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Multi Representation Ability of Students in Solving Physics Problems on Straight Motion

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ABSTRACT
This study aims to describe the students' multi representation abilities in solving descriptive questions on straight motion material. This was qualitative research with an analytic descriptive approach. The subjects of this study were three physics teachers and twenty-five students of class X MIA SMA Negeri 1 Maumere. The data used in this study were evaluation questions, physical evaluation scores, student worksheets on evaluation questions and interview results. The data collection techniques used in this study were as follows: Documentation and in-depth interviews. For qualitative research data to be accounted for as scientific research, In this study, using triangulation techniques, checking data to the same source with different techniques, namely the results of observations, students' answers, and in-depth interviews. Data analysis techniques used in this study were grounded theory. The steps of grounded theory were: creating categories for the information obtained (open coding), selecting one of the categories and placing it in a theoretical model (axial coding), and then compiling a story of the relationship between these categories (selective coding). The results showed that students tend to use the same representation, such as verbal 12.5%, mathematical 87.5%, while graphics and pictures were 0%. For each category, students: (a) in the low category received a mathematical representation score of 73.81% and verbal representation was 83.3%, (b) in the moderate category received a verbal representation score of 85% and mathematically 83.06% (c) in the high category obtained a verbal representation score of 83.3% and mathematics 90.47%.

INTRODUCTION

Multi representation plays a very important role in the process of finding answers to physics problems as covered in the five steps of problem-solving initiated by Heller (Sujarwanto et al., 2014). Certain course students must be skilled at using it in the problem-solving process. One of the abilities needed by students who master the concept of physics is the ability to understand (Hau & Nuri, 2019; Fitriyah et al., 2018). Fatimah (2017) stated that understanding science concepts includes multi-representation abilities. Anugraheni and Handhika (2018: 533) also said that to find out the level of multi

representation it would be easier to use an essay test than multiple choice because in an essay test students can develop their reasoning abilities, so how will their level be seen of representation was in solving the given problem.

Based on the results of observations, the final evaluation value for physics lessons in the odd semester of the 2019/2020 school year at SMA Negeri 1 Maumere, it can be seen that the acquisition of class X MIA students was very good, the KKM value (Minimum Completeness Criteria) for class X was 75 and overall it could be seen that the value final evaluation for physics lessons in class X with a range of values above the KKM. Based on this background, the researchers are interested in collecting evaluation questions that had been done by students at SMA Negeri 1 Maumere in the form of essays along with the answers of class X MIA students of SMA Negeri 1 Maumere to find out the characteristics of the physics questions given to students, and from students' answers in the form of essays can be analyzed on the multi representation ability of students in solving physics problems. Through this research, schools can obtain information about students' multi representation abilities in solving physics problems become material for consideration for further research development and can also train writers as prospective teachers, in analyzing students' multi-representation abilities in answering evaluation questions.

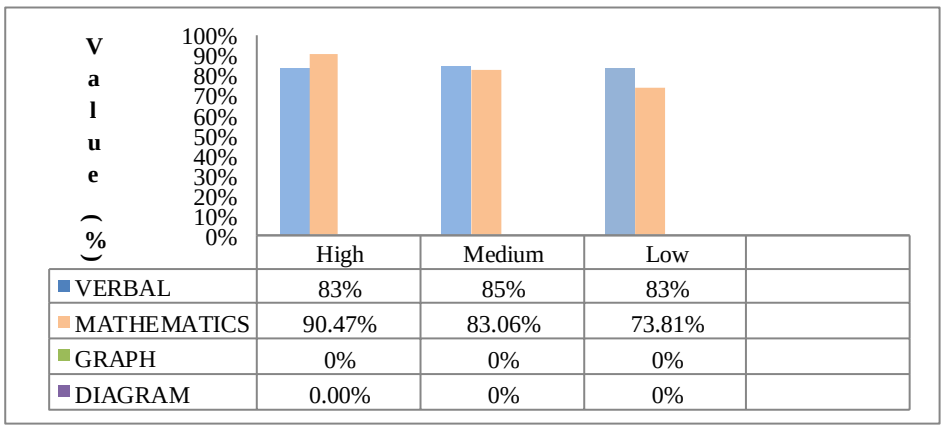
This research had been previously conducted by Harun et al. (2016), the results of the study were as follows: of the 35 students who were the research subjects, only 12 students answered correctly using representation mathematically in solving physics problems faced by the students concerned or only 34.29% of the total students. For the use of verbal representation, 11 students answered correctly or 31.43% of the total students. Only 8 students or only 22.86% were able to solve problems using image representations correctly, while students who used graphical representations correctly when solving fluid problems were only 4 students or only 11.43%. Research conducted by Theasy et al. (2017) results from the study as follows: the multi representation forms used were verbal (V), pictures/diagrams (D), graphs (G), and mathematical (M). High, medium and low multi representation abilities of students have mathematical representation tendencies (M) of 67.85%, 79.92%, and 75%, respectively. Therefore, it is necessary to investigate more deeply multi representation abilities in solving descriptive questions on the straight motion.

RESEARCH METHODS

This type of research was qualitative research with an analytic descriptive approach. According to Sugiyono (2015: 9), qualitative research methods are research methods based on postpositivism, used to examine the conditions of natural objects where the researcher is the key instrument, data analysis is inductive or qualitative, and the results of qualitative research emphasize the meaning more than generalization. The data used in this study were evaluation questions, physical evaluation scores, student worksheets on evaluation questions, and interview results. The subjects of this study were three physics teachers and twenty-five students of class X MIA SMA Negeri 1 Maumere. The data collection techniques used in this study were as follows: documentation and in-depth interviews. For qualitative research data to be accounted for as scientific research, it is necessary to test the validity of the data (Sidiq & Choiri, 2019: 90). This study used triangulation techniques, namely checking data on the same source with different techniques, namely the results of observations seen from observation sheets and student answers from interview questionnaires, interviews used in-depth interviews. The data analysis technique in this study used grounded theory steps (Creswell, 2010: 275). The grounded theory steps are: creating a category for the information obtained (open coding), choosing one category and placing it in a theoretical model (axial coding), and then compiling a story about the relationship between the categories (selective coding). The categorization includes high, medium and low categories based on work results by Dadang et al. (2019) and the representation format includes (1) verbal representation; (2) mathematical representation; (3) a representation of the graph, and (4) a pictorial representation (Marpaung, 2016).

RESULTS AND DISCUSSIONS

Student's multi representation Ability in Solving Problems Description of Straight Motion Independent learning activity unit (UKBM) each category uses 87.5% mathematical and a verbal representation of 12.5%. The analysis is based on student work steps in solving evaluation questions (Hau et al. 2020). According to Lasiani and Rusilowati (2017), students have diverse patterns to solve problems related to physics concepts. However, in each category the identification is known and asked differently, this is due to the understanding of different concepts, the way to understand information is known and asked on different questions that can be seen at the writing stage known and asked with the wrong symbol. So that the method of solving students that looks like a whole is the same but the results obtained are different. This is in line with the opinion of Ngilawajan (2013) that although the results of the work show similarities in writing down systematic problem-solving steps, differences can be seen in writing known and asked symbols from a problem-solving problem which has implications for differences in solving problems. A graph of the multi representation abilities of students in completing straight motion UKBM questions in each category based on the scoring guidelines for multi-representation ability can be seen in Fig 1.



	High	Medium	Low	
VERBAL	83%	85%	83%	
MATHEMATICS	90.47%	83.06%	73.81%	
GRAPH	0%	0%	0%	
DIAGRAM	0.00%	0%	0%	

Fig. 1 *Graph of Students' Multirepresentation Ability in Solving Straight Motion UKBM Questions*

Based on Fig. 1, it can be said that the acquisition value on verbal representations in the highest order to the lowest was in the medium category at 85%, while the low and high categories were the same, namely 83.3%. Mathematical representations with the highest order to the lowest were 90.47% high category, 83.06% medium category, and 73.81% low category. The image and graphic representations were 0% because students as a whole do not use these 2 representations. In addition to the ability of students to solve questions, there were also students' mistakes in completing UKBM of physics questions, namely based on worksheets and interviews with students, there were some students who in solving straight motion questions, seemed to forget and incorrectly put the formula so that it had an impact on wrong processes and results. This was proven when answering question number 8, namely writing the equation used to find the maximum height, S7 and S13 said they forgot the equation used to find the maximum height so that the worksheet was emptied, and S3 did not understand the use of signs (+ or -) in accelerated and decelerated motion. This is in line with research conducted by Yusuf & Setiawan (2009) which stated that students prefer arithmetic questions over conceptual questions. When solving problems, they look for formulas that match the information they find from the problem. If you can't find it or don't remember it, then decide to give up.

Students generally solve the UKBM of straight motion questions using systematic steps, but it was found that S13 in solving problem number 7, chose the wrong equation to be used, thus getting the wrong result. but when interviewed, S13 admitted that he understood the questions given, but was confused about using the correct equation. This is in line with the research conducted by Suparmi et al. (2019: 41) said that R-17 had the wrong answer caused by incorrectly determining what equation to

use in solving the problem, but when interviewed, R-17 admitted be able to solve the problem. this right.

Based on the student worksheets, it was found that there were students who had difficulties in distinguishing the symbols contained in physics and using the wrong units. This was found in S5 which often writes the wrong unit on several answer numbers and the use of the symbols T and t in question number 3 which are considered the same, even though they have different meanings. This was found in S8 in solving problem number 5, writing the wrong symbol, assuming the velocity symbol equals acceleration, and representing the wrong distance symbol and using the velocity symbol. This was also found in previous research conducted by Theasy, et al. (2017: 3), namely that errors in understanding concepts arise due to student errors in constructing their knowledge. The difficulties experienced by students include the difficulty in distinguishing the symbols contained in physics. Symbols that have the same shape, but with different meanings and meanings.

In question number 5, S3 resolved the questions given incorrectly and based on the results of the interview, S3 said that they did not understand the information provided through graphs. So that the wrong information has an impact on the use of wrong calculation formulas and processes. This was also found in previous research conducted by Setyani et al. (2016: 125). The most errors were errors in answering questions in graphical form. Based on the results of an interview with one of the students, it can be seen that in learning activities both in high school and in lectures, their ability to understand and draw graphics is less developed.

CONCLUSION

Physics questions on straight motion material given by the teacher at SMA Negeri 1 Maumere were not multi representation questions. The number of representations used in each category was the same, namely 87.5% mathematical representation, and 12.5% verbal representation. The score for the verbal representation in the highest order to the lowest was in the medium category at 85%, while the low and high categories were the same, namely 83.3%. The mathematical representation in the order of highest to lowest was the high category 90.47%, the medium category 83.06%, and the low category 73.81%. The image and graphic representations were 0% because students as a whole do not use these 2 representations. The high category had a more dominant value, namely mathematical representation, while the lower category was more dominant, namely verbal representation.

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REFERENCES

Anugraheni, N. S. & Handhika, J. (2018). Profil Kemampuan Multi Representasi Siswa dalam Materi Fluida. *Seminar Nasional Pendidikan Fisika IV, ISSN: 2527-6670.262.*

Creswell, J. W. (2010). *Research Design Pendekatan Kualitatif, Kuantitatif, dan Mixed.* Yogyakarta: Pustaka Pelajar.

Dadang, W., Komang, I., & Saehana, S. (2019). Analisis Kemampuan Representasi Mahasiswa dalam Menyelesaikan Soal Fisika pada Materi Hukum III Newton. *Jurnal Pendidikan Fisika Tadulako (JPFT), 7*(2).

Fatimah, S. (2017). Analisis Pemahaman Konsep IPA Berdasarkan Motivasi Belajar, Keterampilan Proses Sains, Kemampuan Multi Representasi, Jenis Kelamin, dan Latar Belakang Sekolah Mahasiswa Calon Guru SD. *Jurnal Inovasi Pendidikan dan Pembelajaran Sekolah Dasar, 1*(1).

Fitriyah, N., Harijanto, A., & Sudarti. (2018). Analisis Pemahaman Konsep Spektrum Gelombang Elektromagnetik pada Siswa SMA Kelas XII di Kabupaten Bondowoso. *Seminar Nasional Pendidikan Fisika 2018, 3*. *ISSN: 2527 – 5917.*

Harun, M., Sutopo., & Kusairi, S. (2016). Analisis Kemampuan Representasi Siswa pada Pokok Bahasan Fluida. *Pros.Semnas Pend. IPA Pascasarjana UM, 1, ISBN: 978-602-9286-21-2.*

Hau, R. R. H. et al. (2020). Students' Multi Representation Ability in Completing Physics Evaluation Problems. *JIPF (Jurnal Ilmu Pendidikan Fisika)*, *5*(3), 187-192.

Hau, R. R. H., & Nuri, N. (2019). Pemahaman Siswa terhadap Konsep Hukum I Newton. *Variabel, 2*(2), 56-61.

Lasiani & Rusilowati, A. (2017). Pola Pemecahan Masalah Berdasarkan Representasi Siswa dalam Membangun Pemahaman Konsep Fisika. *Physics Communication, 1.*

Marpaung, N., Liliasari., & Setiawan, A. (2016). Identifikasi Kemampuan Multipel Representasi Mahasiswa Calon Guru Fisika. *Seminar Nasional XIII Pendidikan Biologi FKIP UNS, 13*(1). ISSN: 2528-5742.

Ngilawajan, D. A. (2013). Proses Berpikir Siswa SMA dalam Memecahkan Masalah Matematika Materi Turunan Ditinjau dari Gaya Kognitif *Field Independent* dan *Field Dependent*. *Pedagogia*, *2*(1), 71-83.

Setyani, N. D.. Handhika, J., & Cari. (2016). Analisis Kesalahan Mahasiswa dalam Menyelesaikan Soal Multi Representasi pada Materi Kinematika dan Dinamika. *Seminar Nasional Pendidikan Fisika II*, ISSN :2527-6670.

Sidiq, U. & Choiri, M. (2019). *Metode Penelitian Kualitatif di BidangPendidikan.* Ponorogo: CV. NataKarya.

Sugiyono. (2015). *Metode Penelitian Kuantitatif, kualitatif, dan R & D*. Bandung: Alfabeta.

Sujarwanto, E., Hidayat, A., & Wartono, W. (2014). Kemampuan pemecahan masalah fisika pada modeling *instruction* pada siswa SMA kelas XI. *Jurnal Pendidikan IPA Indonesia*, *3*(1).

Suparmi., Darsikin., & Syamsu. (2019). Analisis Pemilihan Representasi dalam Pemecahan Masalah Hukum II Newton pada Siswa Kelas XI IPA SMA Negeri 1 Palu. *Jurnal Pendidikan Fisika Tadulako (JPFT)*, *7*(2).

Theasy, Y., Wiyanto., & Sujarwata. (2017). Identifikasi Kesulitan Belajar Fisika Berdasarkan Kemampuan Multi Representasi. *Physics Communication, 1*(2).

Yusuf, M. & Setiawan, W. (2009). Studi Kompetensi Multi Representasi Mahasiswa pada Topik Elektrostatika. *Jurnal Pendidikan Teknologi Informasi dan Komunikasi, 2*(1).