

ANALYSIS OF STUDENT DIFFICULTIES IN SOLVE QUESTIONS PROBLEM SOLVING ABILITY BASED ON DYNAMIC FLUID MATERIALS IN SMA/MA MEDAN CITY

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Abstract

This research aims to determine the level of students' problem solving abilities and to determine the difficulties experienced by students in solving problems based on problem solving abilities in dynamic fluid material. This type of research is qualitative research. The data sampling technique in this research uses a purposive sampling technique. The subjects in this research were class The results obtained show that SMA Negeri 8 Medan, MAN 1 Medan, SMA Private Dwiwarna, and Private SMA Islam Azizi have a good level of problem solving ability according to Heller at the problem focusing stage. the stage of describing the problem was categorized as sufficient, the stage of preparing a plan was categorized as sufficient, the stage of implementing the plan was categorized as inadequate, and the evaluating stage was categorized as insufficient. As for the difficulties experienced by students in solving problems based on problem-solving abilities in dynamic fluid material, namely Public High School 8 got 46.28%, MAN 1 Medan school got 45.48%, Dwiwarna Private High School got 42.03%, and Azizi Islamic Private High School got 37.71%.

Keywords: Difficulty Analysis, Heller Problem Solving Ability, Fluid Dynamics

INTRODUCTION

The increasingly rapid development of science and technology in the 21st century requires improving the quality of education, especially for students to have various competencies. Skills that must be possessed in the 21st century include critical thinking, problem solving, information literacy, and global awareness (Rotherham & Willingham, 2009).

In the 2013 Curriculum, students are required to have high-level thinking skills, one of which is problem-solving ability. The implementation of the 2013 Curriculum is to improve students' high-level thinking abilities in the 2013 Curriculum Graduate Competency Standards (SKL), namely that students are required to have the ability to think and act effectively and creatively in abstract and concrete realms as development through observing, asking, trying, processing activities. , present, reason, and create and be independent according to their talents and interests (Kemendikbud, 2013). To see the level of students' abilities, teachers need a high-level thinking ability test instrument. Then the teacher evaluates students by conducting a test of high-level thinking abilities with stages of solving problem-solving abilities.

Students' ability to solve problems through the overall problem solving ability test is in the low category because students have not mastered the concepts of the material, students also have difficulty connecting real life concepts (Makrufi, et al, 2016). This happens because students

experience difficulty in solving and answering questions, identifying problems and connecting them with real phenomena.

Problem solving is a procedural process that is obtained from a solution to a particular problem. Problem solving ability is a structured part of the process of thinking ability to find or solve a problem. The difficulties experienced by students in solving problems are due to a lack of understanding of the problems posed, a lack of knowledge of strategies for solving problems, and students' inability to translate problems into mathematical form. Difficulties experienced by students can also be caused by internal and external factors (Hidayatulloh, 2020).

The importance of students' problem solving abilities can overcome the causes of students' difficulties in solving problems. The causes of students' difficulties in solving questions can be resolved by supporting factors such as internal and external factors. Difficulties experienced by students can have an impact on learning outcomes or student achievement.

Difficulty is a condition that concerns obstacles in activities to achieve goals so that effort is needed to overcome these obstacles. According to Slameto (2003), students often experience difficulties in solving questions. These difficulties include difficulty in using numbers, decimals, difficulty in understanding physics concepts, difficulty in understanding a sentence or term and difficulty in using formulas. Students experience difficulty in solving questions because students do not like physics subjects, as a result students make mistakes in solving physics questions.

Problem solving ability requires special skills and abilities that each student has with differences in solving a problem. According to Heller (1992) there are five steps in solving problems including visualizing the problem, describing physics, planning a solution, carrying out the solution plan, and checking again.

Problem solving ability is a person's ability to find a solution to a problem based on the understanding they have previously (Sujarwanto, 2014). Problem solving ability is an ability that an individual has in solving a problem with previous understanding. Problem solving ability is a person's ability to determine solutions through a process that involves obtaining and organizing information.

METHOD

This type of research is qualitative research. The sampling technique in this research used a purposive sampling technique. The purposive sampling technique is a technique for sampling data sources with certain considerations and objectives (Sugiyono, 2013). The subjects of this research were class Data collection tools in this research are test instruments, questionnaires, interviews and documentation. The test used in this research is an essay test with 10 questions. Tests are used to measure students' abilities and difficulties in solving problems. This interview was conducted with teachers who teach physics lessons. This questionnaire was carried out on students who experienced difficulties in learning complete the questions that have been given. The data analysis techniques in this research are quantitative and qualitative analysis techniques.

RESULT AND DISCUSSION

This research was conducted on students of SMA Negeri 8 Medan, MAN 1 Medan, SMA Private Dwiwarna, and Private SMA Islam Azizi who had studied dynamic fluid material. There are 30 class XI students in each school for a total of 120 students. There are 10 test questions given to students. After being given the 10 questions, after students have completed the answers to these questions, the student answer sheets are collected. Then students were given a student response questionnaire.

The results of data processing of the average scores obtained by students for each school based on indicators of problem-solving ability in solving dynamic fluid problems are contained in the students' ability test scores in solving problems. Students' answers to the essay tests given can determine the level of problem-solving ability for each indicator of problem-solving ability according to Heller.

Analysis of Problem Solving Ability at the Problem Focusing Stage

The following is a table of indicators of Heller's problem solving abilities at the Focus the Problem stage as follows:

Table 4.3 Indicators of Problem Solving Ability

School Name	Score	%	Criteria
SMAN 8 MEDAN	41.9	69.8%	Capable
MAN 1 MEDAN	41.2	68.7%	Capable
SMAS DWIWARNA	37.8	63.0%	Capable
SMAS ISLAM AZIZI	27.8	63.0%	Capable
Average score	39.7	66.1%	Capable

At the problem focusing stage, students' ability to solve 10 questions obtained an average score of 39.7 with a percentage value of 66.1% falling within the capable criteria. So this shows that SMA Negeri 8, MAN 1 Medan, Dwiwarna Private High School and Azizi Islamic Private High School are able to write down the information they know and the information asked about in the questions.

Analysis of problem solving abilities at the stage of describing the problem in the context of physics (Describe The Problem In Terms Of Physics)

The following is a table of indicators of Heller's problem solving abilities at the Describe the Problem in the context of physics (Describe The Problem In Terms Of Physics) stage as follows:

Table 4.4 Stage II Problem Solving Ability Score

School Name	Score	%	Criteria
SMAN 8 MEDAN	35.1	58.5%	Capable enough
MAN 1 MEDAN	35.0	58.3%	Capable enough

SMAS DWIWARNA	30.5	50.8%	Capable enough
SMAS ISLAM AZIZI	24.7	41.2%	Capable enough
Average score	31.3	52.2%	Capable enough

At the stage of describing the problem in the context of physics, the score was 31.3 with a percentage value of 52.2%, which is within the criteria of being quite capable. So this shows that SMA Negeri 8, MAN 1 Medan, Dwiwarna Private High School and Azizi Islamic Private High School are quite capable of describing problems in the context of physics.

Analysis of Problem Solving Capabilities at the Stage of Preparing a Problem Solving Plan (Plan A Solution)

The following is a table of indicators of Heller's problem solving abilities at the planning stage (Plan A Solution) as follows:

Table 4.5 Stage III Problem Solving Ability Score

School Name	Score	%	Criteria
SMAN 8 MEDAN	28.4	47.3%	Capable enough
MAN 1 MEDAN	26.5	44.2%	Capable enough
SMAS DWIWARNA	24.8	41.3%	Capable enough
SMAS ISLAM AZIZI	22.0	36.7%	Less fortunate
Skor rata-rata	25.4	42.4%	Capable enough

At the stage of describing problems in the context of physics, students' ability to solve 10 questions obtained an average score of 25.4 with a percentage value of 42.4%, which falls within the criteria of being quite capable. So this shows that SMA Negeri 8, MAN 1 Medan, Dwiwarna Private High School and Azizi Islamic Private High School are quite capable of preparing problem solving plans.

Analysis of Problem Solving Capabilities at the Execute the Problem Solving Planning Stage (Excute The Plan)

The following is a table of indicators of Heller's problem solving abilities at the stage of executing problem solving (Excute the plan) as follows:

Table 4.6 Stage IV Problem Solving Ability Score

School Name	Score	%	Criteria
SMAN 8 MEDAN	24.9	41.5%	Capable enough
MAN 1 MEDAN	24.7	41.2%	Capable enough
SMAS DWIWARNA	16.1	26.8%	Less fortunate
SMAS ISLAM AZIZI	16.3	27.2%	Less fortunate
Average score	20.5	34.2%	Less fortunate

At the stage of executing problem solving planning, students' ability to solve 10 questions

obtained an average score of 20.5 with a percentage value of 34.2% falling within the criteria of being less capable. So this shows that SMA Negeri 8, MAN 1 Medan, Dwiwarna Private High School, and Azizi Islamic Private High School are less able to execute problem solving plans.

Analysis of Problem Solving Ability at the Stage of Evaluating the Results Obtained (Evaluate the Answer)

The following is a table of indicators of Heller's problem solving abilities at the stage of evaluating the results obtained (Evaluate the answer) as follows:

Table 4.7 Results of Phase V Problem Solving Ability

School Name	Score	%	Criteria
SMAN 8 MEDAN	15.7	26.2%	Capable enough
MAN 1 MEDAN	14.9	24.8%	Capable enough
SMAS DWIWARNA	13.2	22.0%	Capable enough
SMAS ISLAM AZIZI	12.1	20.2%	Capable enough
Average score	14.0	23.3%	Capable enough

At the stage of executing problem solving planning, students' ability to solve 10 questions obtained an average score of 14.0 with a percentage value of 23.3% falling within the criteria of being less capable. So this shows that SMA Negeri 8, MAN 1 Medan, Dwiwarna Private High School, and Azizi Islamic Private High School are less able to execute problem solving plans.

Analysis of Student Difficulties in Solving Questions

The difficulties experienced by students in solving problems based on problem-solving abilities in dynamic fluid material using Heller's theory, consist of 5 sub-indicators, including focusing the problem, describing the problem in physical form, drawing up a plan, executing or carrying out the plan and evaluating the results obtained, each item The questions given to students include 5 indicators of problem solving abilities.

Table 4.8 Student Difficulty Test Results in Solving Questions

Number Question	School Name			
	SMAN 8	MAN 1	SMAS DWIWARNA	SMAS AZIZI
1	44.4%	44.0%	43.4%	39.2%
2	47.0%	46.7%	40.6%	38.8%
3	48.8%	47.3%	44.2%	34.8%
4	47.8%	48.0%	40.4%	37.6%
5	52.4%	51.0%	45.6%	39.4%
6	44.4%	44.8%	41.4%	39.0%
7	51.4%	42.9%	40.2%	36.4%
8	45.8%	41.5%	38.6%	38.8%

9	53.0%	44.0%	47.0%	37.4%
10	44.0%	49.1%	39.0%	36.2%
% Overall Average	47.9%	45.9%	42.0%	37.8%
Criteria	Currently	Currently	Currently	Low

The table above shows that the students' difficulty in solving questions, namely at State High School 8, the average percentage reached 47.9%, which is in the medium criteria. At the MAN 1 Medan school, the average percentage reached 45.9%, which is included in the medium criteria. At the Dwiwarna Private High School, the average percentage reached 42.0%, which is included in the medium criteria. At the Azizi Islamic Private High School, the average percentage reached 37.8%, which is in the low criteria.

DISCUSSION

The results of this research show that students' difficulties and problem-solving abilities can be identified through a 10-question essay test. The results of the test analysis can be seen from the problem solving abilities of each school. At SMA Negeri 8 Medan, an average percentage of 48.7% was included in the criteria of being quite capable. MAN 1 Medan obtained an average percentage of 47.4% which falls within the criteria of being quite capable. Dwiwarna Private High School obtained an average percentage of 40.8% which falls within the criteria of being quite capable. Azizi Islamic Private High School obtained an average percentage of 37.6% in the underprivileged criteria. The research results also show students' difficulties in solving Heller problem solving questions. Based on the results of the analysis of the difficulties experienced by students, most students are at the stage of focusing the problem, describing the problem, and compiling a plan with a moderate percentage. Meanwhile, at the stage of executing or carrying out the problem and evaluating the results of the answers with a low percentage.

CONCLUSION

Based on the results of the data analysis that has been carried out, it can be concluded that students' abilities in solving questions can be seen based on Heller's problem solving stages with 10 essay questions. Schools that have a fairly capable level of ability in the criteria are SMA Negeri 8 Medan, MAN 1 Medan, and SMA Private Dwiwarna. Meanwhile, Azizi Islamic High School has poor problem solving abilities. The difficulties of students at SMA Negeri 8 Medan, MAN 1 Medan, SMA Private Dwiwarna, and SMA Islam Azizi Medan in solving Heller problem solving questions. Based on the results of the analysis of the difficulties experienced by students, most students are at the stage of focusing the problem, describing the problem, and compiling a plan with a moderate percentage. Meanwhile, at the stage of executing or carrying out the problem and evaluating the results of the answers with a low percentage.

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REFERENCE

- Heller, P., Keith, R., & Anderson, S. (1992). Teaching problem solving through cooperative grouping. Part 1: Group versus individual problem solving. *American journal of physics*, 60(7), 627-636.
- Hidayatulloh, A. (2020). Analisis Kesulitan Belajar Fisika Materi Elastisitas Dan Hukum Hooke Dalam Penyelesaian Soal–Soal Fisika. *Kappa Journal*, 4(1), 69-75.
- Kemdikbud. (2013). Kurikulum 2013 Sekolah Menengah Atas(SMA)/ Madrasah Aliyah (MA). Jakarta: Kemdikbud.
- Makrufi, A. (2016). Analisis Kemampuan Pemecahan Masalah Siswa Pada Materi Fluida Dinamis. *Jurnal Pembelajaran Fisika*, 4(5), 332-340.
- Rotherham, A. J., & Willingham, D. (2009). 21st century. *Educational leadership*, 67(1), 16-21.
- Slameto. (2003). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Jakarta: Rineka Cipta
- Sugiyono. (2013). *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).