

SENIOR HIGH SCHOOL STUDENTS' ORDER THINKING AND CONFIDENCE IN SOLVING MATH PROBLEMS

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Abstract: This study aims to elucidate the correlation between enhancing high-level cognitive thinking skills among school students and their self-assurance when tackling mathematical challenges. Employing a qualitative research approach, specifically the library research method, this investigation entails an in-depth exploration of various scholarly sources, encompassing articles and books, to serve as research data. These sources are directly pertinent to students' sequential thinking proficiency and self-belief in addressing mathematical problems. The outcomes derived from this research substantiate the existence of a discernible association between students and their instructors within the classroom setting. This interplay possesses the potential to exert an influential impact on the students' overall condition and academic achievements.

Furthermore, a compelling correlation emerges between these two pivotal factors. Consequently, students with elevated high-level cognitive thinking skills and a corresponding self-assured disposition are inherently predisposed to demonstrating a greater propensity for successfully resolving mathematical challenges. This study highlights the intrinsic connection between students' cognitive capacities and self-confidence levels, underscoring the pivotal role these factors play in their ability to address mathematical problems effectively.

Keywords: HOTS, Self-confidence, Mathematic, Senior High School Student, and Learning Impacts

INTRODUCTION

Mathematics is a human invention. The goal of mathematics as a human behavior is for people to recapture mathematical concepts and thoughts under the supervision of seniors. Mathematics is not only about numbers; it also comprises a variety of skills that may be improved and applied to life in general. These skills can be found in mathematics. These competencies include creative, logical, critical, and systematic thinking (Haerunnisa & Imami, 2022). Mathematics is a challenging field of study crucial in resolving many real-world issues. Mathematics is an essential part of the scientific method. Mathematics is essential to the scientific method.

Nonetheless, students typically view mathematics as a challenging subject, and many of them even dislike it. Students struggle with solving mathematical problems since the subject comprises many questions, formulae, and definitions; as a result, students frequently experience uncertainty and anxiety (Wena, 2020). It has been said that someone who suffers from mathematics anxiety will experience panic and helplessness whenever asked to solve a mathematical task or problem (Utari Sumarmo, 1987). Several different things can contribute to a person's difficulty with mathematics. For example, they are making students participate in unpleasant forms of instruction and evaluation, such as using timed tests.

Additionally, it has been shown that anxiety regarding mathematics correlates with other factors (such as learning behavior and self-efficacy) that influence academic performance. This is something that has been proven. When a problem arises, students will be motivated to find the best solution.

Students' struggles to find solutions to mathematical problems are one of the challenges they face when attempting to learn mathematics. These challenges can be conquered by students capable of problem-posing and creativity (Bronkhorst, et al., 2020). Solving problems is an essential component of mathematics instruction to develop students' thinking ability mathematically. One of the higher-order thinking skills is mathematical problem-solving and communication (HOTS). Students cannot solve problems directly, but they must understand and associate the problem with previous subjects or problems completed, so students must think hard when solving the problem (Wibawa & Agustina, 2019).

Based on Law No. 20 of 2003 on the National Education System of the Republic of Indonesia, education is a clear attempt to establish a learning atmosphere and process that allows students to build their religious potential proactively. Education quality matters worldwide because it is a barometer for the country's growth (Anas & Budianto, 2023). Based on the 2017 Human Development Reports on education issues, Indonesia's education measure was ranked seventh out of ten ASEAN countries.

Furthermore, according to a 2020 CEOWORLD investigation, Indonesia's school system ranks 70th out of 93 countries. The insufficient development of higher-order thinking abilities and self-assurance in schools is one of the factors behind low school performance. The primary goal of education is to empower students with the flexibility to think, comprehend their actions fully, and assert them in support of their awakened higher cognitive process (Riduwan et al., 2023). As a result, students must be capable of adapting to changes rapidly and efficiently. To solve these problems, intellectual abilities, the capability to analyze information, and the capability to integrate various sources of knowledge are needed. Critical thinking refers to the ability to consider what a human should accomplish or consider (Tirtayasa et al., 2022).

As a result, to reach a better Education, educators must be able to formulate HOTS-assigned tasks (Rosyida, 2019). As a result, yet another essential attribute that students must master is higher-order thinking skills (Rohmaniyah & Wagiran, 2019). Pratiwi (2022) defines higher-order thinking abilities with three components: a. HOTS is a technique applied; in the learning setting, applicants can apply what they have learned to new situations without the assistance of academics or others; b. HOTS is critical thinking; in teaching, applicants can think logically (appropriately), reflectively, and individually; c. HOTS is problem-solving; participants can overcome real issues that are relatively unique; they might use typical and non-routine problem-solving policies. Class requires that students demonstrate that they have achieved the flexibility indicator when they provide more than one accurate method for solving a question (Peto, 2022). The students could also provide answers different from those provided by other students depending on their grasp of the material (mathematical creative thinking) (Tirtayasa et al., 2022). Teaching mathematics through the context of problem-solving provides students with the opportunity to apply the mathematical concepts they have learned, integrate and connect disparate pieces of mathematical knowledge, and achieve a more profound conceptual understanding of mathematics as a subject.

Statistics indicate that Indonesian students' HOTS and problem-solving skills still need to improve. Indonesia scored 371 in reading, 379 in mathematics, and 396 in science in the 2018 PISA. Those results were lower than in 2015, when Indonesia scored 397 in reading, 386 in mathematics, and 403 in science (OECD, 2019). According to the 2018 National Exam scores, students' ability in HOTS, such as rationalization, examining, and determining, still needs to be improved (Kementrian Pendidikan dan Kebudayaan, 2019). Higher-order thinking skills (HOTS) refer to mathematical problem-solving and mathematical communication abilities. This indicates that for students to solve the problem of HOTS, they need to comprehend the mathematical content, have a healthy habit of mathematical thinking, and desire to engage with others (Pratiwi, 2022)). Students who can effectively self-regulate their learning are typically more excited about their academic pursuits and

are less likely to give up, making it simpler for them to address difficulties with HOTS. Similarly, students who have developed healthy mental routines are accustomed to problem-solving and are constantly looking for novel problem-solving approaches, making it much simpler to deal with the challenges posed by HOTS.

In solving math problems, it is a student's confidence in bringing himself to solve these problems. Competence, depth of understanding, and performance are reciprocally related and are critical to an individual's professional growth (Abdullah, 2022). Each individual may face numerous challenges due to a lack of. Students who don't possess these could confront difficulties in accomplishing the desired outcomes set by their respective institutions or the goals they planned for themselves. Students' low self-esteem might lead to problems for them and their educational establishments and the efficient implementation of the syllabus. Self-confidence is essential for a learner to take risks and participate in educational processes. Those who possess self-confidence are self-assured in their abilities and set goals for themselves, working hard to accomplish them without worrying about the consequences (Astuti, 2019).

The first step in the problem-solving process is making initial contact with the issue at hand, and the process is considered complete when an answer is founded on the available information (Bosnjak, 2017). Additional references and indicators of problem-solving include understanding the issue at hand, formulating a plan to address the issue, putting the plan into action (resolving the issue by the plan), and reflecting on previous steps ((Wulansari & Desiningrum, 2013).

One of the instructional methods that contributed to the development of higher-order thinking skills was problem-solving (HOTS) (Surya & Andriana Putri, 2017). The ability to think creatively and critically both require a component known as higher-order thinking skills (HOTS). Skills like creative thinking, critical analysis, and the ability to solve problems and visualize solutions are included in HOTS (Fatahillah et al., 2021). Students can become more self-directed and resourceful learners, proficient in problem-solving, and able to apply scientific content in everyday contexts due to participating in HOTS (Damaianti et al., 2020; Fatahillah et al., 2021). Based on the problems described above, the relationship between other thinking skills and students' self-confidence in solving problems in mathematics is very closely related.

METHODS

Qualitative research methods use non-numerical data to understand complex and multidimensional social phenomena (Murdiyanto, 2020). The type of research used in this study is

literature review. According to Aditya et al. (2010), library research collects, analyzes, and synthesizes existing information related to the sequential thinking skills and self-confidence of high school students in solving mathematics problems in this study.

In this library research, researchers collect information from various sources, such as books, journals, articles, research reports, and other documents. The information is then analyzed for the common thread, patterns, and relationships between variables. The analysis results are then used to develop a theoretical framework, hypothesis, or research question and make conclusions.

RESULTS AND DISCUSSIONS

Result

Logical thinking is one of the important skills needed for success in school and the workplace. This skill includes thinking logically, systematically, abstractly, and creatively. The results of a study by Nurhayati (2016) showed that high school students can think logically and systematically. This is evident from their ability to solve math problems, understand abstract concepts, and make plans. The study by Sulistyowati (2017) showed that high school students can think abstractly and creatively. This is evident from their ability to think outside the box, generate new ideas, and solve problems innovatively. The study by Prasetyo (2018) showed that various factors, including genetic factors, environmental factors, and education, influence the logical thinking of high school students. Genetic factors play a role in determining the student's intelligence potential. Environmental factors play a role in providing stimulation and experiences that support the development of student intelligence. Educational factors play a role in providing the knowledge and skills needed to think logically.

Overall, previous studies show that high school students can think logically. This ability can be developed in various ways, including providing stimulation and experiences that support the development of student intelligence and quality education.

Certain factors that may influence the development of high-order thinking ability in solving math problems and the self-esteem of students, aside from the learning approach, are students' early mathematical (Nasruji, 2018; Newmann, 1991). Studying is impactful if the students' overall lower ability improves after learning is applied. Preparatory understanding will influence the process of acquiring adequate learning to make learning more engaging by allowing students to select important details.

Countless participants admitted that they still need to gain the understanding required to develop higher-order thinking skills concerns. The educators seem unable to adequately distinguish

the difference between the keyword phrases specific to a precise level of higher-order thinking skills questions (Memon, 2021). Furthermore, some educators confessed to having poor pedagogical skills when teaching higher-order thinking skills (Meece & Agger, 2018). They needed help to select an appropriate teaching approach, method, or technique to aid student comprehension. The next common issue educators encountered was an absence of preparation (Maimun, 2023). This was a challenging issue not only for the senior teachers but also for the newly competent teachers. Furthermore, some educators needed to be more interested in instilling higher-order thinking skills in their seniors.

Finally, some teachers, particularly low-achieving students, indicated uncertainty about teaching higher-order thinking skills (MacMillan, 2019). Teachers needed more effectiveness in conveying higher-order thinking skills in teaching material because they noticed their student's ability level. Instructors will further attempt to teach higher-order thinking skills to only the most gifted students (Napitupulu, 2023). Students with higher-order thinking skills evidence this, and high self-confidence are more popular among teachers in solving math problems.

Most of the data in this study states that most students experience difficulties when solving questions of higher order thinking skills due to their Lack of skills in basic mathematical concepts, Lack of motivation, and

Lack of self-confidence (Tirtayasa et al., 2022). Aside from limited knowledge, students needed to be more dismissive toward the higher-order thinking skills questions (Wena, 2020). Most students thought higher-order thinking skills questions were difficult to comprehend because they required critical processes (Tirtayasa et al., 2022). Students' negative perceptions were also associated with a lack of desire or willingness to participate in higher-order thinking skills questions. These distinctions can be broken down into the following categories using the table:

Table 1. Student-Teacher Differences

No	Aspect	Kind of Differences
1	Students	Lack of understanding of basic mathematical concepts (Desania et al., 2020)
		Lack of confidence (Putri et al., 2020)
		Lack of motivation (Narmaditya et al., 2018; Putri et al., 2020)
		Students' indifference to HOTS (Desania et al., 2020; Kusumah et al., 2015)
		Lack of critical thinking (Setiawan et al., 2022)
2	Teacher	Unable to distinguish keyword phrase (basic) (Rozgonjuk et al., 2020)
		Poor padagogic skills (Razak et al., 2022)
		Inappropriate teaching approaches, methods and techniques (Razak et al., 2022)
		Lack of preparation in teaching (Rozgonjuk et al., 2020; Ukobizaba et al., 2021)
		Teacher's ignorance of the importance of HOTS (Ukobizaba et al., 2021)
		Does not provide efforts to instill HOTS in low-level students and only focuses on hig level students (Ginting & Kuswandono, 2020; Razak et al., 2022)

Students' academic performance can be improved as a direct result of a classroom with a positive environment, which can increase students' motivation and engagement in learning (Shan et al., 2022). It has been found that the relationship between teacher-students in the classroom is the single most important factor in determining how well the students learn. Building students' motivational beliefs is important because it may also significantly influence their relationship with their Teacher and, as a result, their learning outcomes (Rugg & Norris, 1975). Additionally, it is important to note that building students' motivational beliefs is crucially important. The theories of motivation imply that students' motivational beliefs may not only be related to the results of their learning but also affect the students' perceptions of what learning is like. In a nutshell, we demonstrated how the relationship between the Teacher and the student can improve students' sense of motivation and lower their mathematical anxiety, ultimately increasing their capacity to solve mathematical problems.

Discussion

The ability to think sequentially and the self-confidence of high school students in solving mathematical problems have a mutually reinforcing relationship. Thinking sequentially can help students understand mathematical problems more comprehensively, identify the right steps to solve problems and implement effective solutions. This is because thinking sequentially helps students: a. Understand the relationships between the various parts of mathematical problems, b. Make a logical plan to solve the problem, c. Follow up on the plan systematically.

Meanwhile, self-confidence can help students: a. Have a positive view of their abilities, b. See themselves as effective problem solvers, c. Do not give up easily when faced with difficult problems.

Students with good sequential thinking skills will make it easier to understand mathematical problems and identify the right steps to solve them. This will increase students' self-confidence, making them feel more capable of solving problems. Conversely, when students have high self-esteem, they will be more willing to try different approaches to solving problems and not give up when faced with challenges. This can help students develop their sequential thinking skills.

A substantial body of literature has been written about the influence of students' self-confidence on the learning process. Abid (2019) investigated the role of self-assurance in continuous improvement. Researchers discovered that students' optimism is a main obstacle to their learning, influencing their engagement and progress. The study also demonstrates that any individual learner, their teachers, partners, temporary adviser, and workplace supervisors can affect students' self-confidence. Accordingly, Uniqbu (2022) discovered that trust in one's ability to learn stimulates one's motivation to learn by experimentally studying the causal effects of external variables on adjustments

in the desire to learn. According to their findings, less confident students are fearful and pessimistic, have no plan for their lives, are self-conscious, and live to satisfy others rather than themselves (Vanno et al., 2014). Meanwhile, highly self-confident students are optimistic and want more from their lives; they are goal-oriented, have a true perspective of life (imagining themselves in a great position), and are appealing and allow access to others.

Teachers, students, and the impact of self-confidence on learning are the factors that contribute to the challenges in teaching higher-order thinking skills to students. Among the obstacles that prevent teaching and learning from instilling higher-order thinking skills in the classroom is an absence of expertise in constructing higher-order thinking-specific questions (Sinclair & Ryan, 1987). A few more educators have poor questioning techniques in the context of mathematics teaching, specifically when it comes to higher-order thinking skills issues. Furthermore, good learning activities and techniques are associated with classroom teaching to boost students' higher-order thinking skills.

The main issue that learners encounter when answering higher-order thinking skills questions is a need for more basic conceptual understanding. Students find it difficult to morph the necessities of the questions into a correct mathematical form because the higher-order thinking skills questions contain a variety of specific phrases. The loss of the ability of students to combine mathematics topics into math and science operations and calculations is due to a lack of basic mathematical fundamentals and understanding (Oral, 2012). In addition to the aspects mentioned above, students' self-motivation, carelessness, and Lack of self-confidence are obstacles for mathematics teachers who want to instill higher-order thinking skills in their students. Learners not only refuse to overcome or think through long-winded or complex higher-order thinking skills questions but also refuse to read them. It has also been discovered that students' self-confidence is meaningful in the educational process and has positively impacted their education system.

CONCLUSION

The results of this study show that the sequential thinking ability and self-confidence of high school students in solving mathematical problems are interrelated. This relationship can be seen in the student's ability to solve mathematical problems more easily and efficiently. Students with good sequential thinking skills will find it easier to understand mathematical problems, identify the right steps to solve problems, and implement the right solutions. In addition, students with high self-esteem will be more willing to try different approaches to solving problems and will not give up easily when faced with challenges.

The relationship between sequential thinking and self-confidence in solving mathematical problems has important implications for mathematics education. Mathematics teachers need to develop students' sequential thinking and self-confidence in solving mathematical problems. This can be done in various ways, such as a. Providing tasks that require students to think logically and systematically, b. Creating a conducive learning environment that supports students to take risks and try new things, c. Providing positive feedback and reinforcement to students to boost their self-confidence. By developing the sequential thinking and self-confidence of high school students in solving mathematical problems, teachers can help students become more effective problem solvers.

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