated that he did not understand the questions well. For number 4, it can be seen that ADS does not describe the distribution table. ADS also miscalculated. Even though there is a calculation error, ADS understands the question asked. In the interview, ADS stated that he was confused about his inaccuracy in calculations. For number 5, ADS did not answer it. Therefore, it is concluded that the ADS *mathematical expression indicator* has not been able to carry out the completion steps in a coherent manner to get the conclusion.

Subjects with low learning activity

NAR subjects are male students who have low learning activity. Below are NAR's answers to the description test questions:

Figure 11. NAR answers to questions number 1 and 2



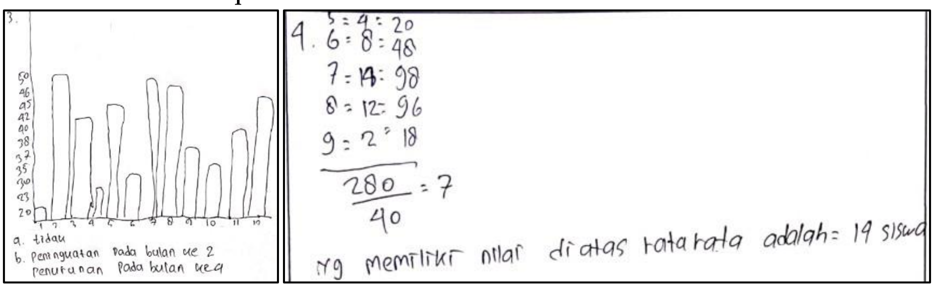
From figure 11, the NAR subject is quite able to state the problems that exist in the problem. However, NAR is confused about the percentage calculation. In the results of the interview, NAR also stated that when he answered the questions he was not sure. The following is a snippet of the interviews conducted:

Researcher : Which part makes you confused?

Subject (NAR): In a question with a percentage division. It's only in the added part, Sis.

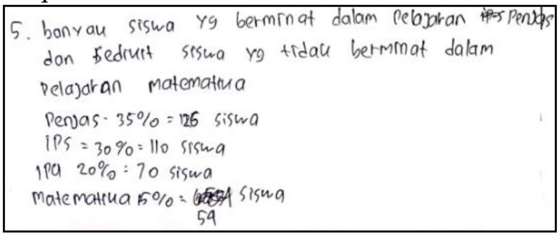
For number 2, it appears that NAR does not understand the questions given. NAR only adds up without using the average formula in the calculation. Therefore, in the *written text indicator*, the NAR subject is only able to answer part of it. From the results of the interview, NAR stated that there were other ways to answer questions, but NAR did not write them down.

Figure 12. NAR answers to questions 3 and 4



From figure 12, in question number 3 the NAR subject is able to describe the bar chart correctly and correctly. It's just that in answering questions NAR does not describe the steps to solve it, NAR only looks at the picture in answering questions. It can be concluded that the NAR has met the *drawing* indicators. For question number 4, it can be seen that the NAR does not describe the table. NAR is able to understand the questions and answer them well. However, in obtaining the answer there is an error at the end of the calculation. NAR only counts the sum of the values 8 and 9. The NAR inaccuracy factor is the main cause of calculation errors.

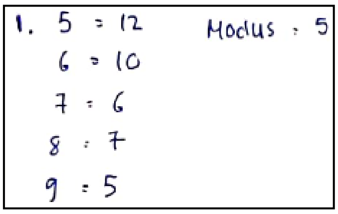
Figure 13. NAR answer to question number 5



From Figure 13, it can be seen that NAR does not understand how to calculate percentages. NAR subjects have not met the *mathematical expression* indicators, where from the written completion steps, NAR only answers a few of the correct completion steps. In the interview process, NAR admitted that he felt confused when answering questions.

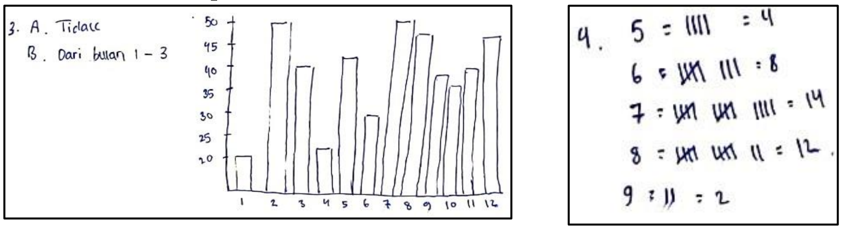
Female students who have low learning activity are CAN. Below are CAN's answers to the description test questions:

Figure 14. CAN's answer to question number 1



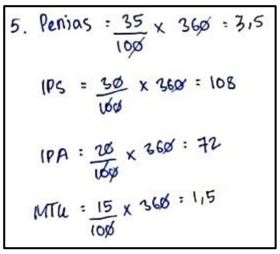
From figure 14, it can be seen that CAN only writes down data from the pictures in the problem, CAN does not solve the questions properly. In the results of the interview, CAN explained that he did not understand the meaning of question number 1. Therefore, the *written text indicator* CAN had not been able to state the problem using calculations, he was only slightly able to answer from the correct explanation.

Figure 15. CAN's answer to questions 3 and 4



In figure 15 for question number 3, the CAN subject is able to describe the bar chart correctly. It's just that in answering the CAN question, he doesn't describe the solution steps, he only looks at the table in the question. In answering the second question, the subject of CAN also made a mistake. For question number 4, the CAN subject did not make a table and only wrote down the frequency range. In the interview results, CAN admitted that he understood the questions but he was confused about how to determine the number of students who passed. So, it can be concluded that CAN is sufficient to fulfill the *drawing indicators.*

Figure 16. CAN's answer to question number 5



In Figure 16, it can be seen that CAN does not meet the *mathematical expression indicators.* CAN subjects did the completion steps quite correctly, it's just that there were a few miscalculations in the subjects of physical education and mathematics. CAN also did not write about the final conclusion of the questions listed. In the results of the interview, CAN admitted that he was confused in calculating the distribution.

CONCLUSION

Based on the results of research and data analysis, overall it can be concluded that the mathematical communication skills of students with low and moderate learning activeness in subjects with male gender are classified as better than subjects with high, medium, and low learning activities with female gender. The results of students' mathematical communication skills do not depend on the student's active learning. Students with male gender are able to fulfill *written text* and *mathematical expression* indicators, but are quite capable of *drawing indicators.* Students with female gender are quite able to meet the *drawing indicators,* but are lacking in *written text* and *mathematical expression indicators*. This research is expected to be one of the reference materials for further research related to mathematical communication skills with other broader indicators.

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