

PROBLEM SOLVING SKILL ANALYSIS OF JUNIOR SCHOOL STUDENTS THROUGH *HOTS* TYPE MATHEMATICS QUESTIONS (*HIGHER ORDER THINKING SKILLS*)

Yurnalis¹, Beniario².

Fakultas Keguruan dan Ilmu Pendidikan, UM Sumbar

Abstract

The purpose of this research is to analyze the problem solving ability of junior high school students for high, medium and low ability levels in solving Higher Order Thinking Skill (HOTS) type mathematical problems. This type of research is library research. Some series of research relating to library data collection method or research that objects of research is explored through the number of library information. The data collection technique in this research is documentation. The Researcher uses three literatures as sources of main data for research and three literatures as sources of supporting data for research. The data that has been collected is then analyzed so that conclusion can be taken to solve the topic of the problem in this research. Based on the result of this research shows that : (1) Junior high school students with high level problem solving skill are able to work on and solve HOTS questions very well, (2) Junior high school students with medium level problem solving skill are also able to work on and solve HOTS questions well but still having difficulty in proposing conjectures and finding patterns of mathematical phenomena, (3) Junior high school students with low level problem solving skill still have difficulty working on and solving HOTS questions on indicators device a plan, checked back the plan and looking back in problem solving.

Keywords: *HOTS, Problem-Solving Skill*

Abstrak

Tujuan dalam penelitian ini adalah untuk menganalisis kemampuan pemecahan masalah siswa SMP untuk tingkat kemampuan tinggi, sedang dan rendah dalam menyelesaikan soal matematika tipe Higher Order Thinking Skill (HOTS). Jenis penelitian ini adalah penelitian kepustakaan (library research). Teknik pengumpulan data dalam penelitian ini adalah dokumentasi. Peneliti menggunakan tiga literatur sebagai sumber data utama penelitian dan tiga literatur sebagai sumber data pendukung penelitian. Data yang telah terkumpul kemudian dianalisis sehingga dapat ditarik kesimpulan untuk menyelesaikan topik permasalahan dalam penelitian ini. Berdasarkan hasil penelitian ini menunjukkan : (1) siswa SMP dengan kemampuan pemecahan masalah tingkat tinggi mampu mengerjakan dan menyelesaikan soal HOTS dengan sangat baik, (2) siswa SMP dengan kemampuan pemecahan masalah tingkat sedang juga sudah mampu mengerjakan dan menyelesaikan soal HOTS dengan baik namun masih kesulitan dalam mengajukan dugaan atau konjektur dan menemukan pola dari suatu gejala matematis, (3) siswa SMP dengan kemampuan pemecahan masalah tingkat rendah kesulitan dalam mengerjakan dan menyelesaikan soal – soal HOTS pada indikator membuat perencanaan, melaksanakan rencana dan melihat kembali dalam pemecahan masalah.

Kata Kunci : *HOTS, Problem-solving skill*

INTRODUCTION

Mathematics is a very important science. The government hinted at this by making mathematics a compulsory subject in schools, starting from elementary school (SD/MI), junior high school (SMP/MTs), senior high school (SMA/MA), even universities. This case shows that mathematics has its own existence

As a very compulsory subject, it is certain that there are qualifications for students' abilities to be achieved. In the Regulation of the *Menteri Pendidikan dan Kebudayaan* No. 22 of 2016 that one of the objectives of learning mathematics is to solve mathematical problems which include the ability to understand problems, develop models of solving mathematics, solve mathematical models and give appropriate solutions.

In dealing with the *Permendikbud*, Wardhani (in Harahap and Surya, 2017: 269) states that one of the objectives of learning mathematics is to solve problems which include the ability to understand problems, design mathematical models, complete models, and interpret the models obtained from problem solving skill activities.

According to Susanto (in Partayasa et al, 2020: 169), problem solving is a process of applying previously possessed knowledge to new situations. Problem solving is part of the process of doing math that was often neglected in the past in favor of some skills such as addition, so problem solving can be considered as the essence of mathematics and doing mathematics means solving problems.

The problem that arises related to the ability to solve mathematical problems is the number of students who have difficulty solving mathematical problems. The results of Iin Suhartini's study (in Khotna Sofiyah et al, 2017: 2) argue that the ability to solve problem solving problems for school students at MTs Miftahussalam Medan is still low. In line with the results of Ni'mah Khairani Nasution's research (in Khotna Sofiyah et al, 2017: 2) for junior high schools (SMP), in general, the results of the ability to solve mathematical problems for junior high school students have not been satisfactory.

The factor causing the large number of students who have difficulty solving math problems is that most teachers still give Low Order Thinking Skill (LOTS) questions which are a type of closed questions that focus on a certain formula, are explicit and it is enough just to remember and understand and students who are not used to dealing with questions-Higher Order Thinking Skill (HOTS) questions. This is evidenced by the statement by the Head of the Research and Development Agency of the *Menteri Pendidikan dan Kebudayaan* in Oktiningrum and Wardhani (2019: 282-283), one of the factors causing the decrease in the average National Examination score is the presence of several questions with a higher standard than the 2017 National Examination, known as *HOTS* or Higher Order Thinking Skills. Indonesia's achievements in the Trends International Mathematics and Science Study (*TIMSS*) and the Program for International Student Assessment (*PISA*) also show that the mathematics abilities

of students in Indonesia are still low. Quoted from *Detiknews*, Indonesia's achievement at *TIMSS* in 2015 Indonesia was ranked 46th out of 51 countries with a math score of 397. Meanwhile, Indonesia's achievement at *PISA* in 2018 was ranked in the bottom 10 of 79 countries with a math score of 379.

Quoted in Suryapuspitarini, et al (2018: 877), questions with the *HOTS* type are questions that require students to have high-order thinking skills and involve a reasoning process in solving them. To bring up the ability to think at a high level requires a very long process. Students need a habit of dealing with *HOTS* type questions. Meanwhile, teachers must be able to motivate students to think at a higher level and direct students to have the high reasoning abilities.

As described above, the researchers conducted research on "Analysis of Problem Solving Ability of Junior High School Students through HOTS Questions (*Higher Order Thinking Skill*)".

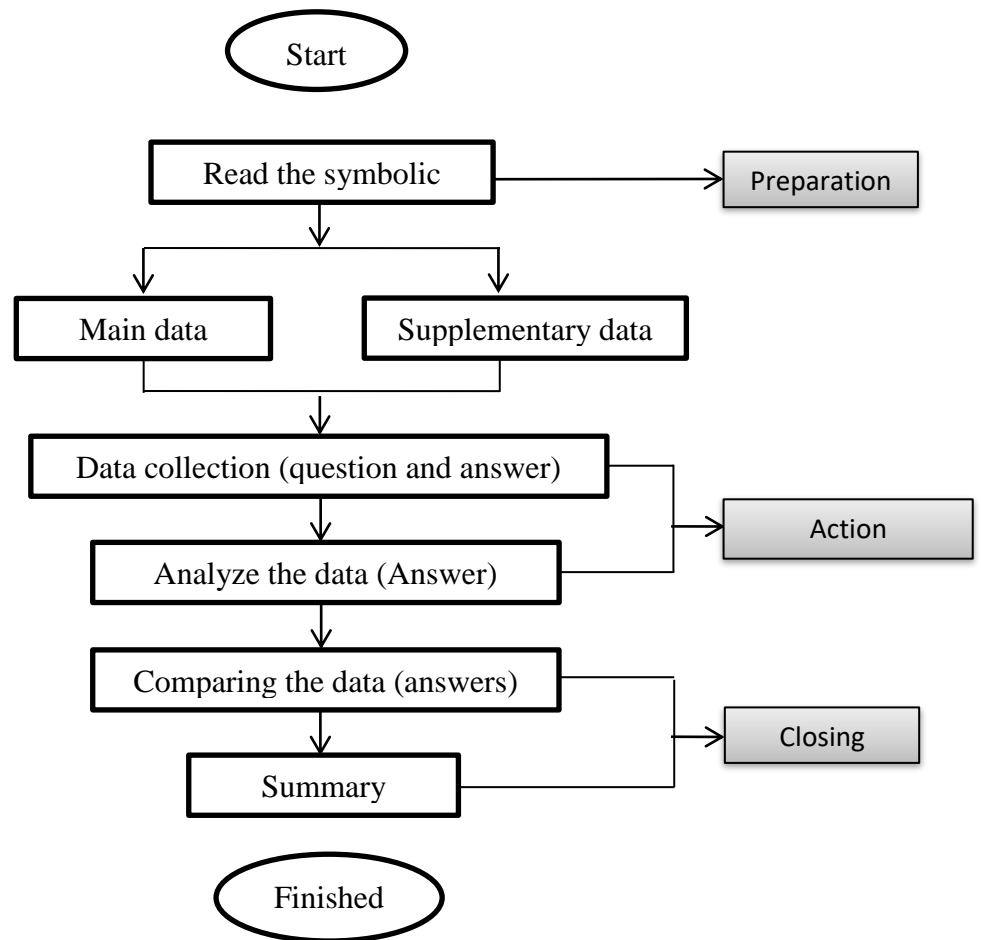
METHODOLOGY

This type of research was library research, which is a series of studies related to library data collection methods, or research whose research object is explored through the various library information such as books, encyclopedia, scientific journals, newspapers, magazines, and documents analysis.

The data collection technique used in this research is documentation. According to Mirzaqon & Purwoko (in Sari and Asmendri, 2020: 45) which states that, documentation is looking for data regarding matters or variables in the form of notes, books, papers or articles, journals and so on. The data that has been obtained from various literatures is collected as a single document that is used to answer the problems that have been formulated. The data collection instrument used in this study was *Mendeley*, while the data analysis technique used was content analysis and descriptive analysis. The data used in this study is secondary data, namely data obtained not directly, but the data is obtained from the results of research that has been conducted by previous researchers.

This research was carried out through several procedures in order to see how the problem solving abilities of junior high school students in solving Higher Order Thinking Skill (HOTS) type math problems. The procedure that needs to be carried out by this researcher consists of 3 stages, namely the preparation, implementation and closing stages. At the preparatory stage the researcher carried out symbolic reading activities to divide literature sources into two types of data, namely the main data sources and supporting data sources. At the implementation stage the researcher collected HOTS questions and student answers from the main data sources that had been collected and then analyzed student answers using *Polya* steps to obtain information about problem solving abilities in solving HOTS type math problems. In the closing stage the researcher draws conclusions by comparing the results of student work from the main sources.

Here, some research procedures, it can be seen from the *Alir* above:



Gambar 1. Alir Diagram of Research procedures

RESULT AND DISCUSSION

This research used three main sources and three supporting sources. The main research data source was the literature which is used as the basis for solving the problems in this study. While the research supporting data sources were literature that was used as additional information to support the findings of the main sources.

Sumber Data Main Primary Research

Some journals written by Nisvu Nanda Saputra, Ismatul Maula, Siska Indriyani and Tiyur Maharani which broadly aims to analyze problem solving abilities through HOTS questions in terms of creative thinking skills with research subjects of class VII students of SMP Negeri 1 Legok as many as 6 people who have Heterogeneous ability levels, namely high, medium and low creative thinking skills.

Each student was given 2 HOTS questions on number pattern material to see students' problem solving abilities and an observation sheet as a guide in assessing student problem solving in HOTS questions.

The Main Data Source of the Second Research

Some journals written by Nasha Nauvalika Permana, Ana Setiani and Novi Andri Nurcahyono which broadly aims to describe students' mathematical adaptive reasoning abilities in solving HOTS questions with research subjects in class VIII junior high school students as many as 6 people in one of the Junior High Schools in Sukabumi which had a heterogeneous level of ability, namely high, medium and low adaptive reasoning abilities. Each student was given 5 HOTS questions with the subject of flat sided space shapes.

The Third Main Data Source of Research

A journal written by Nurul Tri Lestari which broadly aims to determine the suitability of midterm math assessment questions to High Order Thinking Skills (HOTS) oriented math instruments, to analyze the suitability of mathematical instruments to High Order Thinking Skills (HOTS) oriented midterm assessment questions. and analyze the results of student work. The subjects of this study were 3 class VII students of SMP Muhammadiyah 1 Sukoharjo who had heterogeneous levels of ability, namely high, medium and low. Each student is given 5 questions consisting of 4 HOTS questions and 1 LOTS question taken from the Mid Semester Assessment (*PTS*) questions.

Sources Data Supporting for the First Research

A journal written by Erna Sari Agusta in 2020 which outlines the effect of the HOTS-based learning model on mathematical problem solving abilities.

The research was carried out in 3 cycles, each cycle consisting of planning, action, observation, evaluation, and reflection stages. Based on data analysis, it can be seen that students' mathematical problem solving abilities in learning from cycle I to cycle III have increased. It has been seen that some students are excited to learn mathematics. Based on the results of the interviews, it is known that some students have considered mathematics as an easy and interesting subject. Therefore, many students feel challenged to do the assignments given by the teacher. This can be seen from the increase in the number of students who master the problem-solving ability indicators.

Sources of Supporting Data for the Second Research

Some journal written by Novia Dwi Rahmawati, Gunanto Amintoko, Siti Faizah in 2018 which outlines the description of students' higher-order thinking skills in solving generator function problems. Based on the research results, the following conclusions are obtained:

- 1) Students who are classified as having high-level thinking skills with moderate levels are able to identify main ideas, analyze arguments, and show the usefulness of things that are known to answer several questions, so they have fairly good analytical skills. The student is able to provide an assessment of the solutions and methods used and to re-examine the questions, so that he has good evaluation skills. In addition, these students are also able to design ways of working and show the correctness of the questions, so they have good creative abilities. Whereas in logic and reasoning abilities, students write the content of answers, evidence and clarity of language style in a logical, good and effective way.
- 2) Students who are classified as having high-level and low-level thinking skills are less able to identify main ideas, analyze arguments, and show the usefulness of what is known to answer several questions, so they have poor analytical skills. These students are also less able to provide an assessment of the solutions and methods used and to re-examine the questions, so they have poor evaluation skills. These students are also less able to design ways of working and show the correctness of the questions, so they have poor creative abilities. Whereas in logic and reasoning abilities, students are less able to write the content of answers, evidence and clarity of language style in a logical, good and effective manner

Sources of Supporting Data for the Third Research

The Higher Order Thinking Skills (HOTS) Question Compilation Module was written by the Directorate of High School Development, Directorate General of Elementary and Secondary Education in 2017 which outlines 3 (three) main topics: (1) Definition and concept of HOTS questions. (2) The role of HOTS questions in the assessment. (3) Strategy and implementation of HOTS questions. Based on the discussion from the three main sources, a description is obtained which is summarized in table 1:

Table1. Description of Problem Solving Ability of Junior High School Students by Using Type Mathematics Problem Questions HOTS (Higher Order Thinking Skills)

No	Depiction	The source of first Data	The Source of the second Data	The Source of the Third Data
1.	The student with high ability	Students had high-level abilities can solve HOTS type questions correctly and in detail in each the answer	Students had high-level abilities can solve HOTS type questions on indicators put forward conjectures or conjectures, give reasons or evidence against a truth, draw	Students had high-level abilities are able to solve HOTS type questions correctly and in detail in each the answer.

No	Depiction	The source of first Data	The Source of the second Data	The Source of the Third Data
			conclusions on a statements and checks the validity of an argument very well but has not been able to solve HOTS questions on indicators of finding patterns of a mathematical phenomenon	
2.	The students with the moderate ability	Students had moderate level abilities can complete several stages on HOTS type questions but the student workmanship is not detailed in each answer.	Students had moderate level abilities can solve HOTS type questions on giving reasons or evidence against a truth, draw conclusions on a statements and checks the validity of an argument properly but has not been able to solve HOTS questions on indicators submit conjectures or conjectures and find patterns of a mathematical phenomenon..	Students had moderate level abilities are quite capable of solving HOTS type questions correctly and in detail in each the answer
3.	The students with the low ability	Students had low level abilities are able to solve HOTS type questions but the solution is not quite right and every answer was wrong	Students had low level abilities can solve HOTS type questions on indicators make good conjectures or conjectures but have not been able to solve HOTS questions on the indicators of giving reasons or evidence against a truth, draw conclusions on a statement, checking the validity of an argument and finding a pattern of a mathematical phenomenon	Students who have low level abilities are less able to complete HOTS type questions correctly and in detail in each the answer.

CONCLUSION AND SUGGESTION

Based on the analysis related to problem-solving abilities through HOTS questions, it was concluded that junior high school students with high-level problem-solving abilities were able to work on and solve HOTS questions very well and junior high school students with moderate-level problem-solving abilities were also able to work on and solve HOTS questions well, but still have difficulty in making conjectures or conjectures and finding patterns of a mathematical phenomenon, while junior high school students with low-level problem-solving abilities have difficulty working on and solving HOTS questions on indicators of making plans, implementing plans and checking back in the problem solving.

REFERENCES

- Betha Kurnia Suryapuspitarini dkk, “Analisis Soal – Soal Matematika Tipe *Higher Order Thinking Skill* (HOTS) pada Kurikulum 2013 untuk Mendukung Kemampuan Literasi Siswa”. Seminar Nasional Matematika, 1:1, 2018, 877
- Direktorat Pembinaan SMA Ditjen Pendidikan Dasar dan Menengah, Modul Penyusunan Soal HOTS, (Jakarta: Direktorat Pembinaan SMA Direktorat Jenderal Pendidikan Dasar dan Menengah Departemen Pendidikan Dan Kebudayaan, 2017)
- Elvira Riska Harahap dan Edy Surya, “Kemampuan Pemecahan Masalah Matematis Siswa Kelas VII dalam Menyelesaikan Persamaan Linear Satu Variabel”. Seminar Nasional Matematika, (Mei, 2017), 269
- Nasha Nauvalika Permana dkk, “Analisis Kemampuan Penalaran Adaptif Siswa dalam Menyelesaikan Soal *Higher Order Thinking Skills* (HOTS)”. *Jurnal Pengembangan Pembelajaran Matematika*, 2:2, (Agustus, 2020), 54 – 59
- Nisvu Nanda Saputra dkk, “Analisis HOTS dalam Pemecahan Masalah Ditinjau dari Kemampuan Berpikir Kreatif Matematis”. *Jurnal Pendidikan Matematika*, 5:1, (Januari, 2020), 41 – 45
- Novia Dwi Rahmawati dkk, “Kemampuan Berpikir Tingkat Tinggi Mahasiswa dalam Memecahkan Masalah Fungsi Pembangkit”. *Jurnal Elektronik Pembelajaran Matematika*, 5:1, (Agustus, 2018), 22
- Nurul Tri Lestari, “Kesesuaian Soal Penilaian Tengah Semester SMP dengan Instrumen Matematika Berorientasi *Higher Order Thinking Skill* (HOTS)”. *Jurnal Kajian Pembelajaran Matematika*, (Agustus, 2020), 8 – 20
- Sari Milya dan Asmedri, “Penelitian Kepustakaan (*Library Research*) dalam Penelitian Pendidikan IPA”. *Jurnal Penelitian Bidang IPA dan Pendidikan IPA*, 6:1, 2020, 45
- Sofiyah Khotna dkk, “Membangun Kemampuan Pemecahan Masalah dan Kemandirian Belajar Siswa Melalui Pembelajaran Geometri Berbasis Pendidikan Matematika Realistik”. *Jurnal Pengembangan Pembelajaran Matematika*, (Desember, 2017), 2

- Wawan Partayasa dkk, “Pengaruh Model *Creative Problem Solving (CPS)* Berbantuan Video Pembelajaran terhadap Kemampuan Pemecahan Masalah Ditinjau dari Minat”. *JNPM*, 4:1, (Maret, 2020), 169
- Wuli Oktiningrum dan Dyah A. P. Wardhani, “Kemampuan Pemecahan Masalah Matematis Siswa Sekolah Dasar Melalui Soal *Higher Order Thinking Skills*”. *Jurnal Matematika dan pembelajaran*, 7:2, (Desember, 2019), 282 – 283