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Analysis of Students' Concession Understanding Ability in Solving Physics Concepts

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Abstract: Analysis of Students' Concept Understanding in Solving Physics Problems at SMPN 27 Tanjung Jabung Timur. This research is descriptive quantitative research using a survey design which aims to determine the understanding of the physical concepts of class VII b students on unit quantities and measurements. The research subject was class VII B SMPN 27 Tanjabtim, which involved 20 students. The result data was obtained by giving a concept understanding test in the form of a post-test in the form of multiple choice. The data were analyzed descriptively; the percentage of understanding the concept of each indicator sequentially was 76%, illustrating 73%, classifying 28%, comparing 17%, and explaining 62%. It can be ascertained that the most dominant understanding of physics concepts for class VII b SMPN 27 Tanjabtim is indicators and is in the high category, while the most dominant is in comparison and is in a low category. Factors that cause low student understanding of concepts, namely, lack of interest and motivation of students to repeat the material learned, accustomed to learning by memorizing formulas, not being able to manipulate equations containing three variables and less thorough in understanding questions.

INTRODUCTION

Along with the development of science and technology that brings changes to human life, education in schools is a need that must be met by every human being (Torres, 2011; Zb, Novalian, Rozal, et al., 2021). Students' understanding ability can be seen from the test results in solving problems (Meiliani et al., 2021; Sulman et al., 2020; Zb et al., 2020). one of which is in learning physics (Rozal et al., 2021; Sulman, Sutopo, et al., 2021; Zb, Novalian, Ananda, et al., 2021), Students must be able to develop their thinking skills and not just memorize lessons (Putra et al., 2021; Sulman, Tanti, et al., 2021). Students must be able to develop their thinking skills and not just memorize lessons (Zb et al., 2020), but in learning, students are able to understand the concepts being taught so that students can solve and find solutions to a problem. As we know that physics is an empirical science, so to solve physics problems, students must first understand the concept of the material being studied. This is in accordance with what was stated by Sudrajad (2009); physics is built based on empirical experience (Kusairi, 2013), where concepts are formulated based on facts and data from observations of the

symptoms that exist in everyday life (Malone, 2008; Ramlo, 2008). When we want to study physics, the most important thing is to understand the concept of physics first (Abiolu & Okere, 2012; Acar et al., 2015). statement above is in accordance with the opinion of Widodo (2006), namely the most appropriate first step to studying physics is to understand the concept first (Zhang & Zhang, 2018; Zheng et al., 2021). Learning concepts are arranged systematically. So it is necessary to master the concepts in each subject matter before moving on to the next material (Halloun, 2007; Lee & Lee, 2020; Wells et al., 2019). The concepts that are taught earlier will be the basis for the development of further concepts. Physics subjects are subjects that are classified as difficult and less attractive to students. This can be seen from the observations at SMPN 27 Tanjabtim.

Based on the results of observations by interviewing several students directly on physics subjects. They said that physics was challenging and exciting to learn, and some considered physics subjects to be very difficult and uninteresting because too many formulas and calculations made it difficult to understand. Based on the results of the interview with the physics teacher for class VII b, he said that when the exam was given, many students did not reach the Minimum Completeness Criteria (KKM). This was because most of the students only relied on their memorization abilities. When given a different question, they find it difficult to do it. Therefore, understanding students' concepts is very important to solving physics problems. Suppose students do not understand the idea. Students will have difficulty solving physics problems.

METHOD

This research is quantitative descriptive. The research subjects were students of class VII B SMPN 27 Tanjabtim, totalling 20 students. This research was conducted in the odd semester of the 2021 academic year (September). This research took place at SMPN 27 Tanjabtim. The variables studied were understanding the concept of physics.

RESULT AND DISCUSSION

Based on the results of descriptive statistical analysis, the percentage of average scores for understanding physics concepts for class VII B SMPN 27 Tanjabtim can be seen in Table 1 below.

Table 1. Percentage of Average Scores of Students' Concept Understanding Tests On Interpreting Indicator

No Question	Concept Understanding Indicator	Average Score %	Concept Understanding Category
1	Interpret	88	Very High
2	Interpret	90	Very High
3	Interpret	90	Very High
4	Interpret	98	Very High
5	Interpret	86	Very High

6	Interpret	67	High
7	Interpret	17	Low

Table 1 above shows the percentage of the average score of students in class VII B SMPN 27 Tanjabtim for each item on the indicator interprets. Students who answered many questions correctly were on questions number 2, 3 and number 5 with a percentage of 98% in the very high category low.

Tabel 2. Percentage of Average Scores of Students' Concept Understanding Tests on Examples of Indicators.

No Question	Concept Understanding Indicator	Average Score %	Concept Understanding Category
8	exemplify	67	High
9	exemplify	50	Medium
10	exemplify	79	Very High
11	exemplify	96	Very High

Based on Table 2 above shows that the percentage of the average score of understanding the concepts of class VII b SMPN 27 Tanjabtim participants for each item on the indicator shows that the most correctly answered by students is question number 11 with a percentage of 96% being in the very high category while the percentage of the average score of students who answered slightly correctly was on question number 9 with a percentage of 50% being in the medium category.

Table 3. Percentage of Average Scores of Students' Concept Understanding Tests On Classifying Indicators

No Question	Concept Understanding Indicator	Average Score %	Concept Understanding Category
12	Classify	47	Medium
13	Classify	23	Low
14	Classify	14	Low

Table 3 above shows that the percentage of the average score of students in class VII b SMPN 27 Tanjabtim for each item on the indicator classifying the most correctly answered is question number 12 with a percentage of 47% being in the medium category. While the portion of the average score of students who responded slightly correctly was question number 14, with a rate of 14% being in a low category.

Table 4. Percentage of Average Scores of Students' Concept Understanding Tests on Comparing Indicators.

No Question	Concept Understanding Indicator	Average Score %	Concept Understanding Category
15	Compare	12	Low
16	Compare	22	Low

Based on Table 4 above, it shows that the percentage of the average score of students in class VII b SMPN 27 Tanjabtim for each item on the indicator compares, namely question number 16 is answered correctly by students compared to question number 15 with a percentage of 22%% and 12% are in a low category.

Table 5. Percentage of Average Scores of Students' Concept Understanding Tests on Explaining Indicators.

No Question	Concept Understanding Indicator	Average Score %	Concept Understanding Category
17	Explain	65	High
18	Explain	60	Medium

Table 5 above shows the average score percentage of students in class VII b SMPN 27 Tanjabtim. Each item on the indicator explains that the most correctly answered is question number 17, with a rate of 65% being in the high category. While the percentage of the average score of students who responded slightly correctly was question number 18, with a ratio of 60% being in the medium category. The score criteria for acquiring each indicator of understanding physics concepts for class VII b SMPN 27 Tanjabtim are adjusted to the interpretation criteria for understanding physics concepts scores as follows.

Table 6. Percentage of each Indicator of Understanding Physics Concepts for Class VII B SMPN 27 Tanjabtim

Concept Understanding Indicator	Average Score %	Concept Understanding Category
Interpret	76	Hight
exemplify	73	Hight
Classify	28	Low
Compare	17	Low
Explain	62	Hight

Table 6 above shows the average percentage score of students' conceptual understanding in Class VII B SMPN 27 Tanjabtim for each indicator of conceptual understanding. The interpreting indicator has the highest percentage, 76% is in the high category. Then the indicator gives an example of having a percentage of 73% in the high category. The indicator explains that it has a percentage of 62% in the high category. In classifying indicators, it has a percentage of 28% in the low category. At the same time, the comparing indicator is an indicator that has a very low percentage of 17%. Based on the results of research analysis on indicators interpreting the understanding of physics concepts, students are in the high category. In question number 1, 18 students answered correctly by choosing answer C, while two students chose answer B. In question number 2, 16 students answered correctly by choosing

answer C, while those who answered A, B and D were chosen as many as 1, 1 and 2. Question number 3 obtained 16 students who answered correctly by choosing the answer choice A, while those who answered B and C were chosen by as many as 1 and 3 students. In question number 4, 19 students answered correctly by choosing answer choice D, while one student chose answer A. In question number 5, 14 students answered correctly by choosing answer C, while five students answered B and one student students answered A. Question number 6 obtained two students who answered correctly by choosing the answer E, while those who answered A, B and C were chosen as many as 6,4 and 7. In question number 7, seven students answered correctly by choosing the answer E, while 13 students chose option D, who answered A and B, were chosen by 3 and 2 students. This shows that most of the students are able to interpret graphs or tables.

From the analysis of the factors that cause students to make mistakes when given a test, students are in a hurry, so they are less thorough in understanding the questions(M. Wang et al., 2021; R. Wang, 2001). Students also have the wrong strategy because the steps for solving the problem are improper. Based on the research analysis results, indicators exemplifying understanding of physics concepts are in the high category. In question number 8, 19 students correctly chose option D, while only one answered A. In question number 9, 13 students correctly chose option A, while those who answered B, D and E were selected from as many as 4, 2 and 1 students. In question number 10, 17 students responded correctly choosing option E, while those who answered A, B and D were selected as 1.1 and 1 student. In question number 11, 19 students correctly chose option A, while one decided on option D. This shows that most students can apply unit quantities and measurements in everyday life. The results of research analysis on indicators classifying the understanding of physics concepts are in a low category. Question number 12 obtained eight students who answered correctly by choosing B, while those who answered A, C, D and E were chosen by as many as 2, 3, 2 and 5 students. Question number 13 obtained three students who answered correctly by selecting the answer E, while those who answered A, B, C and D were chosen by as many as 6, 1, 3 and 7 students. Question number 14 obtained two students who answered correctly by selecting the answer E, while those who answered A, B, C and D were chosen by as many as 6, 2, 7 and 3 students. This shows that the ability of students to understand the concept of classifying indicators is still lacking. This is because students have not been able to categorize or group according to the concept, or students do not understand the material and are wrong when choosing answers.

The results of research analysis on indicators comparing understanding of physics concepts are deficient. In question number 15, 2 students answered correctly by choosing A, while those who answered B, C, D and E were selected from as many as 3, 2, 5 and 8. In question number 16, 5 students answered correctly by choosing the answer. E, while those who answered A, B, C and D were selected from as many as 4, 7, 3, and 1. This shows that the ability to understand concepts in comparing indicators is very poor, as can be seen from the results of the analysis. Most students have not been able to detect equations or have not been able to manipulate two or more variables.

Students are wrong in entering values for each variable and wrong in performing mathematical operations. In addition, students only rely on memorization skills so that when given a different question, they find it challenging to do it. In question number 17, 12 students answered correctly by choosing answer C, while those who answered A, B, D and E were chosen as many as 3, 1, 2, and 2. In question number 18 obtained, 11 students answered correctly by choosing the answer E, while those who answered A, C and D were chosen as many as 4, 4 and 15. This shows that most of the students have been able to express theoretical concepts. Based on the analysis of numbers 7, 13, 14, 15 and 16, what causes students' lack of understanding of physics concepts is the lack of motivation and interest of students to repeat the material they have learned(Malone, 2008; Yu & Xi, 2009).

Understand the physical symbols from the data mentioned in the problem, misinterpret the meaning of the question, and are less careful in reading and understanding the importance of the question. Based on the results of this discussion, educators should convey the basic concepts of each material in teaching and not only convey formulas that tend to make students memorize so easy to forget; educators should do demonstrations or direct practicum when explaining so that students are more motivated to learn, educators should design meaningful learning strategies, and educators should demonstrate the application of physics in everyday life. In addition, students are expected to be able to repeat the material that has been studied, not rely on their memorization skills, do more practice questions and students are expected to be more thorough in reading questions and counting.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the understanding of physics concepts for Class VII B SMPN 27 Tanjabtim in the 2021 academic year on unit quantities and measurements shows that the percentage of understanding of concepts that is the most dominant is the interpreting indicator and the very non-dominant indicator is the comparison indicator. In the indicator of interpreting the understanding of students' concepts in the high category where students are able to interpret the measurements, the indicators exemplifying the understanding of the concepts students are in the high category, the indicators explaining are in the high category, while the indicators classifying the understanding of the concepts students are in the category low, and the comparing indicator is in the very low class. Several factors cause students' common understanding of concepts, namely, the lack of interest and motivation of students to repeat the material that has been taught. Students are accustomed to memorizing concepts, so when they are given different questions, they find it challenging to work on them, students do not understand the questions, and the class conditions are uncomfortable.

REFERENCES

Abiolu, O. A., & Okere, O. O. (2012). Environmental literacy and the emerging roles of information professionals in developing economies. *IFLA Journal*, *38*(1), 53–59.

https://doi.org/10.1177/0340035211435070

Acar, Ö., Büber, A., & Tola, Z. (2015). The Effect of Gender and Socio-economic Status of Students on Their Physics Conceptual Knowledge, Scientific Reasoning, and Nature of Science Understanding. *Procedia - Social and Behavioral Sciences*, *174*, 2753–2756. https://doi.org/10.1016/j.sbspro.2015.01.962

Halloun, I. A. (2007). *Evaluation of the Impact of the New Physics Curriculum on the Conceptual Profiles of Secondary Students*. 1–25. http://www.halloun.net/index.php?option=com_content&task=view&id=4&Itemid=6

Kusairi, S. (2013). Analisis Asesmen Formatif Fisika Sma Berbantuan Komputer. *Jurnal Penelitian Dan Evaluasi Pendidikan*, *16*(3), 68–87. https://doi.org/10.21831/pep.v16i0.1106

Lee, S. W., & Lee, E. A. (2020). Teacher qualification matters: The association between cumulative teacher qualification and students' educational attainment. *International Journal of Educational Development*, *77*(April). https://doi.org/10.1016/j.ijedudev.2020.102218

Malone, K. L. (2008). Correlations among knowledge structures, force concept inventory, and problem-solving behaviors. *Physical Review Special Topics - Physics Education Research*, *4*(2), 1–15. https://doi.org/10.1103/PhysRevSTPER.4.020107

Meiliani, M., Tanti, T., & Sulman, F. (2021). Student Resources On Newton's Lawa Concepts Reviewing From Gender: Identification Using Open-Ended Question. *Indonesia Journal of Science and Mathematics Education*, *04*(November), 324–332. https://doi.org/10.24042/ijsme.v4i3.10177

Putra, M. I. J., Junaid, M., & Sulman, F. (2021). The Ability of the Question and Answer (Q&A) Method with the Help of Learning Videos against Student Learning Outcomes amid the Covid-19 Pandemic. *EDUKATIF: Jurnal Ilmu Pendidikan*, *3*(5), 2160–2169. https://doi.org/https://doi.org/10.31004/edukatif.v3i5.768

Ramlo, S. (2008). Validity and reliability of the force and motion conceptual evaluation. *American Journal of Physics*, *76*(9), 882–886. https://doi.org/10.1119/1.2952440

Rozal, E., Ananda, R., Zb, A., Fauziddin, M., & Sulman, F. (2021). The Effect of Project-Based Learning through YouTube Presentations on English Learning Outcomes in Physics. *AL-ISHLAH: Jurnal Pendidikan*, *13*(3), 1924–1933. https://doi.org/10.35445/alishlah.v13i3.1241

Sulman, F., Sutopo, S., & Kusairi, S. (2021). FMCE-PHQ-9 Assessment with Rasch Model in Detecting Concept Understanding , Cheating , and Depression amid the Covid-19 Pandemic. *Tadris: Jurnal Keguruan Dan Ilmu Tarbiyah*, *6*(2), 297–309. https://doi.org/10.24042/tadris.v6i2.9273

Sulman, F., Tanti, T., Habibi, M., & Zb, A. (2021). Pengaruh Media Animasi Berkarakter Islami Terhadap Hasil Belajar Pengetahuan Bumi dan Antariksa. *Edumaspul: Jurnal Pendidikan*, *5*(1), 135–146. https://doi.org/10.33487/edumaspul.v5i1.1044

Sulman, F., Taqwa, M. R. A., Aminah Zb, A. Z., Rafzan, R., & Fikri, A. (2020). The Effect of Mathematical Connections on the Mastery of Probability Material.

Edumatika : Jurnal Riset Pendidikan Matematika, *3*(2), 147–157. https://doi.org/10.32939/ejrpm.v3i2.645

Torres, A. L. M. O. C. (2011). Understanding and intervening in E-learning in higher education institution. *Procedia - Social and Behavioral Sciences*, *15*, 756–760. https://doi.org/10.1016/j.sbspro.2011.03.178

Wang, M., Zhao, Q., Hu, C., Wang, Y., Cao, J., Huang, S., Li, J., Huang, Y., Liang, Q., Guo, Z., Wang, L., Ma, L., Zhang, S., Wang, H., Zhu, C., Luo, W., Guo, C., Chen, C., Chen, Y., … Yang, Y. (2021). Prevalence of psychological disorders in the COVID-19 epidemic in China: A real world cross-sectional study. *Journal of Affective Disorders*, *281*, 312–320. https://doi.org/10.1016/j.jad.2020.11.118

Wang, R. (2001). A hybrid learning network for shift, orientation, and scaling invariant pattern recognition. *Network: Computation in Neural Systems*, *12*(4), 493–512. https://doi.org/10.1080/net.12.4.493.512

Wells, J., Henderson, R., Stewart, J., Stewart, G., Yang, J., & Traxler, A. (2019). Exploring the structure of misconceptions in the Force Concept Inventory with modified module analysis. *Physical Review Physics Education Research*, *15*(2), 20122. https://doi.org/10.1103/PhysRevPhysEducRes.15.020122

Yu, J., & Xi, L. (2009). A hybrid learning-based model for on-line monitoring and diagnosis of out-of-control signals in multivariate manufacturing processes. *International Journal of Production Research*, *47*(15), 4077–4108. https://doi.org/10.1080/00207540801942208

Zb, A., Novalian, D., Ananda, R., Habibi, M., & Sulman, F. (2021). *DISTANCE LEARNING WITH STEAM APPROACHES: Is Effect On The Cognitive Domain?* *6*(2), 129–140.

Zb, A., Novalian, D., Rozal, E., Sulman, F., & Habibi, M. (2021). STEM Approach in Online Lectures: How Does it Contribute to Cognitive Aspects? *Indonesian Journal of Science and Education*, *5*(2), 88–97. https://doi.org/10.31002/ijose.v5i2.4365

Zb, A., Setiawan, M. E., & Sulman, F. (2020). Pengaruh E-Learning Berbasis Schoology Berbantuan WhatsApp Group terhadap Hasil Belajar Ditengah Pandemi Covid-19. *Al-Khidmah*, *3*(2), 55–60. https://doi.org/10.29406/al-khidmah.v3i2.2282

Zhang, Y., & Zhang, Z. (2018). 'Kexue Wenhua' in Chinese and 'Scientific Culture', 'Science Culture', 'Culture of Science' and 'Science as Culture' in English: The Meanings and the Structure. *Cultures of Science*, *1*(1), 25–37. https://doi.org/10.1177/209660831800100104

Zheng, J., Huang, L., Li, S., Lajoie, S. P., Chen, Y., & Hmelo-Silver, C. E. (2021). Self-regulation and emotion matter: A case study of instructor interactions with a learning analytics dashboard. *Computers and Education*, *161*, 104061. https://doi.org/10.1016/j.compedu.2020.104061