

Analyzing Students Mathematical Problem Solving Skills Through HOTS-Based Questions at the Elementary School Level

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Abstract

Mathematical problem solving ability is related to higher order thinking skills (HOTS) which makes students tend to use logic rather than remembering or memorizing a formula, but in reality the problem solving ability of students is still low. The existence of these problems, the focus of this research is to describe the mathematical problem solving ability of students through HOTS-based questions. In accordance with the objectives of the research, the method used in the research is a literature study which helps in describing and explaining the data in narrative form. Literature study is used as a reference from previous similar research results and is useful as a theoretical basis for the problem being studied. The data collection technique used is by reviewing and analyzing from various sources of discourse such as books, articles, and journals with international and national levels related to mathematical problem solving skills and HOTS-based questions. Based on the data obtained, it is concluded that using HOTS-based questions really helps students in growing and developing their problem solving skills both in understanding mathematical material and developing problem solving skills both in solving mathematical problems and problems around students.

Keywords: *Mathematical, problem solving ability, HOTS question*

Abstrak

Kemampuan pemecahan masalah matematis berkaitan dengan kemampuan berpikir tingkat tinggi (HOTS) yang membuat siswa cenderung menggunakan logika dibandingkan mengingat atau menghafal suatu rumus, namun pada kenyataannya kemampuan pemecahan masalah siswa masih rendah. Adanya permasalahan tersebut, maka fokus penelitian ini adalah mendeskripsikan kemampuan pemecahan masalah matematis siswa melalui soal berbasis HOTS. Sesuai dengan tujuan penelitian, metode yang digunakan dalam penelitian adalah studi literatur yang membantu dalam mendeskripsikan dan menjelaskan data dalam bentuk naratif. Studi kepustakaan digunakan sebagai acuan dari hasil-hasil penelitian serupa sebelumnya dan berguna sebagai landasan teori terhadap masalah yang sedang diteliti. Teknik pengumpulan data yang digunakan adalah dengan cara mengkaji dan menganalisis dari berbagai sumber wacana seperti buku, artikel, dan jurnal bertaraf internasional dan nasional terkait keterampilan pemecahan masalah matematis dan soal berbasis HOTS. Berdasarkan data yang diperoleh dapat disimpulkan bahwa penggunaan soal berbasis HOTS sangat membantu siswa dalam menumbuhkan dan mengembangkan kemampuan pemecahan masalah baik dalam memahami materi matematika maupun mengembangkan keterampilan pemecahan masalah baik dalam menyelesaikan masalah matematika maupun permasalahan di sekitar siswa.

Kata kunci: *Matematis, kemampuan pemecahan masalah, soal HOTS*



INTRODUCTION

Educational documents and curricula in almost all countries mention that learning mathematics is one of the important things because mathematics is the main goal in shaping the competence of students who are able to solve problems in everyday life (Van Dooren et al., 2011). The Indonesian government lists the importance of learning mathematics in Permendikbudristek No. 5 of 2022 concerning graduate competency standards at the basic education level which states that students are able to demonstrate the ability to reason using mathematical concepts, procedures, facts and tools to solve problems related to themselves and the immediate environment. Mathematics in the school system is a core subject that is most closely related to problem solving (Zhou et al., 2020). Given the importance of learning mathematics, Hendriana & Soemarno (2017) divide mathematical abilities into five main competencies, one of which is mathematical problem solving. Mathematical problem solving as an important aspect and a necessity in mathematics curricula around the world (Liljedahl et al., 2016).

The ability of students to solve a problem either in mathematics, daily life or other sciences is called mathematical problem solving ability (Layali & Masri, 2020). Mathematical problem solving ability is a core ability of mathematics learning that helps students solve complex and non-routine problems (Martha et al., 2022). Problem solving is still an important issue in school mathematics education, this is because problem solving ability is a process that contributes to the development of conceptual and operational information together in understanding mathematical concepts and relationships (Öztürk et al., 2020). Mathematical problem solving also helps learners in developing and improving learners' thinking to a higher level, so that learners can separate ideas or concepts, solve existing problems, reason well, help learners in forming hypotheses, and understand complex problems well.

The existing curriculum in Indonesia ensures that the learning activities taught lead to 21st century learning activities, this is because students are encouraged to be more creative in solving problems that lead to higher order thinking (HOTS). problem solving with a high level of difficulty can use the stages of problem solving. Problem solving is often used when solving non-routine problems, and complex problems. Problem solving is used to help problem solvers learn how to think mathematically (Rott et al., 2021). Problem solving acts as a guide that helps in the thinking process of learners.

The importance of mathematical problem solving skills in the real life of students is still inversely proportional to the problem solving skills that students have. This is because in improving problem solving skills, students still experience many obstacles and problems in problem solving. One of the obstacles experienced by students is that students are still not able to work on HOTS-based problems so that students are still not used to solving problems in these types of problems. The obstacles that students experience show that students when solving problems in math problems indicate that they are still lacking in understanding the information in the problem, lack of understanding of students' concepts, and mathematical calculations, students' inability to use appropriate problem solving strategies, and lack of critical and creative students in solving problems in HOTS-based problems. The lack of problem solving skills has an impact on the quality of mathematics education in Indonesia, which is still not as expected. The quality of mathematics education in Indonesia can be seen from the results of PISA in 2018, Indonesia is in the bottom 10 out of 79 countries, with an average math ability of 379 which shows that students in solving problems in mathematics are still relatively low (KEMENDIKBUD, 2018).

Based on the existing problems, through mathematics learning activities, students should be directed to support the formation of higher-order abilities so that students can think logically, critically, and creatively in solving HOTS-based problems

at every stage of problem solving. One of the mathematical abilities needed in today's world must also have mathematical problem solving (Ukobizaba et al., 2021). To improve students' problem solving skills, students are also involved in solving non-routine problems that involve deriving numerical information that is not given explicitly (Suseelan et al., 2023). Therefore, to improve the quality of education in Indonesia in mathematics can be done by training students' ability to solve HOTS mathematical problems, this is because in research HOTS questions are non-routine problems that contain analysis, evaluation and creation (Rahmawatiningrum et al., 2019). Based on these problems, researchers are interested in conducting research to analyze students' mathematical problem solving skills through HOTS-based questions.

METHOD

This research is a research that uses literature studies with descriptive qualitative research methods. Literature study is a research that studies various reading materials that will be used as references from previous similar research results and is useful as a theoretical basis for the problem being studied (Sarwono, 2006; Munirah, 2018). The data collection technique used is to explore data from various sources such as books, scientific articles, and journals both international and national journals that examine mathematical problem solving skills and HOTS questions. Researchers used 20 articles to obtain data related to students' mathematical problem solving skills through HOTS-based questions. The study of the 20 articles was guided by references published from 2018-2023.

The procedure stages carried out first the researcher determines the topic to be identified in the study. Second, the researcher will explore various information related to the identified topic with the help of experts. Third, the researcher collects sources related to the topic that has been selected and finally the fourth stage of the researcher analyzes the content with a focus on description and explanation of the selected topic from various reference sources until the researcher can draw a conclusion. The data obtained was collected through discourse identification starting from reading, reviewing, studying, and recording literature related to the research to be carried out.

RESULTS AND DISCUSSION

The data results of this study are the results of analysis and summaries of several articles related to students' mathematical problem solving skills through HOTS-based problems. there are 20 articles used in this study which are divided into 15 international journals (Number 1-15) and 5 national journals (Number 16-20) which have been analyzed to help researchers obtain data based on existing problems. The results of the analysis are contained in the form of a table containing the title and results of the analysis. The following is the data from the analysis of students' mathematical problem solving skills through **HOTS-based questions**.

No	Title	Research Result
1	Higher-Order Thinking Skill (HOTS) Analysis of Students in Solving HOTS Question in Higher Education (Yuliati & Lestari, 2018)	At the university level, students should have higher order thinking skills (HOTS) so that they can train students to have HOTS skills through the learning process when they become teachers. The research findings found that 80% of students still did not know the whole concept of HOTS, 95% did not have references related to HOTS, and 70% of students answered paper-based assignments where students did not analyze the results of the assignments first. From this, students' HOTS abilities in analyzing (C4), evaluating (C5), and creating (C6) are still not developed. With this ability, a learning module is needed in higher education that can

No	Title	Research Result
		facilitate students in learning activities to direct their abilities to HOTS abilities so that students can be more skilled in answering and making questions so that later they can be practiced when teaching in elementary schools.
2	Skill of Elementary School Teachers in Developing Mathematics Questions based on Higher-Order Thinking Skills (HOTS) (Surya et al., 2019)	The teacher as the control in the learning activity provides a problem topic and asks students to solve a problem to train their divergent and convergent thinking skills. This mindset is included in the indicators of HOTS ability achievement. At the primary school level, HOTS skills are achieved through teacher transfer in the learning process and HOTS-based assessment. The results of the study showed that teachers' HOTS ability is still low because teachers are accustomed to taking questions based on existing questions, without looking at whether the questions are categorized as HOTS or not, and teachers need to get more information to develop HOTS-based questions at the basic education level.
3	Students' skills in solving non-routine mathematical problem (Ozreeberoglu et al., 2022)	The findings in the study on problem solving skills using non-routine problems resulted in increased learner ability, this is because learners are trained with questions that involve their higher-order thinking skills. Learners who have the ability to reason in mathematics provide logical arguments for solutions and the level of answering correctly in solving non-routine problems is seen to increase.
4	Improving Elementary School Student's Critical Thinking Skill through HOTS-Based Mathematics Question (Dwi Rohmawati & Fathoni, 2022)	Mathematical literacy is a person's ability to formulate, apply and interpret mathematics in various contexts. One of the efforts to improve mathematical literacy is through improvement in critical thinking, and such improvement requires training and habituation. Critical thinking is a skill in solving problems that are contextual or non-contextual in nature that makes students combine some of the information they have, associate the information they have, reorganize and develop the information to achieve a goal or solve a problem, and this can produce HOTS abilities. The results of the study found that these abilities need to be taught early because they can help students get used to HOTS-based questions and are more effective and optimal in improving critical thinking skills at the elementary school level.
5	Improving Student's Ability to Solve HOTS-Based Mathematics Problems With Problem Solving Theory from Polya (Maysaroh & Sutarni, 2023)	The findings show that applying Polya's problem solving strategy can improve students' problem solving skills in solving HOTS-based math problems. This is because problem solving skills help students develop a deeper understanding of mathematical concepts, foster students' creative nature in mathematical problem solving strategies and gain new knowledge that can be applied in everyday life.

No	Title	Research Result
6	The Development of HOTS Based Mathematics Teaching material in Elementary School (Nurlaily et al., 2021)	Teaching materials are one of the components that play an important role in the learning process. Teaching materials with HOTS components will be able to differentiate ideas clearly, provide good argumentation, be able to solve problems, construct explanations, be able to hypothesize, and understand complex things. The findings in this study show that using mathematics teaching materials based on HOTS makes students interested and challenged in the learning activities presented.
7	Problem Solving Ability of Junior High School Student in Solving HOTS Questions (Martha et al., 2022)	Problem solving is a very high level type of learning than other types of learning. Problem solving can develop learners' higher-order intellectual skills. Higher-order thinking skills are important for learners because it helps them master and familiarize in higher-order thinking so that learners can think logically and make decisions independently. Each learner has different problem-solving abilities. From the results of the research conducted, the problem solving ability of students is divided into low, medium and high. Learners who have low problem solving skills are only able to work on HOTS questions at the C4 level, students who have moderate problem solving skills are able to work on HOTS questions at the C4 and C5 levels, while students who have high problem solving skills have been able to solve HOTS questions at all levels in C4, C5, and C6. From the differences in ability, teachers have a very important role to familiarize students in solving HOTS-based problems and create learning innovations so that students can improve their mathematical problem solving skills.
8	The Effectiveness of the Problem Solving Strategy and the Scientific Approach to Students' Mathematical Capabilities in High Order Thinking Skills (Tambunan, 2019)	In achieving problem solving ability, there are several factors that influence one of them is the problem solving strategy. The results of the research conducted found that the problem-solving strategy is more effective than the scientific approach to mathematical communication skills, and mathematical communication through problem solving is better than conventional learning. The problem-solving strategy is better than other approaches, so the problem-solving strategy has an impact on students' abilities and skills. The impact can be seen in learners' academic ability and achievement, making it easier for learners to solve difficult problems, and contributing to learners' achievement and knowledge development.
9	The Development of Mathematical Problem Based on Higher Order Thinking Skill (HOTS) on Comparative	The rapid development of students' mindset should be followed by the teacher's ability to create questions that are able to determine high-level cognitive aspects, such as application and reasoning questions. Questions that are able to determine the cognitive level of students are known as HOTS questions. HOTS questions can challenge the thinking and reasoning power of students

No	Title	Research Result
	Material by Implementing PBL and its Effect on the Teacher's Creative Thinking Skill (Widiatsih et al., 2020)	so that HOTS questions have a close relationship with higher-level thinking skills in the education process. HOTS questions can be combined with the implementation of learning models or methods, one of which is PBL. PBL models that involve the use of problems can help teachers solve and think about problems and improve their problem-solving skills. From the results of research that has been done, the use of problems can improve the quality and effectiveness of problem solving skills and this is related to creative thinking skills.
10	Problem Solving Skill Analysis of Junior School Student Throuhg HOTS Type Mathematics Questions (Higher Order Thinking Skills) (Yurnalis & Beniario, 2022)	The results of these findings are the ability to solve mathematical problems through HOTS-based problems in students at the junior high school level have problem solving abilities from high, medium and low levels, where at a low level students are able to solve problems at the C4 level, at a medium level they are able to solve problems at the C4 and C5 levels, and at a high level students are able to work and solve existing problems.
11	Mathematics Problem Solving Ability of Elementary School Students in Solving HOTS Type of Mathematics Problems (Kurniawati et al., 2022)	The results of the study found that problem solving skills through HOTS problems produced students with high level problem solving skills and were able to work on HOTS problems well, students with moderate levels were able to work but still had difficulty in making conjectures and finding patterns from mathematical phenomena, and for students with low level problem solving skills had difficulty working on and solving HOTS problems on indicators of making plans, implementing plans and checking back in solving existing problems. With these differences in ability, teachers have a role in motivating students to have high reasoning skills.
12	Analysis of Student's Thinking Ablity to Solve Higher-Order Thinking Skills (HOTS) Math Problems (Megawati et al., 2020)	Implementing higher order thinking problems is the most effective method to improve learners' critical thinking and problem solving skills. Learners are given the opportunity to hone their critical thinking, creativity and problem-solving skills by using HOTS-type questions, which require learners to think at a higher cognitive level. The results of the research found that HOTS questions are very useful because they are based on everyday phenomena and also focus on contextual problems that arise in various fields of life and provide practice opportunities for students.
13	Student's Ability in Solving Higher Order Thinking Skills (HOTS) Mathematics Problem Based on Learning Achievement	HOTS is very important to understand in all sectors, especially the education sector, therefore to improve the quality of education in Indonesia, it is necessary to refer to international education by training students' ability to solve HOTS math problems. From the results of the research conducted, HOTS questions are non-routine questions that contain elements of analysis, evaluation and creation, so that students who have the ability to

No	Title	Research Result
	(Rahmawatinigrum et al., 2019)	solve high HOTS problems will have high learning achievement because they are able to solve problems well and are able to carry out the problem solving process correctly and precisely, while students who have low learning achievement abilities will experience difficulties in solving HOTS problems because students cannot continue the next step.
14	Mathematical Problem Solving: Students' Cognitive Level for Solving HOTS Problem in term of Mathematical Ability (Anami et al., 2021)	Problem solving ability is one part of higher order thinking skills (HOTS). The results of the study found that problem solving is the highest level of HOTS because problem solving ability is a combination of creative thinking and critical thinking. Problem solving ability helps develop students' thinking skills, especially HOTS, and students with high mathematics ability can reach cognitive level C6 in solving HOTS problems, while students with moderate mathematics ability can only reach cognitive level C5, and students who have low ability can only reach cognitive level C4.
15	Junior High School Students' Ability to Complete Mathematical HOTS Questions (Hadi & Wijaya, 2020)	This HOTS ability stimulates learners to be able to analyze or manipulate previously obtained information so that it is not monotonous. HOTS questions help learners to explore existing concepts and solve existing problems. HOTS is related to Bloom's taxonomy at the C4, C5, and C6 levels of thinking ability. From the results of the study, 65% of students still experienced problems in solving mathematical HOTS problems in the language section, 25% had difficulty in modeling, and 35% of students had difficulty in solving mathematical HOTS problems in terms of understanding the problem, creating problem representations, developing strategies, and implementing strategies.
16	Student Strategies and Polya's steps in HOTS-based Mathematical Problem Solving (Leonisa et al., 2022)	The findings of the study found that the existence of strategies in problem solving makes students have problem solving skills and tend to solve existing problems based on the results of their own thinking not by memory from the way of working taught by others. This is because students' problem solving skills are closely related to higher order thinking skills. High-level thinking skills (HOTS) are not only remembering but these abilities can be used to solve non-routine problems. By having this strategy, students will get a logical solution, and can lead to more flexible, intuitive, and creative problem solving skills.
17	Analysis of Problem Solving Ability of Junior High School Students in Grade IX in Solving Mathematics Problems of Higher Order Thinking	The results of the study found that higher order thinking skills can be developed through the presentation of HOTS-type math problems taught at school. There are 3 levels used in HOTS questions, namely analyzing (C4), evaluating (C5), and creating (C6). The levels in HOTS questions help students determine what is needed and help students connect several concepts, increasing their understanding in solving a problem.

No	Title	Research Result
18	Skill (HOTS) type(Fikriani & Nurva, 2020) Analysis of Students' Problem Solving Ability Based on Mathematics Initial Ability (Suryani et al., 2020)	The low mathematical problem solving ability of students causes students to be less able to solve non-routine problems and results in students not developing their ideas and abilities. This is because in the learning process the teacher never orientates students to a problem that exists in everyday life and does not pay attention to the problem solving skills possessed by students, resulting in students tending to learn by rote. In the learning process, it should be known in advance because of the initial ability of students because it is useful to know that students are qualified to take part in learning activities. In the study, it was found that students who had low initial abilities increased 75% to moderate initial abilities and 25% remained in the initial position, students who initially had moderate abilities increased by 26%, and as many as 21% of students' abilities decreased from moderate to low, and 52% remained in the same position. The initial ability of high learners 40% decreased to moderate level and 60% stayed in the same position.
19	Improving Mathematical Problem Solving Ability through Problem Based Learning Model by Using Local Culture Based Problems (Vera et al., 2021)	The findings in the study using the problem-based learning model can be used as an alternative used by teachers to improve students' mathematical problem solving skills. The PBL model using local culture-based problems is the latest innovation in packaging problems in everyday life and training students on non-routine problems so that students' problem solving skills increase.
20	Mathematics Learning Based on Higher Order Thinking (Siregar & Nasution, 2019)	The results of the study found that HOTS-based mathematics learning can increase the potential of students. These potentials include the ability to solve math problems creatively, think logically, and make logical conclusions based on existing facts. These potentials are produced by giving HOTS-based problems in mathematics learning in the form of non-routine problems, open-ended problems, many ways of solving or answers are not single or single, so that students think in analysis, evaluation and creation.

From the explanation above, it shows that mathematical problem solving ability is a high-level thinking ability (HOTS) because problem solving ability is a combination of creative thinking and critical thinking which can help students to think critically, creatively, analytically, and be able to solve problems both simple and complex. In accordance with the statement from Anugraheni (Anugraheni, 2019) problem solving ability and critical thinking ability are soft skills that must be possessed by students. this is because problem solving ability is an important ability for students to the world of work later (Cahyono, 2016). Problem solving can occur when students can think towards the expected solution because problem solving ability has a role in interpreting

the situation in the problem solving process so that students when facing an unusual problem can use higher order thinking skills (HOTS). Mathematical problem solving skills through problem-based problems can be through non-routine and complex problems that are loaded in the form of practice questions in mathematics learning activities so that they can help students hone their mathematical problem solving skills. And in accordance with the statement from Suseelan et al (2023) to improve students' problem solving skills, students are also involved in solving non-routine problems that involve deriving numerical information that is not given explicitly.

In learning activities, teachers can provide several exercises that facilitate students' mathematical problem solving skills through questions based on HOTS. The characteristics of HOTS-based questions include: (1) measuring higher-order reasoning skills; (2) HOTS questions are based on contextual problems, (3) HOTS questions can be in the form of description questions, or multiple choice questions. Although only a few items, HOTS questions require students to think at a higher cognitive level and train students to use their higher-level thinking skills. HOTS questions consist of analyzing (C4), evaluating (C5), and creating/making (C6). And Rahmawatingrum et al., (2019) also stated that to improve the quality of education in Indonesia in mathematics can be done by training students' ability to solve HOTS mathematical problems, this is because in research HOTS questions are non-routine questions that contain analysis, evaluation and creation.

Based on this, it is important for teachers to understand the concept, implement HOTS in learning, and measure HOTS to students through HOTS-based mathematics problems, because as is known, HOTS skills help students draw conclusions, connect facts with concepts, manipulate, categorize, combine in new ways, and apply them to find new solutions to new problems and provide problems that support students in improving problem solving skills through working on HOTS-based problems.

CONCLUSION

Based on the findings in the literature study that HOTS-based problems by going through the stages of problem solving skills make students have higher-level thinking skills. Through problem solving strategies can improve students' problem solving skills in solving HOTS-based math problems, this is because problem solving skills help students develop a deeper understanding of mathematical concepts, foster students' creative nature in mathematical problem solving strategies and gain new knowledge that can be applied in everyday life. The strategy results in learners being able to provide logical solutions because it provides differences in ideas or ideas clearly, provides good argumentation, is able to solve problems, construct explanations, be able to hypothesize, understand complex things, and lead learners' problem solving skills to be more flexible, intuitive, and creative.

- Anami, C., Usodo, B., & Subanti, S. (2021). Mathematical Problem-solving: Students' Cognitive Level for Solving HOTS Problem in Terms of Mathematical Ability. *Proceedings of the International Conference of Mathematics and Mathematics Education (I-CMME 2021)*, 597, 62–72. <https://doi.org/10.2991/assehr.k.211122.009>
- Dwi Rohmawati, A., & Fathoni, A. (2022). Improving Elementary School Student's Critical Thinking Skills through HOTS-Based Mathematics Question. *International Journal of Elementary Education*, 6(3), 631–637. <https://doi.org/10.23887/ijee.v6i4.55892>

- Fikriani, T., & Nurva, M. S. (2020). Analisis kemampuan pemecahan masalah siswa smp kelas IX dalam menyelesaikan soal matematika tipe Higher Order Thinking Skill (HOTS). *AKSIOMA : Jurnal Matematika Dan Pendidikan Matematika*, 11(2), 252–266. <https://doi.org/10.26877/aks.v11i2.6132>
- Hadi, S., & Wijaya, S. (2020). Junior High School Students' Ability To Complete Mathematical Hots Questions. *Jurnal Ilmiah Global Education*, 1(2), 91–93. <https://doi.org/10.55681/jige.v1i2.42>
- Kurniawati, I., Guntur, M., & Sofiasyari, I. (2022). Mathematics Problem-Solving Ability of Elementary School Students in Solving Hots Type of Mathematics Problems. *Journal of Education and Learning Mathematics Research (JELMaR)*, 3(2), 190–196. <https://doi.org/10.37303/jelmar.v3i2.91>
- Leonisa, I., Soebagyo, J., Matematika, P., Siswa, S., & Polya, E. L. (2022). Strategi Siswa Dan Langkah Polya Dalam. *Proximal: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, 5(2), 77–86.
- Martha, C. W. S., Maimunah, M., & Roza, Y. (2022). Problem Solving Ability of Junior High School Students in Solving Hots Questions. *Jurnal Pendidikan Matematika (JUPITEK)*, 5(2), 138–144. <https://doi.org/10.30598/jupitekvol5iss2pp138-144>
- Maysaroh, E., & Sutarni, S. (2023). *Improving Students ' Ability to Solve HOTS-Based Mathematics Problems with Problem-Solving Theory from Polya*. 5(August), 91–100.
- Megawati, Hartatiana, & Wardani, A. K. (2020). Analysis of student's thinking ability to solve higher-order thinking skills (HOTS) math problems. *Journal of Physics: Conference Series*, 1480(1). <https://doi.org/10.1088/1742-6596/1480/1/012050>
- Nurlaily, V. A., Sholihah, H. I. A., Wulandari, R. A., & Sa'Diyah, A. (2021). The Development of HOTS-Based Mathematics Teaching Materials in Elementary School. *Journal of Physics: Conference Series*, 1842(1). <https://doi.org/10.1088/1742-6596/1842/1/012042>
- Ozreeberoglu, N., Aydin, S., & Aydin, O. (2022). Students' Skills In Solving Non-Routine Mathematical Problems. *Education Quarterly Reviews*, 5(2), 446–461. <https://doi.org/10.31014/aior.1993.05.02.504>
- Rahmawatingrum, A., Kusmayadi, T. A., & Fitriana, L. (2019). Student's ability in solving higher order thinking skills (HOTS) mathematics problem based on learning achievement. *Journal of Physics: Conference Series*, 1318(1). <https://doi.org/10.1088/1742-6596/1318/1/012090>
- Siregar, N. F., & Nasution, E. Y. P. (2019). Pembelajaran Matematika Berbasis Higher Order Thinking Skills. *Prosiding Seminar Nasional Tadris (Pendidikan) Matematika, (Institut Agama Islam Negeri Curup)*, 20–27. <http://prosiding.iaincurup.ac.id/index.php/cacm>
- Surya, A., Sularmi, S., Istiyati, S., Rukayah, R., & Poerwanti, J. I. S. (2019). Skills of elementary school teachers in developing mathematics questions based on Higher-Order Thinking Skills (HOTS). *Journal of Physics: Conference Series*, 1318(1). <https://doi.org/10.1088/1742-6596/1318/1/012138>
- Suryani, M., Jufri, L. H., & Putri, T. A. (2020). Analisis Kemampuan Pemecahan Masalah Siswa Berdasarkan Kemampuan Awal Matematika. *Mosharafa: Jurnal Pendidikan Matematika*, 9(1), 119–130. <https://doi.org/10.31980/mosharafa.v9i1.605>
- Tambunan, H. (2019). The Effectiveness of the Problem Solving Strategy and the Scientific Approach to Students' Mathematical Capabilities in High Order Thinking Skills. *International Electronic Journal of Mathematics Education*, 14(2), 293–302. <https://doi.org/10.29333/iejme/5715>
- Vera, T. O., Yulia, P., & Rusliah, N. (2021). Peningkatan Kemampuan Pemecahan Masalah Matematis Melalui Model Problem Based Learning dengan Menggunakan Soal-soal Berbasis Budaya Lokal. *Logaritma : Jurnal Ilmu-Ilmu*

- Pendidikan Dan Sains*, 9(01), 1–14. <https://doi.org/10.24952/logaritma.v9i01.2782>
- Widiatsih, A., Wardani, D. A. R., Royhana, U., Djamali, F., & Septory, B. J. (2020). The development of mathematical problem based on Higher Order Thinking Skill (HOTS) on comparative material by implementing PBL and its effect on the teacher's creative thinking skill. *Journal of Physics: Conference Series*, 1538(1). <https://doi.org/10.1088/1742-6596/1538/1/012110>
- Yuliati, S. R., & Lestari, I. (2018). Higher-Order Thinking Skills (Hots) Analysis of Students in Solving Hots Question in Higher Education. *Perspektif Ilmu Pendidikan*, 32(2), 181–188. <https://doi.org/10.21009/pip.322.10>
- Yurnalis, & Beniario. (2022). Problem Solving Skill Analysis of Junior School Students Through Hots Type Mathematics Questions (Higher Order Thinking Skills). *Inovasi Pendidikan*, 9(2), 106–114. <https://doi.org/10.31869/ip.v9i2.3901>