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Analysis of Students' Higher Level Thinking Ability in Solving Mathematics Problems in View of Mathematical Logical Intelligence

Anastasia M. Ikun[1], Stanislaus Amsikan[2], Ferdinandus Mone[3]*, Imanuel Faot[4]
University of Timor[1,2,3)], Soe Institute of Education[4)]
Email: ferdimone@gmail.com

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ABSTRACT

High-level Thinking Ability (HOT) is an ability or way of thinking that requires students to seek information or ideas in a certain way in remembering and restating or referring to something. HOT ability is influenced by several factors, one of which is logical intelligence, so the purpose of this study is to describe students' high-level thinking skills in solving mathematical problems in terms of Mathematical Logical Intelligence. This type of research is descriptive research with a qualitative approach. This research uses instruments in the form of test questions and interview guidelines to obtain students' ability to solve math problems. The research subjects are students of class VIII^{C} who have studied the material of System of Linear Equations of Two Variables (SPLDV). Based on the results of the analysis of student answers, the researcher describes that high ability students at the analysis stage are able to analyze incoming information and classify or formulate information into small parts to find out patterns and relationships, able to understand and distinguish the cause and effect of a complex scenario and identify or formulate questions. high ability students at the evaluation stage are able to provide an assessment of solutions, ideas and methods by using appropriate criteria or standards in determining the value of their effectiveness or benefits. High-performing students at the creation stage are able to draw conclusions about a particular idea or perspective, plan ways to solve problems, and rearrange elements or parts into a new structure that is different from the previous structure.

Keywords: Higher Level Thinking Ability, Mathematical Logical Intelligence.

ABSTRAK

Kemampuan Berpikir level Tinggi (HOT) merupakan kemampuan atau cara berpikir yang mewajibkan murid untuk mengupayakan informasi atau ide dengan cara tertentu dalam mengingat dan menyatakan kembali atau merujuk suatu hal. Kemampuan HOT dipengaruhi oleh beberapa faktor salah satunya adalah kecerdasan logis maka tujuan dalam penelitian ini untuk Mendeskripsikan Kemampuan Berpikir level Tinggi siswa dalam menyelesaikan Masalah Matematika ditinjau dari Kecerdasan Logis Matematis. Jenis penelitian ini adalah penelitian deskriptif dengan pendekatan kualitatif. Penelitian ini menggunakan instrument berupa soal tes dan pedoman wawancara untuk memperoleh kemampuan siswa dalam menyelesaikan masalah matematika. Subyek penelitian adalah siswa kelas VIII^{C} yang telah mempelajari materi Sistem Persamaan Linear Dua Variabel (SPLDV). Berdasarkan hasil analisis jawaban siswa peneliti mendeskripsikan bahwa siswa berkemampuan tinggi pada tahap analisis mampu menganalisis informasi yang masuk dan mengelompokkan atau menformulasikan informasi menjadi bagian-bagian kecil untuk mengetahui pola serta hubungannya, Mampu memahami serta membedakan sebab dan akibat dari suatu skenario yang rumit dan mengidentifikasi atau merumuskan pertanyaan. siswa berkemampuan tinggi pada tahap evaluasi mampu memberikan penilaian terhadap solusi, ide dan metode dengan menggunakan kriteria atau standar yang tepat dalam menentukan nilai efektifitas atau mamfaatnya. Siswa yang berkemampuan tinggi pada tahap kreasi mampu menarik kesimpulan terhadap suatu gagasan atau cara pandang tertentu, merencanakan cara untuk menyelesaikan masalah, dan menyusun kembali unsur-unsur atau bagian-bagian menjadikan struktur baru yang berbeda dengan struktur sebelumnya.

Kata kunci: Kemampuan Berpikir Tingkat Tinggi, Kecerdasan Logis Matematis.

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Introduction

Education is very important for human life. According to Siagian (Rahmany & Asnita, 2020) Education is the whole process of teaching and learning techniques and methods in order to transfer knowledge from one person to another in accordance with predetermined standards. The actualization of education is closely related to educational institutions, both formal and non-formal, formal educational institutions, especially schools, have interactions in them, there are several subjects which are divided into main and supporting subjects. Mathematics is one of the main subjects taught in schools starting from primary, secondary and tertiary levels. According to James (Hidayat & Sariningsih, 2018) Mathematics as a basic science of logic, patterns, shapes, quantities and concepts, which are related to the scope of science and are divided into 3 fields, namely: algebra, analysis, and geometry. In the revised taxonomy, the synthesis ability level was changed to create. The category of creating involves the process of organizing elements into a coherent or functional whole. The purpose is made into the category of creating so that students are able to make new things by rearranging elements or small parts into new patterns or structures that are different from the previous structure. Creating contains three cognitive processes: 1) making a plan that contains the process of describing the problem and making hypotheses that meet certain criteria; 2) planning problem solving methods that match the criteria of the problem, 3) involves the stage of implementing a solution plan that meets certain standards.

Bloom's Taxonomy is a multilevel arrangement that identifies thinking skills based on low to high level thinking. Bloom's taxonomy was introduced by Benjamin S. Bloom, an American educational psychologist in 1950. Bloom argues that most of the questions used in evaluating learning outcomes are memorized questions, while according to him memorization is the lowest level of thinking ability. In order for student learning outcomes to be of high quality, in 1956 he published the levels of student abilities which became known as Bloom's Taxonomy with the title "*Taxonomy of Educational Objectives: The Classification of Educational Goals*" Along with the development of educational theory, Krathwohl (Ruwaida, 2019) and experts in cognitive psychology revised Bloom's taxonomy to fit the times. The results of the revision were then published in 2001 called Bloom's Taxonomy Revised. The revision of Bloom's taxonomy is in the cognitive aspect by using verbs. Assessment of learning outcomes is commonly carried out by a teacher, the assessment instrument used must fulfill the cognitive, effective and psychomotor domains. So far, the realm of Bloom's taxonomy has been recognized, especially in the cognitive realm, this realm is written with the symbol C1 for the cognitive stage of remembering to C6 for the cognitive stage of creating. In learning practice, not all Bloom's revised taxonomy can be achieved by every student, especially learning conditions that are carried out online due to covid19...

The problems experienced by mathematics teachers at SMPN Nunbai are 1. lack of effective time in the classroom learning process due to the covid19 outbreak and the time students get in a week is only 45 minutes. 2. The application of learning at SMPN Nunbai is offline because most students do not have electronic devices so students are grouped into several points but some students are absent so they cannot listen to the teacher's explanation of the material being taught. Evaluation of High-level Thinking Skills by Subject Teachers is ineffective learning so that the material presented is only the concept and the solution process is not completed, so that students do not understand the material provided by the subject teacher and the students' thinking process does not reach a higher level. High-level Thinking Ability is a thinking process that requires students to organize information and ideas in a certain way with new understanding and implications. Gunawan, (Bariroh, 2020). Higher *Order Thinking* (HOT) is a thinking process that requires students to process information and ideas in a certain way by applying management in remembering, restating or referring to something. (Astuti, 2018).

According to Ernawati (Kurino, 2020) *Higher Order Think*ing (HOT) is a method of thinking that is not only verbally memorizing but also interpreting the nature of what is contained therein, to be able to interpret it requires a continuous method of thinking between analysis, association, synthesis to make conclusions that lead to creating creative and productive ideas. To determine students' Higher Level Thinking Ability, indicators are needed to measure this ability. HOT is a higher level thinking process to gain new knowledge in a problem solving. Wardana (Widyawati & Rahayu, 2020) suggests that HOT is a thinking process that involves mental activity in an effort to describe complex, reflective and creative experiences that are carried out consciously towards achieving goals, namely the acquisition of knowledge in the form of levels of thinking, synthesis, analysis and evaluation. HOT skills grow when a person acquires new information and passes it on to memory and interrelates or expands the information to achieve goals or find possible answers in new conditions. (Al-Tabany, 2017) . (Lewy, Zulkardi, & Aisyah, 2013) describes the characteristics of HOT as*: solving tasks where no algorithm has been taught, where justification or explanation is required, and where more than one solution may be possible.* So HOT is the ability to solve math problems. According to King, HOT includes critical, logical, reflective, metacognitive, and creative thinking. These thinking abilities are active when individuals experience unfamiliar problems, questions they do not understand or dilemmas. So it can be concluded that HOT ability is the ability to transform information in memory critically, logically and creatively to gain knowledge in the form of cognitive levels of analysis, evaluation, and creation.

Brookhart (Kurniati, Harimukti, & Jamil, 2016) states that the indicators used in evaluating analytical skills are focusing on the main idea, analyzing statements, and comparing and contrasting. Indicators for evaluating evaluation skills are the ability to make decisions or methods to match the expected goals. Indicators for evaluating creation skills are being able to provide more than one solution in solving problems, being able to design problem solving, and creating something new. Furthermore, (Krathwohl & Krathwohl, 2017) (Krathwohl & Krathwohl, 2017) states that the indicators for evaluating analytical skills are analyzing incoming information and dividing or organizing information into small parts to understand patterns or relationships, being able to know and distinguish the cause and effect factors of a complex event, and identify or formulate questions. Indicators for evaluating evaluation skills are evaluating solutions, ideas, and methods using appropriate standards in determining the value of their effectiveness or benefits, making hypotheses, criticizing, and testing, and accepting or rejecting a statement. According to Saifullah (Rahmawati, 2016) that "Mathematical-Logical Intelligence is the ability to use numbers and reason well and correctly." This intelligence includes how to respond to logical patterns and relationships, statements and information that are used as evidence or reasons for a truth (if-then, cause-and-effect) logical function. Knowledge about students' thinking activities in finding solutions to problems is actually very important for teachers. Teachers need and are required to understand and interpret the way and process of thinking of students and the way students receive information while guiding students to change their thinking process if necessary. By understanding and interpreting students' thinking processes, teachers can determine the causes of errors experienced by students, student difficulties, and parts that students do not understand. Based on some of the above problems, researchers need to conduct research on: "Analysis of Junior High School Students' HOT Ability in Solving Mathematics Problems in View of Mathematical Logical Intelligence".

Intelligence is the common human ability to carry out purposeful actions and think rationally. Human intelligence is divided into eight, namely: linguistic intelligence, mathematical logic, spatial visual, musical, physical-kinesthetic, interpersonal, intrapersonal, and naturalist intelligence. One intelligence that is closely related to problem-solving ability is mathematical-logical intelligence. Mathematical-logical intelligence is the ability to measure, count, consider proportions and hypotheses, and complete operations in the form of numbers, so that in solving students can solve a problem logically. The basic approach in mathematical logical intelligence is to emphasize thinking activities that are measurable, quantitative, and analytical. Students with high mathematical logical intelligence tend to easily understand a problem, analyze and solve it appropriately, because of the interest in students in exploring. One of the abilities closely related to mathematical problem solving ability is the ability to think logically (logical reasoning), namely the ability to conclude a truth based on certain rules, patterns

or logic. Steps or Procedures of Mathematical Logical Thinking (Lewy et al., 2013) namely: Categorization, namely preparation based on certain categories or criteria. Classification, namely classification based on certain rules or standards. Generalization, which is a general inference from an event, thing, or data. Calculation, namely numerical activities such as calculation and counting. Conclusion drawing. According to (Leonard & Linda, 2018). The characteristics and processes of logical-mathematical thinking are closely related to HOT ability because in HOT ability, students must be able to use reasoning and logic in order to solve problems correctly and precisely. In solving SPLDV related to higher order thinking skills, students must have logical intelligence so that students are directed to use logic and reasoning to solve problems correctly and precisely.According to Sukino and Wilson Simangunsong (Siti, 2019) The system of linear equations of two variables is an equation in which there are two variables in which the degree of each variable in it is one. Logical thinking ability consists of several indicators. These indicators can then be used to measure logical thinking skills. According to (Wulandari & Fatmahanik, 2020) the indicators of mathematical logical thinking consist of: (a) describe the facts of a problem (b) choose the right ideas (c) identify and examine the relationship between things in solving problems. (d) examine and investigate problems from every different angle/perspective (e) solve problems by looking at certain patterns (f) make conclusions.

Research Methods

This type of research is descriptive research with a qualitative approach. This research was conducted on January 26-31, 2022 and took place at SMP Negeri Nunbai. The subjects of this study were students of class VIII C at SMP Negeri Nunbai totaling 18 people. Furthermore, to analyze HOT ability, 3 subjects were selected who had high, medium and low mathematical logical intelligence. the criteria for determining the category of mathematical logical intelligence are based on $\bar{x} + SD \leq X \leq X_{\max}$ for students with high mathematical logical intelligence level , $\bar{x} - SD \leq X \leq \bar{x} + SD$ for students with medium level of mathematical logical intelligence, and $0 \leq X \leq \bar{x} - SD$ for students with a low level of mathematical logical intelligence, as the symbol $\bar{x}$ is the average/mean, SD is the standard deviation, *X is the* score/value obtained by the student and X_{maks} is the highest score if 100% of the student's answers are correct, (Arikunto, 2002). The research implementation procedure carried out by this researcher is divided into several stages, namely: The Preparation Stage is the initial stage carried out before the researcher goes to school, the Observation Stage, at this observation stage the researcher conducts an interview with the mathematics subject teacher of class VIII C regarding the condition of class VIII C. The Data Collection Stage, the first stage carried out by researchers in this data collection

stage is the administration of the Compound Intelligence Questionnaire (AKM) and processing the results of the Mathematics Problem Solving Task (TPM) scores of class VIII C students and the second stage is by conducting a logical intelligence test and this test is aimed at 12 questions that must be answered within 45 minutes. The Problem Solving Task (TPM) consists of 3 problems with the same level of difficulty and must be completed within 90 minutes. The following stage is to conduct interviews with research subjects who have been previously determined regarding the results of student work.

Research Results and Discussion

Research Results

1. HOT ability and Mathematical Logical Intelligence test results

   Based on the results of the Higher Level Thinking Ability test on the 18 students, 3 students were selected as research subjects who were taken non-randomly, namely the technique of taking data source subjects with several considerations. Grouping students into 3 categories, namely students who have high HOT ability ($\bar{x} + SD \leq X \leq X_{max}$), medium ($\bar{x} - SD \leq X \leq \bar{x} + SD$) and low ($0 \leq X \leq \bar{x} - SD$) (Arikunto, 2013). Students who have a high level of thinking ability are 3 people, who have a moderate level of ability are 14 people and who have a low level of ability are 1 person.

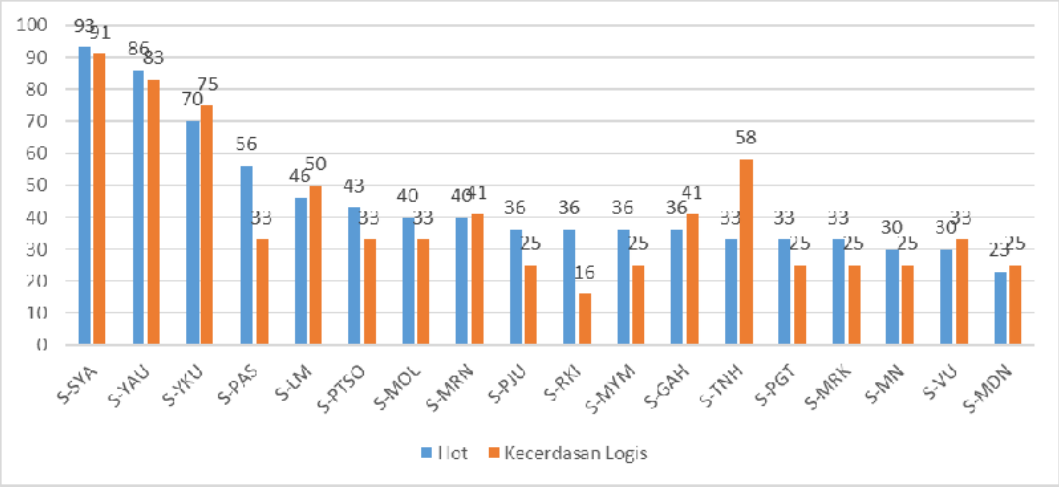


Figure 1. *Data on students' HOT ability and mathematical logical intelligence*

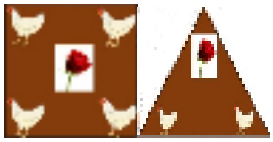
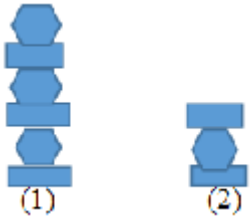
From the data in the diagram above, it can be seen that students with high mathematical logical intelligence have high ability in solving HOT problems and there are some students with high

mathematical logical intelligence but low HOT ability. There are also students with low logical intelligence but high HOT ability and vice versa, namely students with high logical intelligence but low HOT ability, the following is a table of HOT ability and Logical Intelligence.

Discussion

Based on the data obtained from the results of research on 18 students in class VIIIC in solving HOT problems and Mathematical logical intelligence, there are 3 subjects selected to solve story problems and interviews. The following are the aspects assessed and the questions given in this study

Table 1. Hot Skill Indicators

NO	HOT skill indicators	About
	Analysis Ability	
1	Analyze incoming information and divide or structure information into smaller parts to recognize patterns or relationships. Able to recognize and distinguish between cause and effect factors of a complex scenario. Identify or formulate questions	 Anisa has a stack of picture cards. The cards can be sorted into two parts according to their shape. One type is rectangular with four pictures of four chickens and a rose. The other type is triangular with two chickens and a rose. How many square and triangular cards must be drawn from the deck so that the sum of the number of pictures of chickens is 128 and the number of pictures of roses is 41?
2	**Evaluation Ability** Assessing solutions, ideas and methods using suitable or existing standards to assess their effectiveness or benefits.	In a parking lot in the kefamenanu terminal area there are 100 motorcycles and cars with a total of 274 wheels. If the cost of parking 1 car is 5,000.00 and the cost of parking 1 motorcycle is 2\5 of the cost of parking a car: a. What is the total revenue of the motorcycle parking fee? b. Is greater than the total revenue from car parking fees in the kefa terminal area!
3	**Creation Ability** Generalizing an idea or way of looking at something Devise a way to solve the problem Organizing elements or parts into a new structure that is different from the previous structure.	Below are two towers that have different heights and are composed of a hexagon and a rectangle. If the height of the first tower is 21 meters and the height of the second tower is 9 meters.  (1) (2) Draw the third tower if the height of the third tower is 19 meters?

The following is an explanation of each high-level ability performed by the subject:
1. Subjects with high logical intelligence

Subjects with high logical intelligence are Subject S-YA. Based on the results of solving higher order thinking problems and problems and logical intelligence and interviews on subjects with high logical intelligence are shown in Table 2:

Table 2. Results of HOT Ability Analysis of students with high mathematical logical intelligence

Question No.	Student Work Result of Research Subject	Description of HOT ability
1.		✓ Able to carry out activities to process the information received and categorize it into small parts as seen from student answers in writing what is known and asked. ✓ Able to understand patterns or relationships seen from the subject's ability to make mathematical models. ✓ Able to understand and determine the causal factors and consequences of a complicated problem or event from the problem, the subject can carry out calculations appropriately seen from the subject's ability to choose problem-solving strategies and perform calculation operations.
2.		✓ Able to evaluate problem solving, ideas and methods by using appropriate standards or existing standards to ensure the value of effectiveness or benefits, this can be seen from the student's ability to choose a mixed method between evaluation and substitution in solving problems. ✓ able to understand the problem and determine what is known and what is asked in the problem and able to determine the mathematical model and choose the right formula to solve mathematical problems. ✓ Designing a way to solve a problem and being able to do calculations well

3.		✓ Able to bring to the mathematical model and choose the right formula to solve the problem correctly which can be seen in the steps used by the subject in solving the problem. ✓ Organizing elements or parts into a new structure that is different from the previous structure can be seen from the subject being able to solve the problem by making a third drawing.

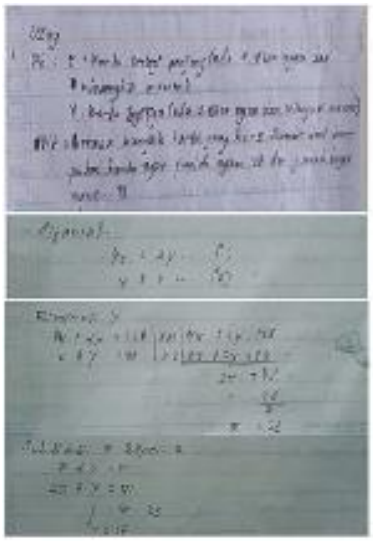
Based on the results of the test of students' ability to solve HOT problems, interviews and observations, it is concluded that students with high mathematical logical intelligence have a high ability to solve HOT problems. Students with high mathematical logical intelligence are able to do the analysis, evaluation and creation stages well. The results of this study are in line with the results of research conducted by (Adha & Rahaju, 2021) that mathematical logical intelligence affects students' HOT ability. The higher the mathematical logical thinking ability, the higher the ability to solve HOT problems.

2. Subjects with moderate logical intelligence

Subjects with moderate logical intelligence are Subject S-YKU. based on the results of solving higher order thinking problems and problems and logical intelligence and interviews on subjects with moderate logical intelligence appear as in Table 3.

Based on the results of the test of students' ability to solve HOT problems, interviews and observations, it is concluded that students with moderate mathematical logical intelligence have moderate ability to solve HOT problems. Students with high mathematical logical intelligence are able to do the analysis stage, less careful in evaluating evaluation and creation. The results of this study are in line with research conducted by (Allo, Yusuf, Arifanti, Naflatunnisa, & Syaifullah, 2021; Wulandari & Fatmahanik, 2020) which states that students with moderate mathematical logical intelligence are less able to make creations.

Table 3. Results of Analysis of HOT Ability of students with moderate mathematical logical intelligence

Question No.	Student Work Result of Research Subject	Description of HOT ability
1.		✓ Able to carry out activities to process the information received and categorize it into small parts as seen from student answers in writing what is known and asked. ✓ Able to understand patterns or relationships seen from the subject's ability to make mathematical models even though the model made to the two-variable linear equation system is incomplete. ✓ Able to understand and determine the cause and effect factors of a complicated problem or event from the problem, the subject can carry out the calculation but incorrectly perform the subtraction operation to obtain the value of variable *y*.
2.		✓ Able to evaluate problem solving, ideas and methods by using appropriate standards or existing standards to ensure the value of effectiveness or benefits, this can be seen from the student's ability to choose a mixed method between evaluation and substitution in solving problems. ✓ able to understand the problem and determine what is known and what is asked in the problem and able to determine the mathematical model and choose the right formula to solve mathematical problems. ✓ Designing a way to solve a problem and being able to do calculations well

3.		✓ Unable to bring to the mathematical model and choose the right formula to solve the problem correctly as seen in the steps used by the subject in solving the problem. ✓ Lack of ability to organize elements or parts into a new structure that is different from the previous structure can be seen from the subject not being able to solve problems by making drawings correctly (drawings are obtained without logical reasoning).

3. Subjects with low mathematical logical intelligence

The subject with low logical intelligence is Subject S-LM. Based on the results of solving high-level thinking problems or HOT and logical intelligence questions and interviews on subjects with high logical intelligence appear in Table 4.

Table 4. Results of HOT Ability Analysis of students with low mathematical logical intelligence

Question No.	Student Work Result of Research Subject	Description of HOT ability
1.		✓ Able to carry out activities to process the information received and categorize it into small parts but the resulting information is not complete, this can be seen from the subject's answer in writing what is known and asked. ✓ Able to understand patterns or relationships seen from the subject's ability to make mathematical models even though the model made to the two-variable linear equation system is incomplete. ✓ Unable to understand and determine the cause and effect of a complicated problem or event from the problem, this can be seen from the subject can carry out calculations but make mistakes but not until obtaining the value of *y* (stop doing the calculation after obtaining the value of *x*).

2.		✓ Not able to evaluate problem solving, ideas and methods using appropriate standards or existing standards to ensure the value of their effectiveness or benefits, this can be seen from the subject's ability to choose methods in solving problems. ✓ Able to understand the problem and determine what is known and what is asked in the problem and able to determine the mathematical model but not choose the right formula to solve mathematical problems. ✓ Less able to design a way to solve the problem and able to do calculations well
3.		✓ Unable to bring to the mathematical model and choose the right formula to solve the problem correctly as seen in the steps used by the subject in solving the problem. ✓ Lack of ability to organize elements or parts into a new structure that is different from the previous structure can be seen from the subject not being able to solve problems by making drawings by looking at the patterns in the problem.

Based on the test results of students' ability to solve HOT problems, interviews and observations, it is concluded that students with low mathematical logical intelligence have low ability to solve HOT problems. Students with high mathematical logical intelligence are less able to perform the analysis stage, less thorough in evaluating the evaluation and unable to perform the creation stage. The results of this study are in line with the research results (Purwanti, Mutrofin, & Alfarisi, 2021; Upu, Rusli, & Pratiwi, 2021) that those with low mathematical logical intelligence are less able to perform the evaluation and creation stages well. Therefore, explore and innovate the creative learning is necessary to develop students level thinking (Nugroho, 2020).

Conclusion

Based on the results of the analysis and discussion, it is concluded that: The ability to solve HOT problems in terms of mathematical logical intelligence in Nunbai SMPN students is as follows: 1) for high ability students in mathematical logical thinking able to solve HOT problems at the analysis stage is 93% of students, those able to solve HOT problems at the evaluation stage is 73% of students

and those able to solve HOT problems at the creation stage is 83%. 2) 2.6% of students with moderate ability in mathematical logical thinking were able to solve HOT problems at the analysis stage, 1.3% of students were able to solve HOT problems at the evaluation stage and 1.6% of students were able to solve HOT problems at the creation stage. 3) 43.33% of low ability students in mathematical logical thinking were able to solve HOT problems at the analysis stage, 20% of students were able to solve HOT problems at the evaluation stage and 26.66% of students were able to solve HOT problems at the creation stage. In addition, in terms of the number of students in the mathematical logical thinking ability group, there were 3 high ability students, 14 medium ability students and 1 low ability student. From the mathematical logical ability group above, 3 high ability students in mathematical logical thinking ability are the same students in HOT ability and also 14 medium ability students in mathematical logical thinking ability are the same students in HOT ability. And 1 low ability student in mathematical logical thinking ability is the same student in solving HOT problems, thus it can be concluded that 100% of students with high mathematical logical thinking ability also have high HOT ability. And 100% of students with medium mathematical logical thinking ability have medium HOT ability. And 100% of students with low mathematical logical thinking ability have low HOT ability.

Bibliography

Adha, S. M., & Rahaju, E. B. (2021). Profil Berpikir Reflektif Siswa SMA dalam Memecahkan Masalah Matematika Ditinjau Dari Kecerdasan Logis-Matematis. *Jurnal penelitian pendidikan matematika dan sains*, *4*(2). https://doi.org/10.26740/jppms.v4n2.p61-71

Al-Tabany, T. I. B. (2017). *Mendesain Model Pembelajaran Inovatif, Progresif, Dan Konteksual - Trianto Ibnu Badar Al-Tabany - Google Books*. *Kencana*.

Allo, N. M., Yusuf, M., Arifanti, D. R., Naflatunnisa, W., & Syaifullah, M. (2021). Identifikasi Kemampuan Literasi Matematika Ditinjau Dari Perspektif Kecerdasan Logis Matematis. *Al-Khwarizmi : Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam*, *9*(2). https://doi.org/10.24256/jpmipa.v9i2.2978

Arikunto, S. (2002). Metodologi Penelitian Suatu Pendekatan Proposal. *2017*.

Arikunto, S. (2013). *Prosedur penelitian : suatu pendekatan praktik / Suharsimi Arikunto | OPAC Perpustakaan Nasional RI. Jakarta: Rineka Cipta*.

Astuti, P. (2018). Kemampuan Literasi Matematika dan Kemampuan Berpikir Tingkat Tinggi. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*.

Bariroh, W. *Efektivitas Model Pembelajaran Problem Based Learning (Pbl) Terhadap Hasil Belajar Dan Kemampuan Berfikir Tingkat Tinggi Siswa Pada Materi Termodinamika* (Doctoral dissertation, Program Studi Pendidikan Fisika Jurusan Pendidikan Mipa Fakultas Keguruan Dan Ilmu Pendidikan Universitas Jember 2020).

Hidayat, W., & Sariningsih, R. (2018). Kemampuan Pemecahan Masalah Matematis dan Adversity Quotient Siswa SMP Melalui Pembelajaran Open Ended. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *2*(1). https://doi.org/10.33603/jnpm.v2i1.1027

Krathwohl, D. R., & Krathwohl, D. R. (2017). A Revision of Bloom ' s Taxonomy : *Routledge*, *5841*(November).

Kurino, Y. D. (2020). Model Problem Based Learning (PBL) Pada Pelajaran Matematika Di Sekolah

Dasar. *Jurnal Elementaria Edukasia*, *3*(1). https://doi.org/10.31949/jee.v3i1.2240

Kurniati, D., Harimukti, R., & Jamil, N. A. (2016). The Higher Order Thinking Skills of Junior High School Students at Jember District in Solving PISA Standar-Based Test Item. *Jurnal Penelitian dan Evaluasi Pendidikan*, *20*(2).

Leonard, L., & Linda, N. N. (2018). Pengaruh Kecerdasan Logis-Matematis Dan Kecerdasan Musikal Terhadap Higher Order Thinking Skills (HOTS). *Kalamatika Jurnal Pendidikan Matematika*, *3*(2). https://doi.org/10.22236/kalamatika.vol3no2.2018pp193-208

Lewy, L., Zulkardi, Z., & Aisyah, N. (2013). Pengembangan Soal Untuk Mengukur Kemampuan Berpikir level Tinggi Pokok Bahasan Barisan Dan Deret Bilangan Di Kelas IX Akselerasi Smp Xaverius Maria Palembang. *Jurnal Pendidikan Matematika*, *3*(2). https://doi.org/10.22342/jpm.3.2.326.

Nugroho, A.T.S. (2020). Metode Kubus Ringkasan Taksonomi Bloom Berbasis Mind Mapping Untuk Meningkatkan High Order Thinking Skill (HOTS) Guna Pengembangan Literasi Matematika dan Mendukung Kecakapan Abad 21. *Range: Jurnal Pendidikan Matematika*. 1(2). 128-135.

Purwanti, A. F., Mutrofin, M., & Alfarisi, R. (2021). Analisis Literasi Matematika Ditinjau dari Kecerdasan Matematis-Logis Siswa. *Jurnal Ilmu Pendidikan Sekolah Dasar*, *8*(1). https://doi.org/10.19184/jipsd.v8i1.24775

Rahmany, S., & Asnita, Y. (2020). Pengaruh Pendidikan, Profesi Dan Bagi Hasil Terhadap Persepsi Masyarakat Pada Perbankan Syariah. *JPS (Jurnal Perbankan Syariah)*, *1*(1). https://doi.org/10.46367/jps.v1i1.203

Rahmawati, N. (2016). Analisis Keterampilan dan Proses Berpikir Tingkat Tinggi Siswa dalam Pembelajaran Inkuiri Terbimbing Berbantuan LKS Interaktif. *Universitas Negeri Semarang*.

Ruwaida, H. (2019). Proses Kognitif dalam Taksonomi Bloom Revisi : Analisis Kemampuan Mencipta (C6) Pada Pembelajaran Fikih Di MI Miftahul Anwar Desa Banua Lawas. *Al-Madrasah: Jurnal Pendidikan Madrasah Ibtidaiyah*, *4*(1). https://doi.org/10.35931/am.v4i1.168

Siti, M. (2019). Pengembangan Kecerdasan Logika Matematika Melalui Permainan Lotto Angka Di Paud Al-Fachry Kota Bengkulu. *skripsi*.

Upu, H., Rusli, R., & Pratiwi, Y. (2021). Deskripsi Kemampuan Berpikir Reflektif dalam Menyelesaikan Soal High Order Thinking Skill (HOTS) ditinjau dari Kecerdasan Logis Matematis Siswa. *Issues in Mathematics Education (IMED)*, *5*(2). https://doi.org/10.35580/imed23845

Widyawati, E., & Rahayu, S. W. (2020). Kecerdasan Logis Matematis Siswa Kelas IX MTs Negeri Tarakan dalam Memecahkan Masalah Sistem Persamaan Linear Dua Variabel. *MUST: Journal of Mathematics Education, Science and Technology*, *5*(1). https://doi.org/10.30651/must.v5i1.3641

Wulandari, L., & Fatmahanik, U. (2020). Kemampuan Berpikir Logis Matematis Materi Pecahan pada Siswa Berkemampuan Awal Tinggi. *Laplace : Jurnal Pendidikan Matematika*, *3*(1). https://doi.org/10.31537/laplace.v3i1.312