



Development Male Students' Skills in Solving HOTS Problem in Terms of Self Confidence

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Abstrak

Masalah matematika tipe Higher Order Thinking Skills (HOTS) menjadi salah satu cara untuk mengembangkan keterampilan berpikir tingkat tinggi siswa. Salah satu aspek yang berpengaruh terhadap kemampuan pemecahan masalah yaitu self confidence. Oleh karena itu, penelitian ini akan mendeskripsikan pengembangan kemampuan pemecahan masalah siswa ditinjau dari self confidence. Penelitian ini berjenis kualitatif deskriptif dengan enam orang siswa laki-laki sebagai subyeknya. Pada tahap awal, diberikan angket untuk menentukan level self confidence siswa. Kemudian dipilih masing-masing dua orang subyek pada setiap level untuk mengikuti tes kemampuan pemecahan masalah. Sebagai triangulasi, dilakukan wawancara semi-terstruktur. Hasil tes dan wawancara dianalisis dengan model Miles and Hubberman dengan menyesuaikan dengan langkah pemecahan masalah yaitu: memahami masalah, menentukan rencana penyelesaian, melaksanakan rencana penyelesaian, dan memeriksa kembali. Hasil penelitian menunjukkan bahwa subyek dengan self confidence tinggi mampu mengembangkan kemampuan pemecahan masalah, subyek dengan self confidence sedang hanya memenuhi langkah memahami masalah dan menyusun rencana penyelesaian, sedangkan subyek dengan self confidence rendah hanya mampu memahami masalah. Dengan demikian, siswa dengan self confidence lebih baik dalam mengembangkan kemampuan pemecahan masalah, sehingga penting bagi pendidik untuk membantu siswa mengembangkan self confidence mereka melalui metode-metode pengajaran yang tepat, seperti memberikan feedback yang konstruktif dan memberikan kesempatan pada siswa untuk berpartisipasi aktif dalam proses belajar mengajar.

Abstract

Higher Order Thinking Skills (HOTS) type math problems are one way to develop students' higher order thinking skills. One aspect that affects problem solving ability is self confidence. Therefore, this study will describe the development of students' problem solving skills in terms of self confidence. This research is descriptive qualitative type with six male students as the subjects. At the initial stage, a questionnaire was given to determine the level of students' self-confidence. Then two subjects at each level were selected to take the problem solving ability test. As a triangulation, semi-structured interviews were conducted. The test and interview results were analyzed using the Miles and Hubberman model by adjusting to the problem solving steps, namely: understanding the problem, determining the solution plan, implementing the solution plan, and checking back. The results showed that subjects with high self confidence were able to develop problem solving skills, subjects with moderate self confidence only fulfilled the steps of understanding the problem and developing a solution plan, while subjects with low self confidence were only able to understand the problem. Thus, students with self confidence are better at developing problem solving skills, so it is important for educators to help students develop their self confidence through appropriate teaching methods, such as providing constructive feedback and providing opportunities for students to actively participate in the teaching and learning process.

INTRODUCTION

Mathematics can develop skills that involve logical, systematic, critical, analytical, procedural, and creative reasoning skills (Rahmawatiningrum, Kusmayadi, & Fitriana, 2019; Kurniawati, Guntur, & Sofiasyari, 2022). One of the main objectives of learning mathematics is to develop students' problem-solving skills (Kurniawati, Guntur, & Sofiasyari, 2022), so mathematics plays a major role in preparing students' abilities for further education, career

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development, and strengthening students' problem solving skills in the real world (Ukobizaba, Nizeyimana, & Mukuka, 2021). Math problem solving refers to mathematical tasks that have the potential to provide intellectual change to improve students' understanding and mathematical development (Ukobizaba, Nizeyimana, & Mukuka, 2021).

Problem solving is an important part of mathematics which provides opportunities for students to improve their in-depth understanding of mathematical concepts and various ways to represent mathematical solutions (Rahmawatiningrum, Kusmayadi, & Fitriana, 2019). Problem solving is a very important part of the mathematics curriculum because it gives the students the chance to gain experience and use their knowledge and skills to solve non-routine questions. Non-routine questions cannot be answered easily by students, because they do not have certain rules for answering them (Aini, 2017). School mathematics objectives are made the students can solve problems involving the ability to understand the problem, devise a mathematical model, solve the model and interpret the solution (Aini, Sunardi, Slamini, & Hobri, 2017).

Problem solving as a process is an activity that emphasizes procedures, steps taken by students, and strategies for finding solutions to the problems encountered (Kurniawati, Guntur, & Sofiasyari, 2022). Polya (2004) stated that problem solving is a skill that can be taught and learned. Problem solving skills are also needed to compete globally, improve self-confidence, train students to accept and appreciate others' opinions in making decisions, and reviewed things from various perspectives (Kurniawati, Guntur, & Sofiasyari, 2022). Therefore students should be encouraged to reflect on their thoughts to implement, adapt, and modify appropriate strategies to solve complex problems (Rahmawatiningrum, Kusmayadi, & Fitriana, 2019). Someone with good problem solving skills can identify problems, overcome obstacles and find effective solutions to solve problems (Kurniawati, Guntur, & Sofiasyari, 2022). In training problem solving, teachers can teach how to solve problems, familiarize students with trying to find problem solving strategies on their own or teach mathematical facts then present problems to students (Ukobizaba, Nizeyimana, & Mukuka, 2021).

Problem solving skills is an ability that enables a person to apply knowledge and skills to solve a problem. The stages of math problem solving stated by Polya (2004) are as follows:

Table 1. The stages of math problem solving

The stages of math problem solving	Indicator
Understanding the problem	Students can mention or write information about the problem
Devising a plan	Students can find a plan by making a mathematical model and choosing an appropriate strategy to solve the problem
Carrying out the plan	Students can solve the problems correctly through the planning strategies that have been made
Looking back	Students can look back at the results or complete the answers

Education in Indonesia presents questions that require high-level thinking skills in the last national examination to improve students' reasoning skills (Indonesian Ministry of Education and Culture, 2018). Curriculum 2013 assessment that adapts international standard assessment models is expected to improve students' thinking skills. In solving the HOTS problem, students are encouraged to think broadly and deeply about the subject they learn (Karimah, Kusmayadi, & Pramudya, 2018, Aini, Mukhlis, Annizar, Jakaria, & Septiadi, 2020).

Anderson & Kratwohl stated that indicators for measuring HOTS are analyzing (C4), evaluating (C5), and creating (C6) (Aini and Mukhlis, 2020). The classification of the dimensions of higher-order thinking processes is described as follows (Indonesian Ministry of Education and Culture, 2019):

Table 2. HOTS dimensions

Objective	Illustrative verbs	Indicators
Analyzing (C4)	Examine, compare, separate, and review.	Classifying what is known into parts and then associating between parts. Questions at this level see how students conclude and analyze these parts.
Evaluating (C5)	Judge, refute, and determine	Evaluate according to purpose; taking into account existing standards.
Creating (C6)	Create, develop, build	Collaborating knowledge into something new

HOTS problems in learning math can improve problem solving abilities (Kurniawati, Guntur, & Sofiasyari, 2022). Conversely, problem solving abilities can improve HOTS (Karimah, Kusmayadi, & Pramudya, 2018). This means that there is a relationship between problem solving abilities and HOTS. Further, several competencies developed for students in Indonesia include critical thinking, creativity and innovation, communication skills, collaboration skills, and Self confidence (Kemendikbud, 2019). It means that both HOTS and self confidence are important for students.

Self confidence is a feeling of confidence in students' abilities and feelings in dealing with problems. The indicators are: believing in their abilities, acting independently to make decisions, positive self concept, and daring to express opinions (Fauziah, Maya, & Fitrianna, 2018). Self confidence can motivate students and optimize their problem solving skills (Aisyah, Nurani, Akbar, & Yuliani, 2018).

Self confidence is an important factor in student's math achievement and problem solving skills (Aisyah, Nurani, Akbar, & Yuliani, 2018; Putra, Putri, Fitriana, & Andayani, 2018; Ramdan, Veralita, Rohaeti, & Purwasih, 2018). Self confidence can strengthen motivation in achieving learning success, the higher the self confidence the stronger the enthusiasm in completing work and affecting math achievement (Putra, Putri, Fitriana, & Andayani, 2018; Ramdan, Veralita, Rohaeti, & Purwasih, 2018; Çiftçi, & Yildiz, 2019). Students with good self confidence can understand, find, and try to find strategies for solving math problems (Ramdan, Veralita, Rohaeti, & Purwasih, 2018).

Previous research has shown a significant correlation between problem-solving skills and self confidence (Putra, Putri, Fitriana, & Andayani, 2018; Aisyah, Nurani, Akbar, & Yuliani, 2018; Fauziah, Maya, & Fitrianna, 2018; Astutiani & Isnarto, 2021). Pre-research showed that students still had difficulty solving HOTS problems. It is caused by their rarely practicing of solving HOTS problems. Students also have low self confidence in learning mathematics. Thus students cannot optimize their mathematical abilities. This study will describe the problem solving abilities of students with low, moderate, and high self confidence.

METHOD

This research is qualitative descriptive. The subjects were students of class XI BIC 1 MAN 1 Jember academic year 2022/2023 all male. They were selected using a purposive sampling technique. The purposive sampling technique was chosen because it allows researchers to select samples that represent the population with certain characteristics relevant to the research objectives. With this technique, researchers can select samples with predetermined criteria, so as to minimize bias and maximize sampling efficiency. In addition, purposive sampling techniques can also be used when the population under study is limited or difficult to reach, thus allowing researchers to select the most representative sample of the available population.

The instruments used were self-confidence questionnaire and HOTS test questions. Both instruments have met the valid and reliable criteria after the instrument testing. In the early stages, 27 students were given a questionnaire to find out their self confidence level. The results

of the questionnaire were analyzed and categorized into low, moderate, and high based on Table 3 (Misbahudin, 2013).

Table 3. Self confidence level

Level	Score
High	$X \geq \bar{X} + 1.SD$
Moderate	$\bar{X} - 1.SD \leq X < \bar{X} + 1.SD$
Low	$X < \bar{X} - 1.SD$

In each category, two research subjects were selected. Data analyzed by Miles & Hubberman model: data collection, data reduction, data presentation, and conclusion (Sugiyono, 2013). The Miles & Huberman data analysis technique was chosen because it provides a systematic, comprehensive, and flexible approach to analyzing qualitative data. This technique combines inductive and deductive data analysis, allowing the researcher to identify patterns and themes that emerge from the collected data. In addition, this technique can also consider the social and cultural context in which the data was generated, allowing researchers to understand the deeper meaning and implications of the research findings. In addition, Miles & Huberman's data analysis technique can also be adapted according to the type and complexity of the data at hand, allowing researchers to produce findings that are relevant and meaningful to theory and practice.

RESULT AND DISCUSSION

Result

The test questions given are HOTS questions that have been developed by the researcher. These HOTS questions are given to students to develop their problem solving skills. The following are the results of the answers to the HOTS questions given.

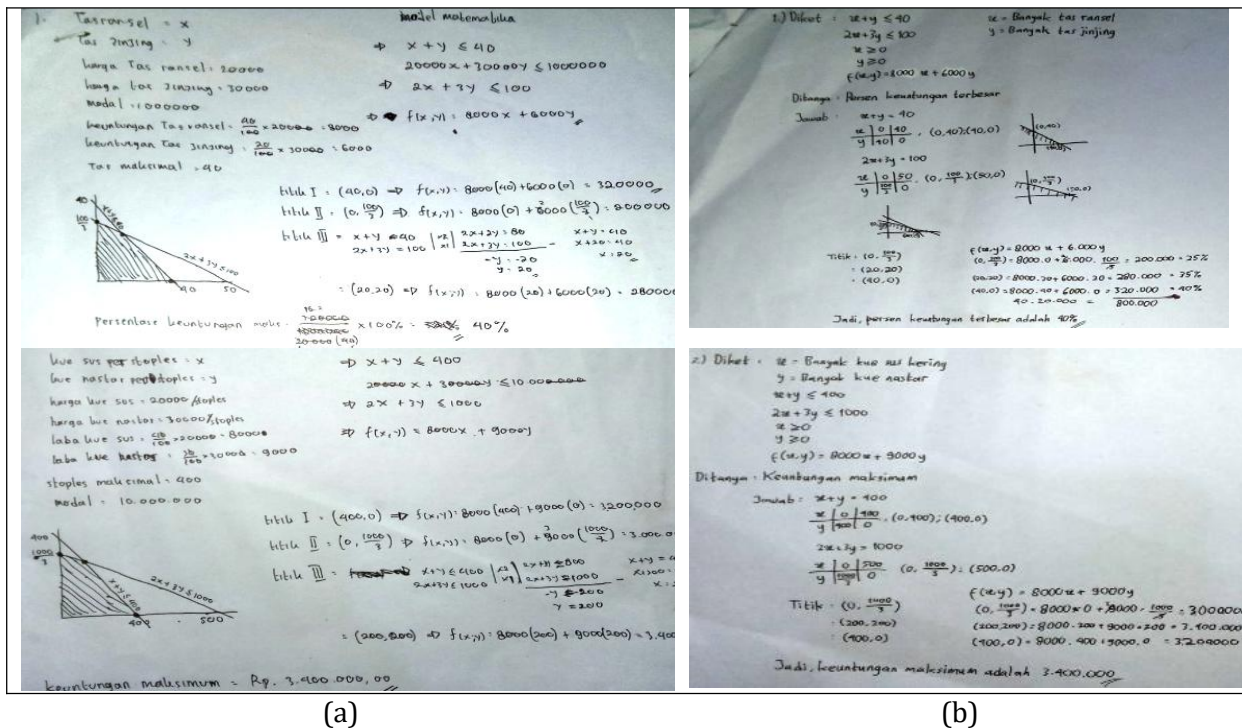


Figure 1. (a) The answers of S1 & (b) The answers of S2

High self confidence subjects are S1 and S2, able to fulfill four steps of problem solving. S1 understands the problem well. Meanwhile, subject S2 did not write down the information that was known in the questions but was able to explain it orally. The two subjects were also able to formulate a problem-solving plan: turn the problem information into a mathematical model, write down two inequalities and one objective function correctly, and explain the method they used to solve the problem. Two subjects carried out the plan. In the end, the two subjects look back at their answers from the beginning to the end.

The following also presents the results of S3 and S4 students' answers in developing problem solving skills through HOTS questions. The results can be seen through Figure 2 below.

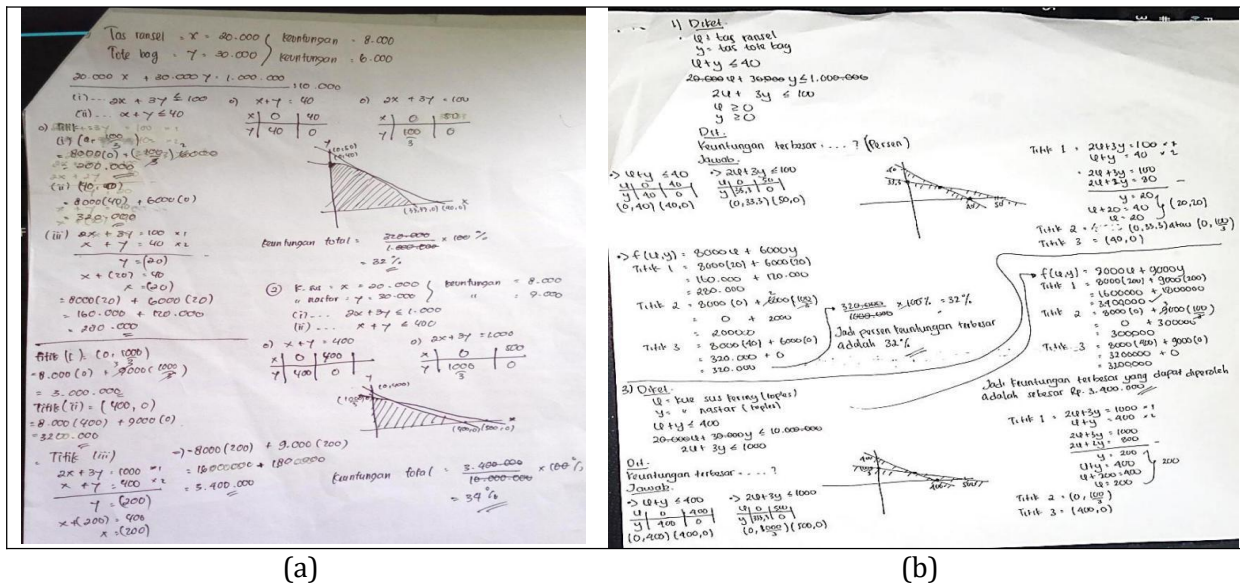
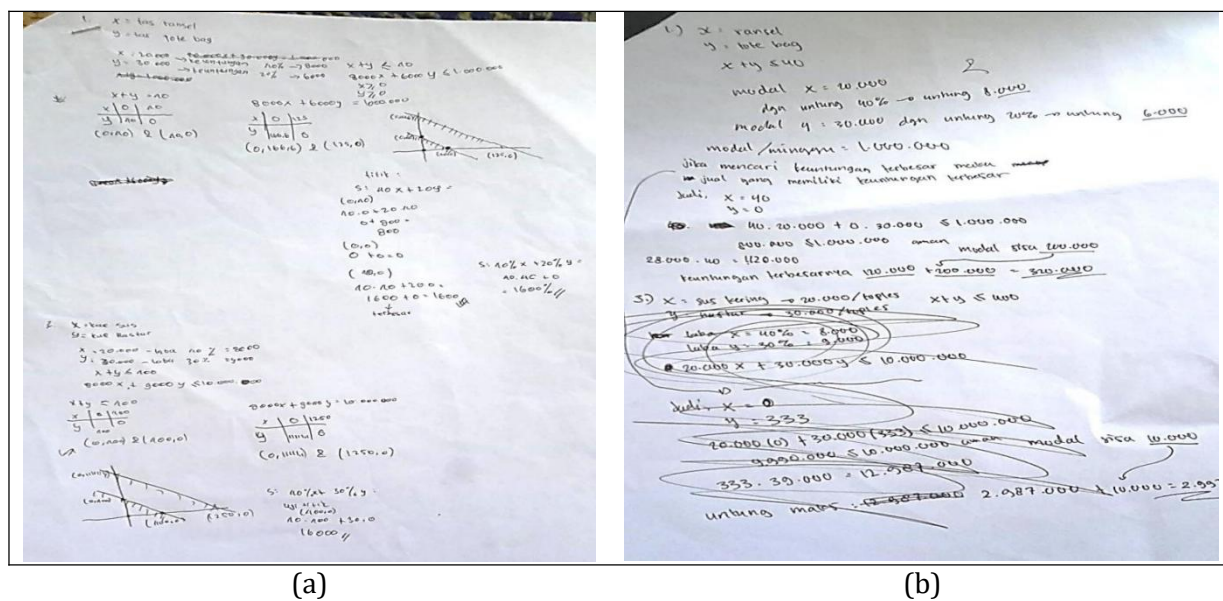


Figure 2. (a) The answers of S3 & (b) The answers of S4

Moderate self confidence subjects S3 and S4 can understand the problem well, which is indicated by the ability to write down and explain known and asked information about the problems. Two subjects also can formulate a problem-solving plan: can transform known information into a mathematical model, correctly write down two inequalities and one objective function, and explain the problem-solving strategy. S3 and S4 were unable to carry out the plans that had been made. But in the second question, they could carry out the plan correctly. In the end, S3 and S4 did not look back at the answers, and the final answers for both questions were wrong.



(a) (b)
Figure 3. The answers of S5 & The answers of S6

Low self confidence subjects are S5 and S6 can understand the problem well. In general, both subjects wrote down known information but they were unable to explain it orally. For the second problem, S6 did not write down information and questions. The two subjects were unable to devise problem solving plans. S5 doing an error in determining the inequality. Meanwhile, S6 did not devise a plan in the form of a mathematical model. He used his reasoning, and it was wrong. Two subjects were unable to carry out the plans. This is due to an error in devising a strategy so that the final result is wrong. They did not look back at their answers.

Discussion

Based on the explanation above, it can be said that high self confidence subjects fulfill all problem-solving stages, moderate self confidence subjects are only able to understand the problem and devise a plan, while low self confidence subjects are just able to understand the problem.

High self confidence subjects show good problem-solving skills. They are can understand problems and fulfill all stages of problem solving because: (1) they have confidence in their abilities so that they have a good understanding of the subjects, (2) act independently in making decisions to solve the problems, and (3) dare to take challenges in solving various problems (Purnama & Mertika, 2018). Meanwhile, moderate self confidence subjects are can understand the problem and devise a plan. However, because of the lack of confidence in their abilities and thinking the HOTS problems are difficult, they easily give up on solving them. Thus, in the problem solving process, they get wrong answers. Even at the last stage, they did not look back at the answers because they were uncertain of them. Low self confidence subjects thought that HOTS problems were difficult so at the beginning they were pessimistic. Even though in fact, they can understand the problem, they could not explain orally what was known and asked about the problem. In the next stage, they cannot devise a strategy to solve the problem. So they do not fulfill the next problem solving stage.

Thus students who have better self confidence tend to have better problem solving skills. Previous research shows a significant correlation between problem solving skills and self confidence (Aisyah, Nurani, Akbar, & Yuliani, 2018). A significant positive correlation is also shown in previous research (Ramdan, Veralita, Rohaeti, & Purwasih, 2018). This means that self confidence does affect students' problem-solving skills. Therefore, it needs to be an effort to improve students' self confidence through learning mathematics. For example, teachers can give praise for student achievements, practice a responsible attitude for completing assigned tasks,

show a friendly personality as a teacher, and focus on student progress and achievements, not on mistakes that have been made (Andayani & Amir, 2019).

HOTS (Higher Order Thinking Skills) questions are questions that require complex problem solving skills and require more critical thinking. This ability can be developed through various learning theories such as cognitive theory and constructivism theory (Gradini, E. 2019). Cognitive theory explains that learning occurs through processing information in the brain. In this case, male students can develop problem solving skills through information processing and critical thinking when facing HOTS questions (Beddu, S. 2019). With continuous exposure to HOTS questions, male students will learn to process information more effectively, expand their understanding, and find more creative solutions (Agustina, W., & Noor, F. (2016).

Meanwhile, constructivism theory states that learning is an active process where students construct their own understanding through reflection, exploration and experimentation (Murniarti, E. 2020). HOTS questions can help male students in building their understanding of complex problems, which will then develop their ability to solve problems in a more effective way. In addition, HOTS questions can also help boys to develop analytical, problem-solving and critical thinking skills, which can be useful in their daily lives (Sofyan, F. A. 2019).. Thus, HOTS questions are able to develop male students' problem-solving skills through various learning theories. Therefore, it is important for educators to provide challenging HOTS problems to male students so that they can continue to improve their problem-solving skills and gain greater confidence in facing complex problems.

The results showed that building male students' skills in solving HOTS (Higher Order Thinking Skills) problems can increase their confidence level. The implication of this study is that educators and parents need to provide more opportunities for male students to develop HOTS skills and provide positive feedback to strengthen their confidence in solving problems. In addition, the development of HOTS skills can help reduce the gender gap in education, as studies show that male students tend to be more confident in dealing with problems that require analytical and problem-solving skills. Therefore, educators and parents should provide adequate support for male students in developing HOTS skills to strengthen their confidence and improve their overall academic ability.

CONCLUSION

The results showed that students with better self confidence showed better problem-solving skills. High self confidence subjects can understand problems and fulfill all problem-solving stages because they believe in their abilities so that they have a good understanding of the subjects. Students with moderate self confidence are can understand problems and devise a plan. However, because of the lack of confidence in their abilities and thinking the HOTS problems are difficult, they easily give up on solving the problems. Low self confidence subjects think that HOTS problems are difficult so they are pessimistic. Thus, they only can understand the problem. Remembering its role in problem solving skills, it is important for teachers, parents, and students to help improve students' self confidence .

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