Journal of Mathematics and Mathematics Education
https://jurnal.uns.ac.id/jmme

p-ISSN 2089-8878; e-ISSN 2715-8276
Vol. 11, No. 1, June 2021

MATHEMATIC THINKING PROFILE OF STUDENTS WITH HIGH LEARNING MOTIVATION

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Abstrak: Penelitian ini bertujuan untuk mengetahui tingginya motivasi belajar siswa dalam keterampilan berpikir kritis matematis. Penelitian ini menggunakan metode kualitatif. Teknik pengumpulan data terdiri dari tes tertulis dan wawancara. Penelitian ini menggunakan teknik triangulasi yang membandingkan data tes dan data wawancara. Teknik analisis data kualitatif adalah pengumpulan data, penyajian data dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa keterampilan berpikir kritis subjek dengan motivasi tinggi mampu memahami permasalahan dalam soal, dan dapat menggunakan informasi yang diperoleh dengan tepat untuk menyelesaikan setiap langkah dalam soal. Kondisi tersebut siswa juga dapat menjelaskan apa yang dilakukan dalam proses dan dapat memperoleh kesimpulan, tidak lupa review yang dilakukan siswa akan membantu menyelesaikan masalah.

Kata kunci: berpikir kritis, motivasi belajar, soal cerita

Abstract: This study aimed to know about high learning motivation students' in mathematical critical thinking skills. This study used a qualitative method and data collection techniques consisted of written tests and interviews. This study used triangulation techniques that compared data of test and interview data. The qualitative data analysis techniques were data collection, data presentation, and drawing conclusions. The results showed that subject critical thinking skills with high motivation are able to understand the problems in the problem and can use the information obtained appropriately to complete each step in the problem. These conditions, students can also explain what was done in the process and can get conclusions, do not forget the review that students do will help solve the problem.

Keywords *: critical thinking, learning motivation, word problem*

INTRODUCTION

Mathematics is commonly known as The Queen of Science or the queen of knowledge which forms the basis of other sciences. Most of science is used to solve problems in life, cannot be separated from mathematics (Siagian, 2017). Mathematics is widely used in the wider community in everyday life. In general, mathematics is used in trade transactions, carpentry, and others. Apart from being flexible and dynamic, mathematics can always keep pace with the times. In its application, mathematics teaches students to think and systematically according to the level of the educational unit needed to solve everyday problems. The unit-level education teaches mathematics in a number of subjects. The higher the level of the educational unit undertaken, the more difficult the difficulty level. However, according to the perceptions of many students, mathematics lessons are considered difficult, uninteresting, and boring (Intisari, 2017).

Students are expected to be able to study mathematics according to their level of education. Persistence in studying and mastering mathematics is very necessary. Because in studying mathematics

Accepted: April 30, 2021 Approved: Mei 30, 2021 Published: June 30, 2021
DOI: 10.20961/jmme.v11i1.52745

p-ISSN 2089-8878; e-ISSN2715-8276

one must be able to understand the concepts in the material so that it can be studied properly. Students begin to think critically during learning activities and do practice questions (Prastowo, 2014).

Peter (2012) states that students as users of information are not recipients of information but instead apply critical thinking skills. Critical thinking takes training, practice, and patience. However, by encouraging students to think, students' critical thinking skills can improve.

According to Jonhson (2014), critical thinking is a stage that makes students review evidence, opinions, logic, and results that underlie other people's statements. In its completion, critical thinking requires several processes to achieve these results. Meanwhile, Fischer (2011) states that critical thinking is the ability to interpret, analyze, evaluate ideas and arguments. In fact, some students are used to critical thinking. According to Maričića and Špijunovićb (2014), when basic education has been applied how to think critically about problems, then during the next education level, students begin to think critically about solving problems. Critical thinking is not just talking about problem-solving but also by providing the ability to collect data.

Students can think critically when asking questions, answering questions, and gathering information efficiently and creatively. Critical thinking is a form of arriving at the right knowledge according to the curriculum. In general, critical thinking is analyzing specific ideas. Critical thinking itself is part of mathematics education.

Firdaus, et al (2015) explained that critical thinking is needed so that students are able to succeed in the future. The reason is that critical thinking must be applied and developed in the curriculum and teaching and learning process to produce quality students. Thus, developing students' critical thinking in all subjects is very necessary, especially mathematics. Learning mathematics does not teach math content but also develops students' critical thinking skills which are needed to solve various problems at school or in social life.

Balecina and Ocampo Jr (2018) found that the use of critical thinking situations is better in problem-solving. This provides motivation and a mechanism for students to measure their abilities. Situations that require students to demonstrate their declarative knowledge and procedural knowledge of critical thinking. In addition, these problem situations develop students' abilities when they analyze problems.

Mathematics lessons are taught in several materials. One of them is the material of quadrilateral and triangle, which is taught in class VII. The material of rectangles and triangles are difficult to understand because they do not only learn about calculating area and perimeter but also must master the concept of rectangles (Dewi, et al, 2016). There are many difficulties experienced by students when working on these questions, questions that lead students to analyze critically. When solving these questions, it appears how much critical thinking ability is in solving these problems.

Interview by one mathematics teacher at MTs in Boyolali, students' critical thinking skills were lacking. Many students had difficulty understanding elusive concepts and the process of calculating the

area and perimeter of a flat shape. Most of these students gave up and stopped working on the questions given instead of continuing or just waiting for other students' answers. This is, of course, an obstacle in teaching and learning activities.

According to Mazmumah (2015), one thing that affects students' critical thinking skills is influenced by teacher-centered learning. The low critical thinking skills of students are caused by various factors, one of which is student motivation. Mulyasa (2014) states that students are able to learn well if several factors in learning activities are fulfilled.

The results of the interviews by the teacher indicated that the motivation of grade VII students at MTs N in Boyolali was still low. There needs to be additional motivation to boost so that students are able to think critically in teaching and learning activities. In fact, in student learning is more influenced by motivation. Research conducted by Güss, et al. (2017) to solve problems requires a process that can motivate. According to Mc. Donald (2014) states that motivation contains three important elements, namely: 1) motivation allows energy changes to occur in individuals; 2) motivation is characterized by the emergence of a person's feelings or feelings and affections; and 3) motivation is stimulated because of the purpose. So motivation is a very important element in the learning process that can increase the meaning of the learning process itself. In the 2013 curriculum, learning activities are not carried out as a transfer of knowledge (transfer of knowledge) from teachers to students, but also as motivation in teaching and learning activities.

The indicators of critical thinking in this study according to Ennis (2011) as quoted in Fridanianti (2018) at table 1 below

Tabel 1. Indicators critical thinking

Indicator	**Descrption**
Focus	Students can identify problems and understand the problems contained in the questions given
Reason	Students can explain in choosing strategies and tactics as a problem-solving step to obtain results from these problems
Inference	Students can provide conclusions from the results of these problems
Clarity	Students can provide reasons about what is obtained from the conclusions and can provide other examples that are similar to the problem
Situation	Students can use all the information contained in the questions given
Overview	Students are expected to be able to research and re-examine the entirety from start to finish

According to Nashar (2014), to improve learning outcomes, it is necessary to have learning motivation that students must-have in every learning activity. So those students are able to understand and practice it for social life. The purpose of this study was to describe students' mathematical critical thinking skills in solving math story problems with high learning motivation.

p-ISSN 2089-8878; e-ISSN 2715-8276

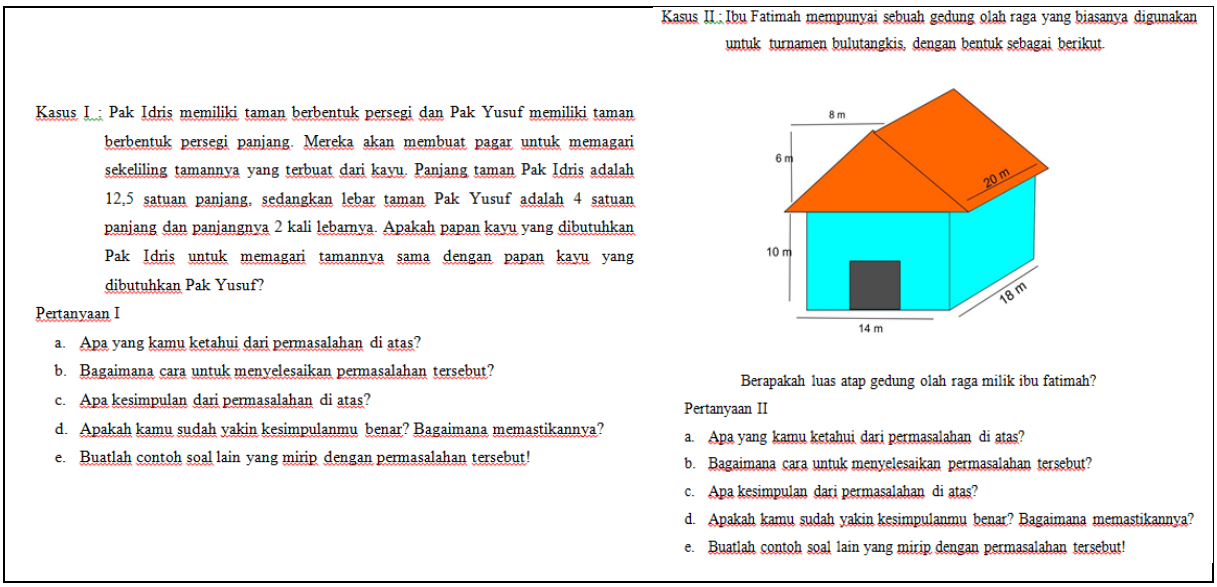
METHOD

This type of research is qualitative with a case study research design. The place of this research which was conducted at MTs Negeri in Boyolali. Subject of the research one only student at class VII

Data obtained from student test results. The test results in this study were in the form of students' answers in solving math problems on geometry material. Data collection techniques in this study consisted of: 1) Tests, to collect data about students' critical thinking skills in solving math problem problems with geometry material; 2) Interviews, to confirm data related to student test results and obtain additional information related to research problems; 3) Photos of student work and the results of interviews with students. The test question instrument is structured for critical thinking. The number of test questions is 2 items. The validity of the data in this study was validated through triangulation techniques. In this study, usud triangulation techniques, namely comparing data, tests, and interview results. Then performed data analysis including data reduction, data presentation and verification or drawing conclusions

RESULTS AND DISCUSSION

The test questions given consisted of 2 questions which were designed to think critically and mathematically by grade VII students on geometry material. The items on the critical thinking test can be seen in Figure 1 below


Kasus I : Pak Idris memiliki taman berbentuk persegi dan Pak Yusuf memiliki taman berbentuk persegi panjang. Mereka akan membuat pagar untuk memagari sekeliling tamannya yang terbuat dari kayu. Panjang taman Pak Idris adalah 12,5 satuan panjang, sedangkan lebar taman Pak Yusuf adalah 4 satuan panjang dan panjangnya 2 kali lebarnya. Apakah papan kayu yang dibutuhkan Pak Idris untuk memagari tamannya sama dengan papan kayu yang dibutuhkan Pak Yusuf?

Pertanyaan I

a. Apa yang kamu ketahui dari permasalahan di atas?
b. Bagaimana cara untuk menyelesaikan permasalahan tersebut?
c. Apa kesimpulan dari permasalahan di atas?
d. Apakah kamu sudah yakin kesimpulanmu benar? Bagaimana memastikannya?
e. Buatlah contoh soal lain yang mirip dengan permasalahan tersebut!

Kasus II : Ibu Fatimah mempunyai sebuah gedung olah raga yang biasanya digunakan untuk turnamen bulutangkis, dengan bentuk sebagai berikut.

Berapakah luas atap gedung olah raga milik ibu fatimah?

Pertanyaan II

a. Apa yang kamu ketahui dari permasalahan di atas?
b. Bagaimana cara untuk menyelesaikan permasalahan tersebut?
c. Apa kesimpulan dari permasalahan di atas?
d. Apakah kamu sudah yakin kesimpulanmu benar? Bagaimana memastikannya?
e. Buatlah contoh soal lain yang mirip dengan permasalahan tersebut!

Figure 1. Items for critical thinking test

Based on the results of the student learning motivation questionnaire, 1 student with high learning motivation was selected, students with high learning motivation had excellent critical thinking skills. The results of students' critical thinking skills with high motivation are shown in Table 2 below.

Table 2. Descriptive Table of Data Analysis Results

Critical Thinking Indicators	High Learning Motivation	
	1	2
1. Focus	√	√
2. Reason	√	√
3. Conclusion	√	√
4. Clarity	√	√
5. Situation	√	√
6. Overview	√	√
	Highly Critical Thinking	

Analysis of critical thinking students with high learning motivation

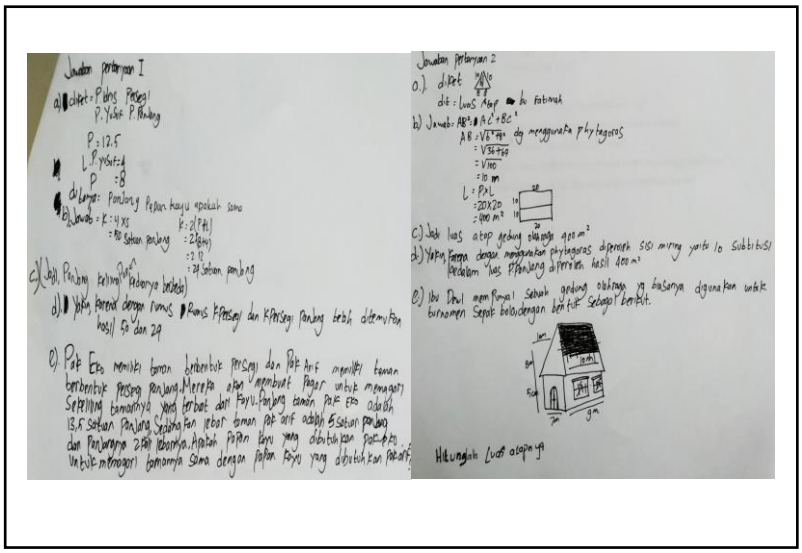


Figure 2. Subject answers to questions number 1 and number 2

1. Focus

   In question number 1 and number 2 Subject T fulfills the focus indicator. Subject T can understand the problem and obtain the information used in solving the problem. In the interview excerpt Subject T can mention what was asked in the question. The following is an excerpt from the researcher interview with the subject T

   P : apa saja yang diketahui dalam soal nomor 1?
   T : taman milik Pak Idiris bentuknya persegi terus taman Pak Yusuf bentuknya persegi panjang. Pak Idris panjang tamannya 12.5 satuan panjang, terus yang punya Pak Yusuf yang dikatetahui lebarnya yaitu 4 satuan panjang, sedangkan panjangnya 2 kali dari lebarnya, jadinya panjangnya 8 satuan panjang
   P : terus, apa saja yang ditanyakan dalam soal nomor 1?
   T : mencari perbedaan panjang kayu yang dibutuhkan untuk memagari taman Pak Idris dan taman Pak Yusuf
   P : apa saja yang diketahui dalam soal nomor 2?
   T : sebuah gedung olah raga milik Bu Fatimah dengan bentuk seperti di gambar
   P : terus, apa saja yang ditanyakan dalam soal nomor 2?
   T : mencari luas atap gedung bu Fatimah kak

p-ISSN 2089-8878; e-ISSN 2715-8276

Subject T fulfills the focus indicator based on the interview excerpt and the test results on question number 1. Subject T in the results that are done can find out what is used to solve the problem, in the interview Subject T can answer what is being asked in the question. In question number 2 Subject T fulfills the focus indicator. Subject T read the questions fluently. Subject T can know what is known and asked in the question. The subject can identify the problem well and also understand the problem. This is in line with Rifqiyana (2015) that students with high motivation can identify problems correctly and completely

2. *Reason*

Subject T in writing down the process correctly and giving reasons for doing the steps in the calculation of Subject T is also correct. The subject also explains the steps and methods of Subject T in solving the problem. The following is an excerpt from the interview from the researcher with Subject T

P : bagaimana langkah-langkah dalam menyelesaikan permasalahan diatas?
T : kan yang ditanyakanperbedaan panjang kayu untuk keliling jadi dengan menggunakan rumus keliling persegi dan persegi panjang, Pak Idirs rumus keliing persegi kan $4 \times sisi$ *sedangkan sisiya 12.5 jadi* 4×12.5 *yaitu 50 satuan panjang. Terus yang punya Pak Yusuf pakai rumus keliing persegi panjang* $2(p + l)$ *dari soal yang diketahui lebrnya 4 satuan panjang, panjangnya 2 kali jadinya 8. Jadi* $2(4 + 8) = 24$ *satuan panjang*
P : apa alasan kamu menggunakan langkah-langkah tersebut?
T : karena taman Pak Idris bentuk nya persegi dan taman Pas Yusuf persegi panjang jadinya pakai rumus keliling persegi dan persegi panjang
P : bagaimana langkah-langkah kamu dalam menyelesaikan soal tersebut
T : dengan rumus luas segitiga .pakai permisalan kak. Atapnya pake segitiga. Missal a b c. terus mencari sisi miring dengan pytagoras, dimisalkan ada segitiga abc sisi miringnya diketahuiab 8 ac 6 terus diakarin jadi 100 akar dari 100 10 jadi sisi miringnya 10. Panjang sisi yang samping 20 Karena atapnya bersebelahan jadi dikali 2 jadinya 20. luasnya $p \times l = 20 \times 20 = 400\, m^2$
P : apa alasan kamu menggunakan langkah-langkah tersebut?
T : karena dengan memakai rumus phytagoras nanti dapat mencari sisi miring yang dicari

For Subject T in questions 1 and 2, it can fulfill the reason indicator. Subjects can provide reasons and explanations about the process steps used to solve the problem. This makes highly motivated students use the right methods and steps so that they can answer correctly according to Rifqiyana (2015).

3. Inference

Subject T fulfils the inference indicator, because Subject T can write down the final conclusion of the question. When conducting interviews with researchers, Subject T can answer the conclusions of the answers and according to what was asked in the questions. The following is an excerpt from the researcher interview with the subject T

P : Bagaimana kesimpulan akhir dari hasil jawaban nomor 1 yang sudah kamu selesaikan?

T : Kesimpulannya panjang kayu yang di butuhkan Pak Idris dan Pak Yusuf berbeda yaitu 50 satuan panjang dan 24 satuan panjang
P : bagaimana kesimpulan akhir dari hasil jawaban nomor 2 yang sudah kamu selesaikan?
T : Kesimpulannya luas atas gedung olah raga milik Ibu Fatimah yaitu 400 m^2

For Subject T in questions 1 and 2 it can fulfill the conclusion indicator. Subjects can provide conclusions on these problems. This is in accordance with Rifqiyana (2015) that students with critical thinking skills can draw conclusions according to the questions

4. Clarity

The clarity indicator on Subject T in question number 1 and question number 2 can fulfill the mention of how to get conclusions and can make similar examples. The following is an excerpt from the researcher's interview with the subject T.

P : bagaimana cara kamu mendapat hasil kesimpulan tersebut?
T : dari mengerjakan menggunakan keliling persegi dan persegi panjang diperoleh hasil yang berda panjang kayunya
P : apakah kamu dapat membuat contoh yang mirip seperti pada soal?
T : ini kak (sambil menunjuk gambar 2)
P : bagaimana cara kamu mendapat kesimpulan tersebut?
T : dengan langkah-langkah yang tadi kak. Pakai rumus phytagora dulu terus baru mencari luas atap gedungnya
P : apakah kamu membuat contoh yang mirip?
T : gini kak (sambil menunjuk gambar 2)

Subject T in questions 1 and 2 can fulfill the clarity indicator. This does not agree with Azizah (2018), there are several factors that lack accuracy in working, even though they are able to plan strategies but do not understand the problem.

5. Situation

In the situation indicator, Subject T can get the information used to solve questions number 1 and number 2. The information obtained in the questions can help the subject to better understand the problems in the questions. so that the subject can solve the problem.

P : apa saja informasi yang kamu peroleh dari permasalahan pada soal nomor 1 dan nomor 2?
T : menurut saya informasinya untuk soal nomor 1 mencari keliling taman pagar antara Pak Yusuf dan Pak Idris terus untuk nomor 2 ada sebuah gedung milik Bu Fatimah terus suruh mencari luas atap gedungnya

Subject T fulfills the situation indicators in questions number 1 and number 2 because Subject T has used all the information in the questions used to solve these questions.

6. Overview

In the review indicator Subject T can fulfill these indicators. Subject T checks the results of the work that has been done in the written answers.

P : Apakah kamu sudah mengecek kembali semua pekerjaan mu?
R : *melihat (sambil mengecek kembali dan membolak balik kertas)*

 p-ISSN 2089-8878; e-ISSN 2715-8276

P : Bagaimana, sudah?
R : *sudah kak*

In question number 1 and number 2 Subject has met the review indicator. Where Subject T rechecks the results of his work.

CONCLUSSION

From the results of this study it can be concluded that in MTs Negeri 6 Boyolali, especially class VII E, there is a difference between low, medium, and high learning motivation students in solving math story problems. The critical thinking skills that are lacking in highly motivated students are indicators of focus, reason, conclusion, clarity, situation, and review. This can help students in solving these problems. Students' accuracy in reading the questions so as to make students interpret the questions. In carrying out the process of solving problems students are also not in a hurry which can make some questions overlooked. Students really need to understand and pay close attention when carrying out the process of solving problems to get the results obtained. Accuracy is required in making sample questions, and during the process of solving problems students must be thorough and precise.

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