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Boosting Students' Mathematical Self-Confidence with Guided Discovery Learning and Geogebra Assistance

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ABSTRAK

Tujuan penelitian ini adalah untuk mengetahui efektivitas model *Guided Discovery Learning* berbantuan GeoGebra dalam meningkatkan kemampuan pemecahan masalah matematis siswa, dengan fokus khusus pada rasa percaya diri. Penelitian ini menggunakan metodologi *Sistematic Literature Review* (SLR) yang meliputi tahap perencanaan, peninjauan, dan dokumentasi, dengan pengelompokan, analisis, dan penarikan kesimpulan dari data. Hasil penelitian menunjukkan guru dapat memanfaatkan pendekatan *Guided Discovery Learning* dengan bantuan GeoGebra untuk meningkatkan kemampuan pemecahan masalah matematis siswa dengan tetap memperhatikan tingkat kepercayaan diri. Siswa yang menggunakan model *Guided Discovery Learning* berbantuan GeoGebra mempunyai kemampuan pemecahan masalah matematis yang lebih baik.

Kata Kunci: *Guided Discovery Learning*; GeoGebra; Kepercayaan diri.

ABSTRACT

This research aims to determine the effectiveness of the Guided Discovery Learning model assisted by GeoGebra in improving students' mathematical problem-solving abilities, with a special focus on self-confidence. This research uses the Systematic Literature Review (SLR) methodology which includes planning, reviewing, and documentation stages, grouping, analysis, and concluding the data. The research results show that teachers can utilize the Guided Discovery Learning approach with the help of GeoGebra to improve students' mathematical problem-solving abilities while still paying attention to their level of self-confidence. Students who use the Guided Discovery Learning model assisted by GeoGebra have better mathematical problem-solving abilities.

Keywords: Guided Discovery Learning; GeoGebra; Confidence.

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1. INTRODUCTION

Matematic is one of the most important subjects that must be taught at every level of education in Indonesia. One of the primary goals of math education in schools is to help students understand problems, develop mathematical models, solve problems, and find solutions (Mawaddah & Anisah, 2015; Ardiansyah & Wahyuningrum, 2022; Wardi et al., 2023; Noverli, Asih, & Juandi, 2024). In line with this, Widayati (2022) states that mathematics is essential for students to solve problems and meet their basic needs. According to SK kepala BSKAP, the goal of maths education in the curriculum is to achieve the following competencies: (1) understanding and application of procedural mathematics; (2) penalisation and implementation of mathematics; (3) problem-solving in mathematics; (4) communication and representation of mathematics; (5) connectivity and disposition; and (6) mathematical knowledge. It is hoped that by learning mathematics, students will be able to maintain the level of competency that has already been established.

However, the development of various competencies has not been achieved to its full potential. According to Cahyani and Setyawati (2016), an essential learning skill is the capacity to solve mathematical problems. Students employ mathematical problem-solving skills to resolve problems in a systematic process consisting of four steps: The issue-solving process involves four main steps: (1) comprehending the problem, (2) devising a solution strategy, (3) implementing the solution based on the strategy, and (4) iterating the process (Fatimah et al., 2022). According to Kesumawati (2010), the capacity to solve mathematical problems encompasses the capacity to recognise previously identified components, inquire about the existence of necessary components, construct or modify mathematical models, select and execute problem-solving strategies, and elucidate and validate accuracy. Because of this, mathematical problem-solving requires the ability to find solutions to problems, the ability to learn and understand the material of study, the ability to foster creativity in students, and the ability to work at a high level.

According to Nurvela et al., (2020), problem-solving skills in mathematics are crucial for future mathematicians and educators, as well as individuals who will use these talents in other academic disciplines. Sagita (2023) goes on to say that solving problems is the primary goal of mathematics education. This is also supported by Branca (1980), who states that 1) the ability to solve problems is an important task in mathematics education, especially as a primary subject, and 2) problem-solving can take the form of a method, procedure, or strategy, which is the fundamental and primary process in mathematics education. This means that problem-solving skills are something that must be considered, as well as a very strategic approach to improving skills among students.

According to the fact that the classroom learning process focuses solely on the ability of the child to comprehend and retain information without the need to understand its relationship to daily life (Nurfausiah & Suhardiman, 2016; Lestari et al., 2022; Nurmajumitasari, 2023). As a result, when children leave school, they have only theoretical knowledge and are unable to apply it.

Indonesia has participated in surveys conducted in collaboration with numerous other countries; examples of these studies are the Trends in Mathematics and Science Study (TIMSS), the Programme for International Student Assessment (PISA), and various others. Based on the 2015 TIMSS survey, which examined math teacher employment across 47 countries, Indonesia has a rata-rata score of 397 and is ranked 45th out of 47 (IEA, 2015). This suggests that Indonesian students are not very advanced in mathematics.

To increase student performance in solving problems, it is necessary to transition them from passive learners to active learners by using appropriate learning models. According toTarsiyah (2021), One educational paradigm that transforms students from passive learners into active learners is the Guided Discovery Learning concept. According to the Guided Discovery Learning learning paradigm, students actively participate in class discussions, sitting between a teacher and a student (Fitriana et al., 2023). This approach is centred around predetermined objectives set by the educator to ensure that the learning process proceeds smoothly (Tayibu & Faizah, 2021; Murwanto, Qohar, & Sa' dijah, 2022).

Self-confidence refers to an individual's perception of themselves and their abilities, which influences their motivation and resources to take appropriate actions in accordance with the tasks at hand (Hendriana et al., 2018:291; Efwan dkk., 2024). According to Puspalita et al (2022), students who possess a strong sense of self-assurance typically exhibit proficient skills in solving mathematical problems, whereas students with a moderate level of self-confidence generally demonstrate lower abilities (Faturohman, Iswara, & Gozali, 2022; Awalia, 2023). Conversely, students who lack self-confidence usually possess limited skills in solving mathematical issues (Hanipah & Kania, 2023).

In relation to the implementation of the independent curriculum, secondary mathematics education (SMP) has also changed the integration of technology and computers (ICT) into classroom instruction. The use of ICT media aims to alleviate the learning difficulties in mathematics that arise from abstraction. (Rahmayanti, 2015). According to Nur (2017), the GeoGebra software application is one of the applications that can be developed as a mathematics learning media and can assist students in learning mathematics more easily. Fitriasari (2017) Hohenwarter (2008) stated that GeoGebra is a computer program specifically developed to aid students in the study of mathematics, with a particular focus on geometry, algebra, and calculus. Markus Hohenwarter created GeoGebra, which may be downloaded for free from

www.Geogebra.com. GeoGebra is the most suitable software for studying geometric structures (Suwanto dkk., 2023; Septia & Wahyu, 2023; Ernita, Isnarto, & Suyitno, 2024).

The researchers will perform a systematic analysis of existing literature, focusing on research findings. The purpose of this study is to examine the effectiveness of the Guided Discovery Learning paradigm, with the assistance of GeoGebra, in enhancing students' mathematical problem-solving skills, specifically focusing on the impact on their self-confidence.

2. METHOD

The research methodology used in this study is a literature review. Research, including a literature review, involves several tasks, including organising research resources, reading, documenting, and gathering library data (Zed, 2008: 3). The sort of literature utilised for the study and the qualitative approach are both reflected in the literature used.

A systematic literature review, or SLR (Systematic et al.), is the kind of literature study that is employed. Systematic Literature Reviews, or SLRs, are meant to assess and examine diverse study findings from a range of literature, then choose and include these findings to make data integration more thorough and precise. (Triandini et al., 2019).

The systematic literature review (SLR) process consists of three stages: (1) planning, which involves defining research objectives and formulating research questions; (2) review, which entails systematically searching literature sources, including identifying research, selecting key studies, and assessing the quality of the literature; and (3) documentation, where the literature material is organised in a way that aligns with the research objectives. (Sauer & Seuring, 2023). The findings will serve as the foundation for addressing the researcher's prior inquiries.

In order to carry out this study, a total of 20 publications were chosen from both national and international journals spanning the years 2019 to 2024. One of the data analysis techniques employed is data grouping, where researchers categorise important material. The impact of the Guided Discovery Learning paradigm on students' mathematical problem-solving skills is evaluated in ten articles. In addition, five articles investigate the impact of GeoGebra-assisted learning tools on students' proficiency in solving mathematical problems. In addition, five publications examine the correlation between self-efficacy and students' proficiency in solving mathematical problems. (2) Data analysis: In this stage, researchers scrutinised and assessed the selected literature. (3) Data inference: In this stage, the researcher makes deductions and reaches conclusions by analysing the research findings.

3. RESULT AND DISCUSSION

a. Result

The Discovery Learning concept comprises two distinct domains: Free Discovery Learning and Guided Discovery Learning. (Antonios et al., 2023). Guided Discovery Learning is an instructional approach developed by Jerome Seymour Bruner. (Mayer, 2004). Anwar (2023) Discovery Learning is a pedagogical style where students actively and independently learn by uncovering concepts and solving issues under the guidance of a teacher. Many academics have extensively utilised the guided discovery learning paradigm to improve students' mathematical problem-solving skills, specifically their self-assurance.

This study conducted a comprehensive analysis and synthesis of the literature sourced from Google Scholar, focusing on pupils' proficiency in solving mathematical problems. After searching, the researcher acquired 20 papers pertaining to the research topic. These documents were then organised and classified using tables 1 to 3. The initial table presents study findings that demonstrate the efficacy of the Guided Discovery Learning paradigm in enhancing students' proficiency in solving mathematical problems.

Table 1. GDL learning model article

Researcher	Research Results
Adelia et al. (2019)	The findings indicated that guided discovery learning effectively evaluated the problem-solving proficiency of eighth-grade students at SMPN 5 Bandar Lampung. However, it was found to be ineffective in enhancing their self-confidence.
Dewi et al. (2019)	The results suggested that the guided discovery learning method affected the mathematics problem-solving abilities of eighth-grade students at SMP Negeri 12 Bandar Lampung School.
Azizah and Granita, (2020)	The findings indicated that implementing the guided discovery learning model resulted in improved performance for class V of SDN 01 Suayan, Akabiluru sub-district. The student with the best score achieved a score of 98, while the student with the average score achieved a score of 83, and the student with the lowest score achieved a score of 50.
(Mutmainnah, 2020)	The guided discovery learning methodology is simple to use and can be gradually adopted, depending on the outcomes. Compared to pupils in the control class, students in the experimental class demonstrated superior problem-solving skills in mathematics. The Guided Discovery Learning paradigm impacts students' mathematical problem-solving skills.
Putri et al. (2022)	The outcomes demonstrate the GDL model's applicability. Math problem-solving skills improved in high school students who used the GDL paradigm, which is superior and more efficient than the traditional technique. The GDL paradigm impacts high school pupils' ability to solve mathematical problems.

Researcher	Research Results
Putri and Nugraheni (2022)	The findings demonstrated that the implementation of GDL was effective and timely. Specifically, the experimental group, which utilised the GDL model, exhibited superior problem-solving skills compared to the control group. The GDL model has a notable impact on the aptitude of high school pupils in solving mathematical problems.
Achmad and Latri (2022)	The findings indicated that the Guided Discovery Learning model was highly effective for the fourth-grade pupils of SD Kartika XX-1 Makassar City. The model's use enhanced students' mathematical problem-solving abilities, as indicated by the test results.
Pratiwi et al. (2023)	The results revealed significant differences in the learning outcomes between students who utilised the guided discovery learning approach and those who followed the standard strategy. The experimental group performed superiorly compared to the control group. Implementing the guided discovery learning methodology has demonstrated significant advantages in improving the problem-solving abilities of Class V Construction Material students at SD Muhammadiyah 11 Semarang.
Widari et al. (2023)	The results indicated that using the Discovery Learning approach, with the support of GeoGebra, can improve students' ability to solve mathematical problems and express mathematical concepts, particularly in the area of calculating the volume of rotating objects.
Langi et al. (2023)	The results revealed that the seventh-grade students at SMP Negeri 3 Buntao' Satap showed outstanding competence in solving mathematics problems after the introduction of the guided discovery learning approach.

Table 1 presents the outcomes of an examination of ten literary works encompassing prior study discoveries. The Guided Discovery Learning (GDL) paradigm is a very effective and efficient approach to enhancing students' mathematical problem-solving skills in the context of mathematics education. Thus, Guided Discovery Learning (GDL) might be suggested as a viable option for educators seeking to enhance students' proficiency in mathematical problem-solving.

Table 2 classifies the literature that shows the influence of Guided Discovery Learning (GDL) on students' ability to solve mathematical problems.

Table 2. GeoGebra-assisted learning tools influence mathematical solution ability

Researcher	Research Results
Mone and Abi, (2019)	The findings indicated that students who were instructed using the Discovery Learning model, with the assistance of Geogebra, exhibited superior problem-solving abilities following the learning process. Additionally, these students demonstrated greater completeness in their understanding compared to those who were taught using the conventional paradigm.
Septrianto et al. (2019)	The findings indicate that the utilisation of the Geogebra-assisted guided discovery learning methodology enhances student involvement,

Researcher	Research Results
	confidence, and comprehension. Nevertheless, the efficacy of this strategy is contingent upon the teacher's leadership and ingenuity.
Susilawati, (2022)	The findings indicated that students from STKIP Budidaya Binjai exhibited enhanced problem-solving abilities subsequent to their use of the GeoGebra-assisted guided discovery learning methodology. However, the Guided Discovery learning paradigm facilitates pupils' acquisition of geometry knowledge through the use of Geogebra software.
Widari et al. (2023)	The findings demonstrated that utilising the GeoGebra-assisted discovery learning model for the volume submaterial of rotating objects can enhance students' proficiency in solving mathematical issues and working with mathematical representations.
Latifi et al. (2022)	The findings indicate that guided instruction using Geogebra as a tool can enhance students' proficiency in mathematical problem-solving.

Table 2 displays the findings obtained by analysing five prior investigations. GeoGebra-assisted learning impacts students' mathematical problem-solving skills. Students' affinity for certain applications enhances their level of engagement and motivation towards learning. To guarantee that pupils remain engaged during the learning process. Furthermore, it represents a novel advancement for educators in the utilisation of the GeoGebra software for instructional purposes.

Moreover, Table 3 illustrates the impact of students' self-confidence on their proficiency in solving mathematical problems.

Table 3. The impact of self-confidence on the aptitude to solve mathematical problems

Researcher	Research Results
Agsya et al. (2019)	The findings indicated that students who possessed a strong sense of self-assurance in their learning abilities exhibited superior problem-solving aptitude and successfully demonstrated proficiency in all four problem-solving criteria. Students who possess a modest level of self-assurance in their learning abilities exhibit a corresponding level of proficiency in problem-solving. They are capable of comprehending the problem at hand and formulating a plan of action. However, they encounter challenges when it comes to executing the proposed solution. Students who possess poor self-confidence exhibit diminished problem-solving abilities.
Puspalita et al. (2022)	The findings indicate that the level of pupils' self-assurance has a direct impact on their aptitude to resolve mathematical issues.
Fitayanti et al. (2022)	The findings demonstrated a significant correlation between self-assurance and students' aptitude in resolving mathematical difficulties. Kids with moderate confidence exhibit a significantly diminished level of ability, while kids with low confidence also demonstrate a notably low level of ability.

Researcher	Research Results
Putri et al. (2022)	The findings indicated a positive correlation between self-confidence and mathematical problem-solving ability. In contrast, there is a negative correlation.
Asari et al. (2022)	The findings indicated that students with a moderate level of self-confidence were classified as having a poor level of problem-solving skills and were unable to meet all of the criteria. Students who possess a strong sense of self-assurance belong to the group of individuals with exceptional problem-solving skills and are capable of attaining all performance measures.

The data presented in Table 3 are obtained from five previous studies. The inquiry establishes a robust association between students' self-assurance and their aptitude for solving mathematics challenges. According to the analysis of the publications above, there is a direct relationship between students' level of self-assurance and their proficiency in solving mathematical problems. However, those with greater self-confidence demonstrate greater proficiency in solving mathematical tasks.

b. Discussion

The government has implemented an autonomous curriculum to tackle Indonesia's present and future educational obstacles effectively. The objective of the Merdeka Curriculum learning process is to provide students with a well-rounded and integrated education according to their specific setting. (Ilmawan, 2024)This approach facilitates students' learning more significantly and effectively than exclusively emphasising rote memory.

When it comes to education, teachers must determine the most effective methods for enhancing students' cognitive capabilities. Teachers can enhance students' cognitive capacities by implementing the learning models they utilise in the classroom. (Alie, 2013). The Guided Discovery Learning model can serve as an alternative method to enhance students' proficiency in solving mathematical issues. (Hutagalung, 2017). This is reinforced by the opinion of Fahmawati (2020), Who stated that the Guided Discovery Learning model can help students solve mathematical problems. This shows that students can solve mathematical learning problems through the Guided Discovery Learning model.

The Guided Discovery Learning approach evaluates learning based on the process rather than solely on the outcomes and requires students to engage in the process actively. (Baskoro et al., 2013)Students can encounter diverse challenges in the learning process and make efforts to resolve them (Haeruman et al., 2017). They are required to enhance their problem-solving abilities by utilising the Guided Discovery Learning paradigm.

ICT-facilitated learning is a diverse method that can enhance students' proficiency in solving mathematical issues. An instance of ICT implementation that helps alleviate student learning challenges in mathematics is the employment of GeoGebra software. (Nurul et al., 2021).

According to Gustina et al., (2021) GeoGebra software can alleviate learning difficulties caused by the abstract nature of mathematics, especially geometry. It can also increase students' curiosity, encourage them to think critically and improve their mathematical problem-solving skills. (Pratiwi, 2016). GeoGebra software simplifies and enhances the comprehension of the material provided by the teacher, making it easily understandable for students.

The implementation of the Geogebra-assisted Guided Discovery learning approach in Indonesia has yielded highly favourable and efficacious outcomes in enhancing students' proficiency in solving mathematical problems. Aside from employing learning models and media to enhance students' proficiency in mathematical problem-solving, their self-assurance plays a significant role in their aptitude to solve mathematical difficulties. (Ituga & Alman, 2023). Students with a high level of confidence are more adept at solving mathematical difficulties. Moreover, fostering self-assurance in students enhances their aptitude for resolving problems. (Puspalita et al, 2022).

Considering the preceding discussion, the Guided Discovery learning style, facilitated by GeoGebra, is anticipated to serve as a favourable option for instructing students in problem-solving techniques and fostering their self-assurance. ICT-enhanced educational media designed to complement classroom instruction is anticipated to enhance course engagement, facilitate comprehension of the topic, and enhance students' proficiency in solving mathematical problems.

4. CONCLUSION

The article's Systematic Literature Review indicates that the Guided Discovery Learning paradigm, when accompanied by GeoGebra, is a highly successful option for teachers to improve students' mathematical problem-solving abilities and increase their self-assurance in mathematics.

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