# The Critical Thinking Skills of Junior High School Student On Simple Machines

**Firda Amelia Ramadhani[1]\*, Tutut Nurita[1]**

[1]Faculty of Mathematics and Natural Science, State University of Surabaya, East Java, Indonesia.

_____
**\*Correspondence Author:**
Firda.19073@mhs.unesa.ac.id

**Abstract:** This study describes students' critical thinking skills in learning science on simple machines. The method used in this research is descriptive quantitative. The subjects in this study were 34 students from one of the public junior high schools in Surabaya. The data collection method used is a test of critical thinking skills. The essay question sheet consists of five critical thinking skills indicators: interpretation, analysis, inference, evaluation, and explanation. The study's results showed that the average percentage of students' critical thinking skills indicators was 20%. The percentage results indicate that the critical thinking skills of one of the public junior high schools in Surabaya are classified as very poor with the standard reference assessment criteria.

## INTRODUCTION

Natural Sciences include procedures for solving problems. Science learning provides students understanding of solving problems found in everyday life (Vennix,dkk 2018). In addition, science education also creates students capable of critical thinking (Depdiknas, 2011). Learning skills in the 21st century are called 4C skills, which consist of: critical thinking, collaboration, communication, and creativity (Junedi, 2020; Defrianti & Iskandar, 2022)

Critical thinking skills include skills in analyzing and evaluating information to draw conclusions obtained (Sari dkk., 2021). Critical thinking is a student's skill to solve a problem (Nuryanti dkk., 2018). Critical thinking skills in the form of a skill to interpret, analyze, infer, evaluate, and provide explanations. Based on the research that has been done, the results of the critical thinking skills of junior high school students are still relatively low. Some factors cause low critical thinking, one of which is that students rarely get questions that can improve critical thinking skills (Adinda, 2021). In addition, students who are less accustomed to getting learning that maximizes their potential for higher-order thinking (Nuryanti dkk., 2018).

Based on the results of interviews with science teachers in one of the public junior high schools in Surabaya, students' critical thinking skills are very important to support the results of teaching and learning activities; besides, students can solve problems that can be found in everyday life. In learning science in schools, students train students to be able to solve a problem and grow objective thinking skills (Ariani, 2020).

Researchers analyzed students' critical thinking skills on simple machines in this study. The subjects in this study were 34 students of one of the public junior high schools in Surabaya. They received simple machine material to analyze their critical thinking skills according to indicators. Based on the explanation above, the researcher is interested in conducting research under the title "Critical Thinking Skills for Junior High School Students with Simple Machines Material."

**METHOD**

This research was conducted by one of the public junior high schools in Surabaya in the odd semester of the 2022/2023 academic year. The type of research used is descriptive research with a quantitative approach. Quantitative description is research that is used to analyze data through the depiction or description of the data that has been collected (Sugiono, 2017). This method is suitable for providing a description of students' critical thinking skills on simple machines. The subjects in the study were 34 students who had received simple machine material.

The instruments used in this study include: 1) Interview sheets to determine critical thinking skills; 2) students' critical thinking skills question sheets for data collection. The question sheet is filled in by answering ten essay questions that have been prepared according to the indicators of critical thinking skills based on Facione (2015), namely interpretation, analysis, inference, evaluation, and explanation.

The data from the students' critical thinking skills test results were analyzed descriptively based on the achievement of critical thinking skills indicators. The instrument used was adapted from (Fauzah Ulil, 2022). The test results were analyzed descriptively based on the results of the achievements of each indicator using the formula:

$$\% \ Indikator \ Berfikir \ Kritis \ Siswa = \frac{\Sigma Perolehan \ Skor}{\Sigma Skor \ Maksimum} \ X \ 100\%$$

The results of the data analysis of the critical thinking skills test sheet were converted and recapitulated using a benchmark reference assessment. The value is obtained from the recap of the observation sheet into critical thinking criteria (Purwanto, 2020), as shown in the following table 1:

**Table 1.** Criteria for Critical Thinking Skills

| Score | Category |
|-------|----------|
| 90-100 | Very Good |
| >80 – 89 | Good |
| >60 – 79 | Pretty Good |
| >50 – 59 | Not Good |
| ≤ 50 | Very Not Good |

**(IJETZ)** | International Journal of Education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022)

Page 61

If the value of the students is known, the researcher will analyze the critical thinking skills that the students have.

## RESULT AND DISCUSSION

This study was conducted to describe students' critical thinking skills who have received simple machine material. This skill is seen based on the critical thinking skills test sheet results. Based on the results of the field test sheets that have been carried out, there are data and the percentage of students in each aspect of the critical thinking skills indicator.

**Table 2.** Results of Critical Thinking Skills for Each Indicator

| Critical Thinking Skills Indicator | Average value | Category |
|---|---|---|
| Interpretation | 61 % | Pretty Good |
| Analysis | 56 % | Not Good |
| Inference | 45 % | Very Not Good |
| Evaluation | 47 % | Very Not Good |
| Explanation | 60 % | Not Good |

Based on the table, the average percentage results in the interpretation aspect are in the good category with an average value of 61%; the analysis aspect is in the less category with an average value of 56%, the inference aspect is very poor category with an average value of 45%, evaluation very poor category with an average value of 47%, and explanation of the poor category with an average value of 60%. Based on the results of the critical thinking skills test, the results are as shown in Figure 1 below:
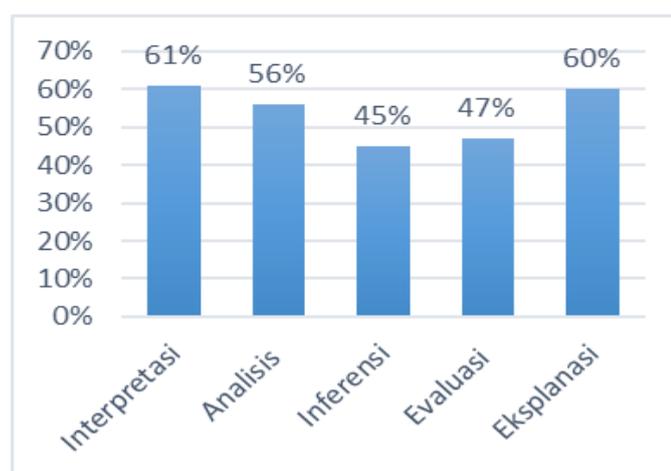


**Figure 1.** Diagram of the percentage of students' critical thinking skills on each indicator.

Based on Figure 1. The results of the percentage of students' critical thinking skills are obtained sequentially from high to low. The highest critical thinking skill indicator is in the interpretation indicator at 61%. Then the second order is the explanation indicator at 60%, the third analysis at 56%, the fourth evaluation at 47%, and the last inference at 45%. Details of critical thinking skills of each indicator can be seen based on the details and explanations as follows:

International Journal of education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022) | (**IJETZ**)

Page 62

*Interpretation*

In the indicator with the interpretation aspect, the results obtained with an average of 61% of students' skills in interpreting are classified in the good category. This means that students are quite capable of interpreting, namely in terms of interpreting, understanding, explaining, and giving meaning to data or information. Essay questions related to interpretation indicators are provided with pictures of levers, and students are expected to be able to interpret the types of levers used to facilitate human work in everyday life. Overall, students can reasonably interpret the types of levers that exist in everyday life. The following is the documentation of the student's work in the good category:
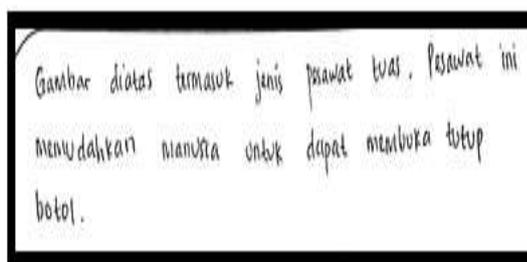


**Figure 2.** The results of the work of students in the good category on the interpretation indicator.

It can be seen that students in this category have been able to interpret the types of levers used to facilitate human work in everyday life. Students belonging to the less category mean that these students have not been able to understand the question and interpret it correctly. Chowning, et al (2012), students need engaging media to understand and make arguments that can strengthen their reasons. Winata, et al (2019) The low indicator of interpretation is caused because students find it challenging to interpret the problems in the question, so students cannot understand the precise meaning of the questions given.

*Analysis*

The indicators with the analytical aspect get an average result of 56% belonging to the less category. This means that students are less able to analyze, namely, identify the information used to express opinions or thoughts. The test questions related to the analytical indicators are: an inclined plane observation table is provided, and students analyze the relationship between the mass of objects, the length of the path, and the height of the mechanical advantage obtained. Overall, students are less able to analyze from the observation table that has been provided. This is because students are less able to identify the problems they get. The following is the documentation of the student's work:
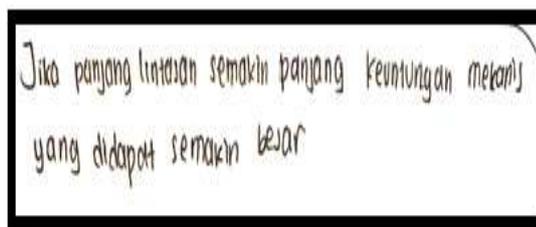
**(IJETZ)** | International Journal of Education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022)

Page 63

**Figure 3.** The results of the work of students in the poor category on analysis indicators

It can be seen that students are less able to analyze the relationship between components of an inclined plane. The results of the answers only write an analysis of the mechanical advantage. In this case, students are less able to identify existing problems and can influence decision-making (Azizah et al., 2021). In analyzing the need for cognitive skills to see the changes that occur (Quitadamo, 2018).

*Inference*

In the indicator of critical thinking skills with inference aspects, the results in this indicator with the average skill of students in concluding are 45% belonging to the inferior category. This means that students are less able to infer in terms of identifying and obtaining the elements used to make a conclusion or draw conclusions. One of the essay test questions related to inference indicators is that a pulley graph is provided on a block, and students are asked to conclude from the graph. Overall, students are very less able to conclude from the observation chart that has been provided. This is because students are less able to conclude from something that is obtained. The following is the documentation of the student's work:
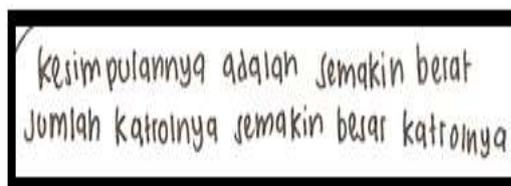


**Figure 4.** The results of the work of students in the category of very poor in inference indicators.

From the results of students' answers, they only conclude the amount on the pulley. (Yuliana, 2020) students have difficulty in concluding the results of the questions. What happens is that students also feel capable of collecting and processing data that will not be available. (Quitadamo, 2018), with problems, must be aware of how to think, not just from what you see, to find a conclusion.

*Evaluation*

In indicators with evaluation aspects the average result is 47% which is in the very poor category. It means that students are very less capable in its application in terms of using an appropriate strategy to solve the main problem. One of the essay test questions related to evaluation evaluation is provided a picture of the application of a pulley, students are asked to calculate the required force and provide opinions from the picture. Overall, participants are very less able to find from the observation

International Journal of education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022) | (**IJETZ**)

Page 64

pictures that have been provided. This is a result of students who are less able to find a problem at hand. The following is the documentation of student results:
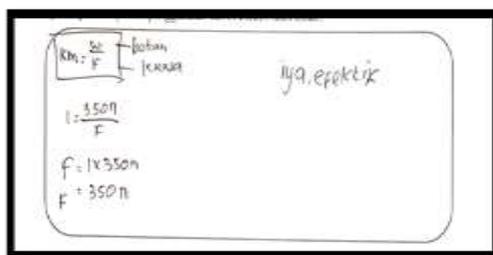


**Figure 5**. The results of the work of students in the category of very poor evaluation indicators.

It can be seen that students in this category are very less able to evaluate the application of the pulley principle in everyday life. The results of the work of students are less in providing reasons for the problems given to the phenomena that occur and mastery of concepts so that the knowledge gained affects critical thinking. Thus, efforts to improve the skills of students, teachers must often ask questions in the form of critical thinking questions that can improve their thinking skills. Based on the results of interviews with science teachers, students are rarely given critical thinking questions because of the online learning factor they have been through before. The students' interest in learning enthusiasm is less formed within the students themselves. If the teacher can provide the right technique in asking students questions, they can be interested in the learning (Kusumawati & Wahyuni, 2022; Ningsih, 2022) and can improve communication and meaningful learning (Nuraini, 2018). In addition, by giving questions, it can add a stimulus to the point of view related to their knowledge (Fritjers et al., 2008).

*Explanation*

In the indicator of critical thinking skills with the explanation aspect, the results obtained in this indicator with an average of 60% of the students' skills in explanation belong to the less category. This means that students are less able to provide explanations, namely stating the results of thoughts based on evidence, methodology and context. One of the essay test questions related to the explanation indicator is that a picture of a screw is provided, students are asked to explain the difference between the two pictures of the screw provided. Overall, students are less able to explain from the observation pictures that have been provided. This is because students are not able to explain a problem at hand. The following is the documentation of the students' work:
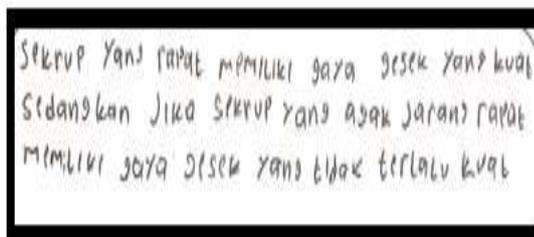
**(IJETZ)** | International Journal of Education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022)

Page 65

**Figure 6**. The results of students in the category of very poor explanation indicators.

It can be seen that students in this category are less able to describe mechanical advantages in using fields to facilitate human work. The situation and condition of students greatly affect their mindset when learning. If students are in poor condition, then their thinking skills and enthusiasm for learning are also in poor condition, so the results obtained will decrease (Prameswari, 2018). The results of students' critical thinking skills are obtained from the analysis of critical thinking skills indicators, which can be seen in table 2 and table 3.

**Table 3.** Results of Students' Critical Thinking Skills

| Kriteria Penilaian | Keterangan | Jumlah Peserta Didik | Persentase (%) |
|---|---|---|---|
| 90-100 | Sangat Baik | 0 | 0% |
| >80 – 89 | Baik | 0 | 0% |
| >60 – 79 | Cukup | 8 | 24% |
| >59 – 59 | Kurang | 12 | 35% |
| ≤ 50 | Sangat kurang | 14 | 41% |

Based on table 3. The results of students' critical thinking skills are classified as very poor. This is evidenced by the average percentage of critical thinking skills from the sample is only 20%. This is in accordance with (Salimah's research, 2015) which states that students' critical thinking skills are still relatively low. Based on the results of interviews with a science teacher at one of the public junior high schools in Surabaya, students rarely get questions about critical thinking skills. Thus, students need to be given practice questions to improve their critical thinking skills. (Wahyuni et al., 2017) say that critical thinking skills in students must be honed to produce critical thinkers. It also includes skills in overcoming or solving an existing problem (Nurhayati, 2018).

**CONCLUSION**

Critical thinking skills are logical thinking skills rationally which have the aim of understanding a fact. Based on the results of research conducted by one of the public junior high schools in Surabaya using five indicators of critical thinking skills, the average result of critical thinking skills is 20%. This study proves that the critical thinking skills of junior high school students on simple machines are included in the category very less in accordance with the benchmark value of critical thinking skills.

The advice that can be given is that students need to be given practice questions about in-depth critical thinking skills to improve their critical thinking skills. So that if students are accustomed to being given critical thinking skills, they will produce

International Journal of education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022) | (**IJETZ**)

Page 66

maximum critical thinking. In addition, appropriate learning models are needed to support maximum results if the selection of the right learning model can improve the critical thinking skills of these students.

## REFERENCES

Adinda, I. R., Hasanah, U., & Banun, S. (2021). *Analisis Kemampuan Berfikir Kritis Biologi Siswa Saat Pembelajaran Daring*

Ariani, R. F. (2020). Pengaruh Model Pembelajaran Problem Based Learning Terhadap Kemampuan Berpikir Kritis Siswa Sd Pada Muatan Ipa. *DIDAKTIKA TAUHIDI: Jurnal Pendidikan Guru Sekolah Dasar*,

Azizzah, H., Arafa, M., Prima, N., Alifah, N., & Sugiharto, B. (2021). Critical Thinking Skills of Male and Female Students Senior High School in IPA Program. *Jurnal Phenomenon*

Chowning, JT, Joan CG, Dina NK, & Laura JC (2012). Menumbuhkan Berpikir Kritis,Keterampilan Penalaran, dan Argumentasi Melalui Pendidikan Bioetika.

Defrianti, D., & Iskandar, I. (2022). The Mastery of Teacher Emotional Intelligence Facing 21st Century Learning. International Journal of Educationa and Teaching Zone, 1(1), 50–59.

Facione, P. A. 2015. Critical Thinking: What It Is and Why It Counts. *Insight Assessment*

Frijters S,. Geert ten D., & Gert R. (2008). Effects of Dialogic Learning on Value-LoadedCritical Thinking. Elsevier Learning and Instruction

Junedi, B., Mahuda, I., & Kusuma, J. W. (2020). Optimalisasi keterampilan pembelajaran abad 21 dalam proses pembelajaran pada Guru MTs Massaratul Mut'allimin Banten. *Transformasi: Jurnal Pengabdian Masyarakat*

Kusumawati, M., & Wahyuni, P. (2022). Investigating the Use of Phet Simulation as a Substitute for Practical Tools in Understanding the Concept of Static Electricity. International Journal of Educationa and Teaching Zone, 1(1), 20–25.

Mardaphi, & Suparno. 2014. Tes Kemampuan Berpikir Tingkat Tinggi 40 Fisika *(Pysthots)* Peserta Didik SMA. Jurnal Penelitian dan Evaluasi Pendidikan Tahun 18, Nomor 1, 2014.

Ningsih, F. N. (2022). Analysis of Students ' Concession Understanding Ability in Solving Physics Concepts. International Journal of Educationa and Teaching Zone, 1(1), 25–33.

Nuraini, R., & Suparman. (2018). Deskripsi Kemampuan Berfikir Kritis dan Kreatif Siswa Melalui Penerapan Pendekatan Saintifik. *Jurnal Pendidikan Sejarah*, *Prosding Seminar Nasional Pendidikan Matematika Etno matnesia*

Nuryanti, L., Zubaidah, S., & Diantoro, M. (2018). Analisis Kemampuan Berpikir Kritis Siswa SMP. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*

Purwanto, M. N. (2020). *Prinsip-prinsip dan teknik evaluasi pengajaran*. PT Remaja Rosda Karya.

Prameswari, S. W., Suharno, S., & Sarwanto, S. (2018). Inculcate Critical Thinking Skills in Primary Schools. *Social, Humanities, and Educational Studies (SHEs): Conference Series.*

**(IJETZ)** | International Journal of Education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022)

Page 67

Quitadamo, IJ, Celia LF, James EJ, & Marta JK (2018). Pertanyaan berbasiskomunitasMeningkatkan Berpikir Kritis dalam Biologi Pendidikan Umum. CBE -Ilmu Kehidupan Pendidikan

Ridho, S., Ruwiyatun, R., Subali, B., & Marwoto, P. (2020). Analisis Kemampuan Berpikir Kritis Siswa Pokok Bahasan Klasifikasi Materi dan Perubahannya. *Jurnal Penelitian Pendidikan IPA*

Sari, A. C., Ilmiyah, N., & Lestari, I. Y. (2021). Analisis Berpikir Kritis Pada Masa Pandemi (Covid-19) Ditinjau Dari Gender. *Journal of Mathematics Education and Science*

Salimah, Salimah dan , Drs. M. Yahya, M.Si (2015) *Hasil Belajar Prakarya Dan Kewirausahaan Ditinjau Dari Persepsi Siswa Tentang Ketrampilan Mengajar Guru Dan Cara Belajar Pada Siswa Kelas X SMK Muhammadiyah 1 Sukoharjo Tahun Ajaran 2014/2015.*

Sugiono. 2017. *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung: Alfabeta

Vennix, J., den Brok, P., & Taconis, R. (2018). Do outreach activities in secondary STEM education motivate students and improve their attitudes towards STEM? *International Journal of Science Education*

Wahyuni, D., I. Mahardika, dan S. Supeno. 2017. Characteristic of Wave and Magnet Textbooks (WMT) with RVGM-BASED to Train Student's Critical Thinking Skills at Vocational High School. *Pancaran Pendidikan*.

Winata, A., H. Sulistyaningrum, dan S. Cacik. 2019. Peningkatan Kemampuan Berpikir Kritis Mahasiswa Menggunakan Pembelajaran Berbasis Android pada Matakuliah Konsep IPA. *Edustream: Jurnal Pendidikan Dasar.*

Yuliana, E., L. Subagiyo, dan Zulkarnaen. 2020, Pembelajaran Fisika Berbasis Android dengan Program Adobe Flash Cs 6 untuk Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Siswa SMA IT Granada Samarinda. *Jurnal Literasi Pendidikan Fisika*.

International Journal of education and Teaching Zone. Volume 1 (Issue 2): 08-10 (2022) | (**IJETZ**)

Page 68