Analysis of Students' High Order Thinking Skills in Vertical Motion Concept

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Analysis of Students' High Order Thinking Skills in Vertical Motion Concept

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Abstract *– One indication of advancement and change in the world of education is the growth of the learning process. Education is a key indicator of a nation's development, particularly in Indonesia. Physics is a very essential topic, and its changes are readily apparent, particularly in school-based learning activities. It is believed that physics learning activities need to be enhanced in order to produce a more intelligent and competitive generation. The improvement can be started from providing better materials and concepts, one of which is by implementing Higher Order Thinking Skills (HOTS) learning activities by emphasizing critical thinking skills and problem-solving skills, it is hoped that students can be more active and creative in participating in the learning process. The purpose of this article is to determine the effect of questions and worksheets that are integrated with Higher Order Thinking Skills (HOTS) on students' critical thinking skills. The results of the study show that 80% of students can complete physics calculations. However, students have difficulty in interpreting the data provided. The conclusion is that the higher order thinking ability (HOTS) of students is still low in the evaluation category. Because the data found that students were only able to complete physics calculations (inference) but were not able to interpret the answers (evaluation).*

Keywords*: Education; Physics; HOTS*

INTRODUCTION

The advancements in the realm of education are one example of growth and change in the world. One of the industries or disciplines that serve as a barometer for change is education. By setting a clear objective to develop excellent and noble human attributes. As a result, the advancement of a nation in the globe has always been measured by its achievement in the field of education (Pramesty & Prabowo, 2013).

One of the scientific disciplines that provides a learning environment that emphasizes conceptual comprehension and application to real-world situations is physics (Murdani, 2020). The aims of learning physics involve improving one's capacity for environmental analysis, acquiring knowledge based on actual concepts, and comprehending concepts in order to use them in daily life (Citra et al., 2021).

Currently, learning science is seen to be highly challenging and tough to understand, especially physics. The presentation of ineffective material may be the root of this. Another aspect that may contribute to this is the inability of educators to effectively impart information to pupils and encourage their participation in the learning process (Setyowati & Subali, 2011).

The capacity to think critically is one of the skills required of both teachers and students when learning physics. The first capital needed to deal with the advancement of science and technology in this millennium is the capacity for critical thought. This skill is usually applied in college coursework with the intention of fostering greater freedom of expression and critical thinking (Susilawati et al., 2020).

Along with lack of critical thinking abilities, another issue that frequently arises is students' inability to comprehend physics concepts or issues that are presented to them

during the learning process. Because of this, the ability to solve problems is just as important as the ability to think critically in helping students master physics concepts and information (Ubaidillah, 2016).

To help students study physics, an element or strategy is required in order to help them develop these skills. Therefore, one way to encourage critical thinking and problem-solving skills is to offer physics learning materials that incorporate the idea of higher order thinking capabilities (HOTS). Being ability to examine, assess, and even create are just a few of the features of HOTS itself. In other words HOTS can be explained as a complex thought process in describing material, making conclusions, analyzing, and building representations (Anisa et al., 2020).

The ability of HOTS to help students think systematically, learn to examine a topic from multiple angles, teach young people to be self-assured, and enhance critical and creative thinking skills can be cited as a key argument for why HOTS is crucial in terms of learning in schools. What was developed in this study was in the form of learning instruments or devices which were C4, C5, and C6 level questions, which were also integrated with critical thinking skills.

RESEARCH METHODS

This type of research uses a qualitative descriptive approach. To accurately describe or characterize a situation or phenomenon is the primary goal of descriptive research (Christensen,2013). The subjects of this research were tenth grade students in Science 2 at a high school in Bandung Regency (N = 5). The procedure of this research is described in Figure 1.

Pre-field stage, field work, and data analysis stage are the stages that included in descriptive research. The pre-field stage actions included obtaining the school's approval and gathering research instruments.

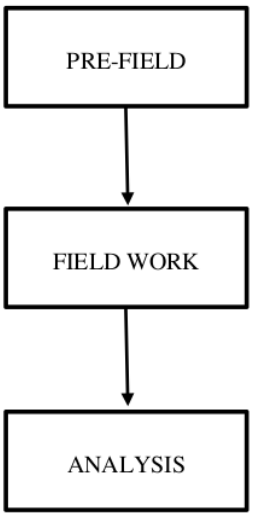

Figure 1. Research Procedure

Students are given a test of their critical thinking skills throughout the activity that takes place during the fieldwork phase. The tasks carried out during the data analysis stage were analyzing the test findings at the same time. This experiment used a critical thinking test that was influenced by Erceg (N. Erceg, et al, 2013) consist of two essay question for Newton Law concept.

The trials or tests carried out in this study were direct adoption tests, and also the results were translated. It has been evaluated for validity and reliability by lecturers in fields connected to learning tools, and has also gotten consent from lecturers who are authorities in their domains to use these learning instruments in research.

This instrument was chosen because thorough analysis is required and cannot be accomplished using only physics formulas. The answers to these questions help students comprehend, examine, assess, and draw conclusions about the completion. After gathering the data, it was examined using

three criteria: correct response, incorrect answer, and no answer. In the meantime Facione's (Facione, 2011) critical thinking abilities category, which included assessment and inference, was used to analyze the students' critical thinking indicators.

RESULTS AND DISCUSSION

Results

The four physics problems on the Vertical Motion material are part of the HOTS thinking ability test, which is used to gather data. The test's outcomes yielded information in the form of the student responses depicted in Figure 1.

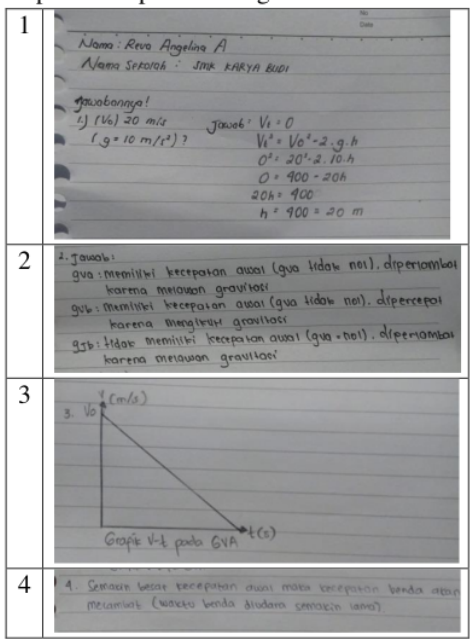

Figure 2. Students' Work Results

The average value of the five students' responses, totaling 50, is then examined using predetermined criteria and categories.

Table 1. Student Ability Score Criteria

No	Percentage	Criteria
1	0% - 25%	Very Weak
2	25% - 45%	Weak
3	45% - 65%	Moderate
4	65% - 75%	Good
5	75% - 100%	Very Good

The distribution of data from the students' test results is showed in Table 1 below.

Table 2. Students' Answers

Question Numbers	Description	Percentage
1	Right Answer	80%
	Wrong Answer	20%
	No Answer	0%
2	Right Answer	60%
	Wrong Answer	40%
	No Answer	0%
3	Right Answer	40%
	Wrong Answer	60%
	No Answer	0%
4	Right Answer	20%
	Wrong Answer	80%
	No Answer	0%

The distribution of data from the students' test scores is depicted in Tables 1 and 2. It demonstrates that students are better at using calculations to solve physics problems (Problem 1) but are unable to apply physics concept to practical/actual situations (Questions 2, 3 and 3). According to the table above, the questions with the most accurate responses are questions 1 and 4, respectively, with 80%, 60%, 40%, and 20% of the answers being correct.

Discussion

Based on Indicators of High Order Thinking Skills

Higher order thinking skills have several indicators, including analyzing, solving problems, evaluating.

Table 3. Indicators of High Order Thinking Skills

No	Indicator	Question Number
1	Analyzing	1
2	Problem Solving	3
3	Evaluating	2,4

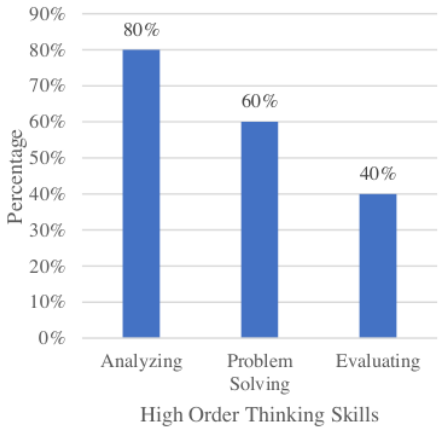

Figure 1. Data of High Order Thinking Skills

In Figure 2, it is showed that students' high-level thinking skills for analysis are 80%, problem-solving is 60%, and evaluation is 40%. According to the criteria for students' ability scores, students' critical thinking abilities are included in the sufficient category as evidenced by the average high-level thinking ability for each indicator and all student responders, which is 60%. Similar studies were carried out by Erceg (N. Erceg, et al, 2013) which stated that a study on Croatian vocational students revealed that their critical thinking skills were lacking because they were accustomed to learning about physics rather than using it in practice.

According to Rian Priyadi et al (Rian Priyadi, et al, 2021) Students are only able to finish physics calculations (inference), and they are unable to evaluate the results (evaluation). When addressing issues, students have trouble recognizing incorrect presumptions and identifying facts that is not given. because pupils can only perform physics calculations, but are unable to understand the results (evaluation). Students have difficulty identifying wrong assumptions and identifying data that is not provided when solving problems (Susilawati et al., 2020).

Students' poor critical thinking skills can be attributed to a number of factors, including (1) their inability to understand and respond to inquiries, (2) their inability to spot patterns in situations, and (3) their inability to relate computations of outcomes to actual phenomena. Several studies have shown that the difficulties, misconceptions, and lack of understanding experienced and possessed by students indicate that one of them comes from low critical thinking skills. For example, when students come to a class they don't actually bring empty knowledge or an empty mind, but they have knowledge that is fragmented, so that students experience difficulties when associating a concept with one another (Sulviana & Pasaribu, 2021). Critical thinking skills are also hindered by students' learning patterns, since they are more prone to accept the teacher's explanation without probing further. In order for pupils to successfully complete high-level questions like C4, C5, and others and to think critically, it is desired that the physics teacher will familiarize them with working on high-level questions (HOTS) (Saddia et al., 2021).

CONCLUSION

This research investigates into how students approach physics problem questions critically and the variety of approaches used to solve physics difficulties. According to the study's findings, 80% of students are capable of completing physics computations. However, the pupils had trouble comprehending the given data. Higher order thinking skills (HOTS) in pupils are still rated as low in the evaluation area, according to this investigation. Students were only able to perform inference-based physics calculations; they were unable to evaluate their results (evaluation). When addressing

problems, students have trouble recognizing incorrect assumptions and detecting missing data. Physics lectures can be used to solve problems like this one in order to help students become more competent in everyday situations. This can make teachers more conscious of the value of fostering in their students a critical approach toward solving issues. Teachers should help students develop the habit of working on questions with high-level abilities (HOTS) so that they can easily complete C4 level questions, C5, and C6 and be able to think critically. Later on in the learning process, it is also important to take into account concepts that cannot be broken down into smaller parts.

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REFERENCES

Anisa, M. K., Permana P, N. D., & Nova, T. L. (2020). Penggunaan Simulasi Virtual Pada Pembelajaran Fisika Untuk Meningkatkan Higher Order Thinking Skill (Hots) Peserta didik : Meta Analisis. *Jurnal Kumparan Fisika*, *3*(2), 163–170. https://doi.org/10.33369/jkf.3.2.163-170

Christensen, B. J. and L. (2013). Educational Research: Quantitative, Qualitative, and Mixed Approaches. In *News.Ge*.

Citra, K. A., Nehru, N., Pujaningsih, F. B., & Riantoni, C. (2021). Keterampilan Pemecahan Masalah Peserta didik Pada Materi Listrik Arus Searah di Masa PJJ. *Jurnal Pendidikan Fisika Dan Teknologi*, *7*(2), 75–79. https://doi.org/10.29303/jpft.v7i2.2663

Facione, P. a. (2011). Critical Thinking : What It Is and Why It Counts. *Insight Assessment*, *ISBN 13: 978-1-891557-07-1.*, 1–28.

Murdani, E. (2020). Hakikat Fisika Dan Keterampilan Proses Sains. *Jurnal Filsafat Indonesia*, *3*(3), 72–80. https://doi.org/10.23887/JFI.V3I3.22195

Pramesty, R. I., & Prabowo, P. (2013). Pengembangan Alat Peraga KIT Fluida Statis Sebagai Media Pembelajaran pada Sub Materi Fluida Statis di Kelas XI IPA SMA Negeri 1 Mojosari, Mojokerto. *Jurnal Inovasi Pendidikan Fisika (JIPF)*, *02*(03), 70–74.

Rian Priyadi, Amin Mustajab, Mohammad Aky Tatsar, S. K. (2021). Analisis Kemampuan Berpikir Kritis Peserta didik SMA Kelas X Dalam Memecahkan Masalah SPLTV. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(2), 909–922. https://doi.org/10.31004/cendekia.v5i2.574

Saddia, A., Sutrisno, S., Saldi, M., & Nurkhalis Agriawan, M. (2021). Analisis Kemampuan Menyelesaikan Soal Hots Fisika Peserta didik Sma Di Kota Majene. *PHYDAGOGIC Jurnal Fisika Dan Pembelajarannya*, *4*(1), 1–5. https://doi.org/10.31605/phy.v4i1.1275

Setyowati, A., & Subali, B. (2011). Implementasi Pendekatan Konflik Kognitif Dalam Pembelajaran Fisika Untuk Menumbuhkan Kemampuan Berpikir Kritis Peserta didik Smp Kelas Viii. *Jurnal Pendidikan Fisika Indonesia*, *7*(2), 89–96. doi:https://doi.org/10.15294/jpfi.v7i2.1078

Sulviana, & Pasaribu, M. (2021). Analisis keterampilan berpikir kritis serta kemandirian belajar peserta didik SMA pada materi Hukum Newton. *Jurnal Pendidikan Fisika Tadulako*, *9*(1), 63–69.

Susilawati, E., Agustinasari, A., Samsudin, A., & Siahaan, P. (2020). Analisis Tingkat Keterampilan Berpikir Kritis Peserta didik SMA. *Jurnal Pendidikan Fisika Dan Teknologi*, *6*(1), 11–16. https://doi.org/10.29303/jpft.v6i1.1453

Ubaidillah, M. (2016). Pengembangan LKPD Fisika Berbasis Problem Solving untuk Meningkatkan Keterampilan Proses Sains dan Keterampilan Berpikir Tingkat Tinggi. *Jurnal EduFisika*, *01*(02), 9–20. https://doi.org/10.22437/edufisika.v1i2.3425

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