26 (1), 2025, 539-555
Jurnal Pendidikan MIPA
e-ISSN: 2685-5488 | p-ISSN: 1411-2531
http://jurnal.fkip.unila.ac.id/index.php/jpmipa/

The Effectiveness of Guided Inquiry with Scaffolding Techniques in Enhancing Primary Students' Self-Efficacy in Mathematics

Adinda Rheyna Vonitasari, & Mohammad Faizal Amir*
Primary School Teacher Education Study Program, Universitas Muhammadiyah Sidoarjo, Indonesia

Abstract: Students' self-efficacy towards mathematics is still low. High self-efficacy is an essential factor in supporting learning success. Guided inquiry elaborated with scaffolding techniques is thought to affect students' self-efficacy. Therefore, this study aims to identify the effect of guided inquiry with scaffolding techniques on students' self-efficacy. The study design used was the posttest-only control group. In this study, data collection techniques were used using a questionnaire containing 20 questions to measure students' self-efficacy (magnitude, generality, and strength) in facing and completing mathematics tasks. Study participants included fourth-grade students' who were drawn through purposive sampling. ANOVA test and post hoc analysis were used for data analysis. The data analysis showed differences in students' self-efficacy between the implementations of guided inquiry with scaffolding techniques, guided inquiry without scaffolding techniques, and conventional learning. It was concluded that guided inquiry implemented with scaffolding techniques significantly enhanced students' mathematics self-efficacy. The most affected dimensions of self-efficacy from high to low are strength, magnitude, and generality. This shows sufficient scaffolding during the implementation of guided inquiry. In addition, students received sufficient scaffolding in the exploration process, which resulted in students being more confident in understanding the material and completing tasks independently.

Keywords: guided inquiry learning, scaffolding techniques, self-efficacy.

▪ INTRODUCTION

Self-efficacy is an individual's belief in his or her capacity to perform tasks and achieve goals, which plays an important role in mathematics education (Bandura, 1997). According to Wale & Bishaw (2020), self-efficacy provides students with confidence in organizing actions effectively to achieve the ultimate goal. Students with high self-efficacy are more engaged in learning, persist in the face of challenges, and use effective problem-solving strategies (Rusmansyah et al., 2023; Zakariya, 2022). In contrast, students with low self-efficacy tend to avoid difficult tasks, experience high anxiety, and show decreased academic achievement (Usher, 2009). In relation to mathematics, studies show a strong correlation between self-efficacy and mathematics achievement, so it is important for educators to foster students' self-confidence (Živković et al., 2023). In addition, self-efficacy affects students' motivation and skill to self-regulate learning, which is important for success in mathematics (Zakariya, 2022) and decision-making Puozzo & Audrin (2021). Therefore, by creating adequate self-efficacy, educators can help students develop resilience and positive attitudes toward mathematics, which has an impact on enhancing students' academic performance (Živković et al., 2023).

Specifically for primary students, self-efficacy is critical to primary students' success in mathematics, as it shapes their basic attitude toward learning (Arifin et al., 2021). High self-efficacy is associated with enhancing problem-solving skills and greater resilience in the face of challenges (Masitoh & Fitriyani, 2018). Conversely, low self-efficacy can lead to increased anxiety, decreased motivation, and lower engagement in

Mohammad Faizal Amir
*Email: faizal.amir@umsida.ac.id
DOI: http://dx.doi.org/10.23960/jpmipa/v26i1.pp539-555
Received: 16 March 2025
Accepted: 19 April 2025
Published: 05 May 2025

mathematics (Tergravida & Prihastiwi, 2023). Mastery experiences, such as successfully solving problems, are key to building self-efficacy in mathematics (Özcan & Kültür, 2021). Teacher support also plays an important role in fostering students' confidence and motivation to learn mathematics (Tergravida & Prihastiwi, 2023).

Students' self-efficacy is still not ideal, especially primary students. Many studies confirm the low and consequent low primary students' self-efficacy in mathematics (Mahmudah & Hermanto, 2024; Prasanti et al., 2023; Yıldız et al., 2019; Živković et al., 2023). Low self-efficacy results in increased anxiety and decreased motivation to learn mathematics. Low self-efficacy also results in low learning outcomes (Mahmudah & Hermanto, 2024; Živković et al., 2023), and math performance (Yıldız et al., 2019), and passive learning activities (Prasanti et al., 2023). This kind of problem, Luzyawati (2018) argues that low self-efficacy is caused by a fundamental factor, namely the wrong learning approach. The learning approach is still teacher-centered and does not stimulate students' self-efficacy. Therefore, enhancing self-efficacy through the right learning strategy can support is very important for students' long-term mathematics success (Schunk & DiBenedetto, 2022).

Guided inquiry is needed in elementary education in Indonesia because it helps students develop a deeper and more meaningful understanding of mathematical concepts. Currently, the education system in Indonesia is still dominated by conventional learning methods that tend to be instructional and do not emphasize the active involvement of students in the learning process (Suyanti et al., 2024). As a result, many students have difficulty understanding mathematical concepts conceptually and only memorize formulas without understanding their implementation in real-life (Magfirotin & Amir, 2024). Guided inquiry allows students to explore concepts through inquiry-based learning experiences with teacher guidance, which can enhance conceptual understanding and problem-solving skills (Rodriguez et al., 2020). More specifically, primary school education related to mathematics aims to provide mathematical skills, understanding, and positive perceptions of mathematics in students' lives and subsequent levels (Bopo et al., 2023). Therefore, concerning self-efficacy, guided inquiry is expected to enhance learning motivation and overcome math anxiety, which is still a challenge at the primary school level (Aryal, 2022).

Guided inquiry alone is not enough to enhance self-efficacy in mathematics. Teachers must also provide guidance using scaffolding techniques (Jatisunda et al., 2020). The scaffolding technique is one way that can be applied to overcome learning difficulties in students. Using this scaffolding technique can also correct the students' misunderstanding of concepts (Puspitaningsih & Handayanto, 2018). Scaffolding techniques also have several other advantages; among others, students can enhance their investigation and performance, avoid students from failure or misunderstanding, and bridge students' learning difficulties (Dou, 2021). Five types of scaffolding techniques can be used: providing explanations, inviting students' participation, verifying and clarifying students' understanding, modeling desired behavior, and inviting students to contribute presentations (Bikmaz et al., 2010). In this inquiry learning, an educator should also give more freedom to students to collaborate during learning activities (Luce, 2024).

Studies on guided inquiry and scaffolding in primary school mathematics learning are still conducted separately in Indonesia and abroad and can be grouped into three main themes. First, studies on guided inquiry that focus on enhancing conceptual understanding and student engagement in mathematics learning, such as those researched by Hastuti et al. (2020), Isran et al. (2024), and Rodriguez et al. (2020), as well as in the Indonesian context by Kurniawati (2018) and Diani et al. (2024). Second, studies on scaffolding that highlight its role in enhancing higher-order thinking skills and problem-solving of primary students (Alanazi et al., 2024; Vallejo et al., 2019), as well as its use in supporting guided inquiry through strategies such as e-scaffolding and reflective questioning in mathematics learning in Indonesia (Wang et al., 2021; Wulandari & Hayati, 2022). Third, studies that try to combine guided inquiry and scaffolding but are still limited to secondary education and international contexts (Wang et al., 2021), while in Indonesia, this integration has only been applied through guided inquiry or discovery approaches and local cultural adaptations for enhancing students' self-efficacy and problem-solving skills (Fitria, 2022; Simamora et al., 2018). Thus, no study specifically examines the integration of guided inquiry and scaffolding in mathematics learning in primary schools, especially in Indonesia, so this study aims to fill this gap.

Hence, it is suspected that guided inquiry elaborated in depth with scaffolding techniques can affect students' self-efficacy. Existing studies have not examined guided inquiry with scaffolding techniques that are applied not separately to enhance students' self-efficacy. Meanwhile, according to Riben et al. (2024), the stages of guided inquiry can enhance self-efficacy because students are guided in understanding concepts, connecting concepts with several scientific phenomena, and expressing their ideas during learning. Scaffolding is used to solve problems that arise during the learning process; with this, scaffolding has been proven to minimize students' cognitive load when learning, which can affect students' self-efficacy. Therefore, this study aims to identify the effect of guided inquiry with scaffolding techniques on students' self-efficacy. The following three study questions were formulated to answer the study objectives: (1) Is there a significant difference in enhancing mathematics self-efficacy between students taught with a guided inquiry approach with scaffolding techniques and guided inquiry alone with conventional learning? (2) Which of the applied learning approaches, guided inquiry with scaffolding techniques, guided inquiry alone, or conventional learning, is most effective in enhancing the mathematics self-efficacy of primary school students? (3) Which of the dimensions of self-efficacy (magnitude, generality, and strength) has the highest to lowest enhancement?

▪ METHOD

Participants

The study participants were fourth-grade students at Sugihwaras State Primary School, Sidoarjo. Of the 119 fourth-grade students, 81 were selected as participants using the purposive sampling technique. Purposive sampling was based on inclusion and exclusion criteria. The selection through inclusion criteria is based on regular students who do not have inclusion barriers and demographic characteristics, namely age, gender, and mathematics achievement in Table 1. Meanwhile, the selection of exclusion criteria was based on the participation of at least 75% of the meetings. In other words, students who attended less than 75% of the meetings were excluded from the study. The selection based on these two criteria resulted in 81 out of 119 fourth-grade students being distributed into three classes: First class with 29 students, second class with 27 students, and third class with 25 students.

Table 1. Demographic information of students

Demographic	Aspects	Total
Age	10 years	36
	11 years	45
Sex	Female	41
	Male	40
Mathematics achievement	< 60	10
	60-80	31
	80-100	40

Research Design and Procedures

The research design uses a posttest-only control group, which is part of a quasi-experiment (Creswell & Creswell, 2018). There are three classes, namely two experimental classes and one control class. The first class and the second class are the experimental classes. The first class applied guided inquiry with scaffolding techniques and the second applied guided inquiry only. Meanwhile, the control class is the third class that applied conventional learning. Furthermore, at the end of the study, the three classes were given a posttest in the form of the same questionnaire to determine the difference between the experimental and control classes. The whole design was implemented over eight weeks, with the first four weeks focusing on testing the instrument and the second four weeks focusing on implementing learning in the three classes.

The procedure for conducting experiments in the first class that applied guided inquiry was based on the six phases adapted from Sotiriou et al. (2020): problem orientation, hypothesis design, designing experiments, conducting experiments, analyzing data, and making conclusions. (1) Problem orientation. The teacher conveys the learning objectives, motivates students to learn, and presents the problem in class. (2) Hypothesis design. Students are asked to make predictions related to the problem that has been presented. (3) Designing experiments. Students are asked to design the steps that must be taken to solve the problem. (4) Conducting experiments. Students collect relevant information or data related to the problem that has been presented. (5) Analyzing data. Students analyze data to find patterns or relationships. (6) Making conclusions. Students make conclusions that answer the initial problem or question.

Meanwhile, the second class applied guided inquiry with scaffolding techniques. Scaffolding techniques were adapted from five types of scaffolding (Bikmaz et al., 2010), which include offering an explanation, inviting student participation, verifying and clarifying student understanding, modeling desired behaviors, and inviting students to contribute clues. (1) Offering explanation. The teacher provides an explicit statement by adjusting it to align with students' understanding of the studied material. (2) Inviting student participation. Learners are allowed to participate in the ongoing process. (3) Verifying and clarifying students' understanding. The teacher confirms the students' responses if the emerging understanding is logical. However, if not, the teacher provides clarification. (4) Modeling desired behaviors. The teacher teaches behaviors that show how one should feel, think, or act in certain situations, including modeling thinking aloud. (5) Inviting students to contribute clues. The teacher asks learners to provide clues to help them complete the task. Operationally, the implementation procedure and the linkage of guided inquiry with scaffolding techniques are explained through the mapping and activity stages in Table 2.

Table 2. Activity stages of implementing guided inquiry with scaffolding techniques

Guided Inquiry	General Guided Inquiry Activity	Scaffolding Techniques	Guided Inquiry Activity with Scaffolding Technique
Problem orientation	The teacher conveys learning objectives, motivates students, and presents the problem	- Offering explanation - Modeling	- Students receive an explanation of the learning objectives and basic concepts - Students observe how to identify problems through examples given by the teacher
Hypothesis design	Students make predictions about the problem that has been presented	- Inviting student - Verifying and clarifying	- Students participate in group discussions to develop hypotheses - Students propose hypotheses and get clarification or feedback from the teacher
Designing experiments	Students design problem-solving steps	- Inviting student participation - Modeling	- Students determine the steps of the investigation with minimal guidance from the teacher - Students observe examples of effective experiment design to apply in their assignments
Conducting experiments	Students collect relevant information or data	- Offering explanation - Inviting student	- Students access various sources of information and collect data based on their experiment plan - Students collaborate with peers to find information that supports problem-solving
Analyzing data	Students analyze data to find patterns or relationships	- Verifying and clarifying - Inviting students	- Students interpret data and identify patterns by discussing them with friends - Students ask questions to clarify their understanding of the analysis results
Making conclusions	Students draw conclusions based on the data obtained	- Offering explanation - Verifying and clarifying	- Students conclude and explain their findings to their friends. - Students receive feedback and clarify conclusions based on the data collected

Instrument

The instrument in this study is a self-efficacy questionnaire, which is classified as a non-test. The researchers developed statements on the self-efficacy questionnaire based on three dimensions of self-efficacy (Bandura, 1997), namely magnitude, generality, and strength. In this, the questionnaire statements on the magnitude dimension measure the extent to which students believe they can complete tasks with various difficulty levels. While the generality dimension measures how broadly students' self-efficacy beliefs can be applied in various fields or conditions. Meanwhile, the strength dimension measures the level of constancy of individual beliefs in their skills. Each dimension has three indicators, each represented by 2 or 3 item positive and negative statements. Finally, mapping items on each indicator per dimension produces 20 statements with details of magnitude, generality, and strength of as many as 7, 6, and 7 items, respectively. The distribution of items on each indicator per dimension is shown in Table 3.

Table 3. Dimensions, indicators, and item of self-efficacy test

Dimensions	Indicators	Items
Magnitude	- Confidence in students' skills to complete a particular task	1. 2
	- Confidence in skills to overcome obstacles in the level of difficulty encountered	3.18
	- Confident in positive thinking about the task at hand	7. 6. 12
Generality	- Confident in responding to situations and conditions in problem-solving with a positive attitude	8. 15
	- Confidence to use life experiences as a step towards success	5. 4
	- Self-confidence is an attitude that shows that students are confident in the entire learning process	10. 19
Strength	- Strong self-confidence in students' potential to complete tasks	13. 9
	- Self-confidence in the form of a fighting spirit and not giving up easily when experiencing obstacles in problem-solving	11. 14. 16
	- Confidently in the form of a strong commitment to complete the task well	20. 17

The questionnaire uses a Guttman scale to make it easier for primary school students to fill in the questionnaire. In this, for positive statements, there are two categories of scores: score 1 is given if students disagree with the statement and their behavior does not match it. A score of 2 is given if students agree with the statement and their behavior is by the statement. Meanwhile, for negative statements, the scoring is the opposite of positive statements.

Before the self-efficacy questionnaire was used, researchers conducted validity and reliability. In addition, the instrument was also validated by two validators. The first validator is an expert in mathematics learning and the second validator is an expert in measurement. The validity test was conducted with a significance level of 5%. If the significance value exceeds 0.05, the data is declared valid. Conversely, if the value is less than 0.05, the data is considered invalid. As for the reliability test using Cronbach's Alpha value, the instrument is declared reliable if the value exceeds 0.6. Based on the analysis results, the 20 statements tested obtained a significance value of more than 0.05. Regarding the reliability test, the Cronbach's Alpha value is 0.891, which exceeds 0.6. Thus, the self-efficacy questionnaire is valid and reliable to use.

Data Analysis

Data analysis used descriptive statistics by calculating the mean and standard deviation (SD) and presenting a bar chart to illustrate the data distribution on the experimental and control class self-efficacy scores. In addition, inferential analysis was conducted through hypothesis testing. Hypothesis testing was conducted to determine whether there is a significant difference in students' self-efficacy based on the learning treatment given. The null hypothesis (H0) states no significant difference between the different learning groups, while hypothesis one (H1) states a significant difference between the different learning groups. The decision to accept or reject the null hypothesis (H_0) is based on the p-value of the ANOVA analysis results. If the p-value < 0.05, then

H_0 is rejected and H_1 is accepted, which means there is a significant difference between the learning groups. Conversely, if the p-value ≥ 0.05, then H_0 is accepted, indicating no significant difference between the tested learning groups. Furthermore, a post hoc test was conducted to determine which group experienced the difference.

▪ RESULT AND DISSCUSSION

This study determined the effectiveness of guided inquiry learning implementation with scaffolding techniques on students' self-efficacy. This study was measured from the self-efficacy questionnaire scores of the fourth-grade students. The posttest score in this questionnaire was used to measure students' self-efficacy after the treatment. A one-way ANOVA analysis was used to test whether the three classes have different characteristics based on the analysis of the three classes (two experimental and one control class). Table 4 provides information on a significant difference in the questionnaire results between the three classes.

Table 4. Self-efficacy scores of experimental and control classes

Inter-Within-Groups	SS	df	MS	F	P
Inter-groups	144.245	2	72.123	17.804	<.001
Within-groups	315.977	78	4.051		
Total	460.222	80			

Description
SS: Sum of Squares df: Degrees of Freedom MS: Mean Square F: F-Ratio P: P-value

Based on the results of the one-way ANOVA test in Table 4. The analysis was based on two statistical hypotheses (H0 and H1). H0 is that students' self-efficacy from both experimental and conventional classes is not significantly different or equal. H1 is that students' self-efficacy from both experimental and conventional classes is significantly different or not the same. It appears that the p-value <0.05 so that H0 is rejected and H1 is accepted, or it can be concluded that the self-efficacy of the two experimental and the control classes is significantly different or not the same. After that, the post hoc analysis was continued to determine the differences in the self-efficacy of each student in the two experimental classes and one control class in detail in Table 5.

Table 5. Results of post hoc analysis

(i)	(j)	Mean Difference (i-j)	SE	p	Lower Bound	Upper Bound
Guided inquiry with scaffolding technique	Guided inquiry without scaffolding technique	.352	.453	.718	-.74	1.45
	Conventional learning	3.041*	.589	<.001	1.60	4.48
Guided inquiry without	Guided inquiry with scaffolding technique	-.352	.453	.718	-1.45	.74

scaffolding technique	Conventional learning	2.689*	.637	<.001	1.14	4.23
Conventional learning	Guided inquiry with scaffolding technique	-3.041	.589	<.001	-4.48	-1.60
	Guided inquiry without scaffolding technique	-2.689*	.637	<.001	-4.23	-1.14

Table 5 shows a difference between guided inquiry implementation with scaffolding techniques and guided inquiry implementation without scaffolding techniques in students' self-efficacy ($p < 0.05$). There is a difference between guided inquiry implementation with scaffolding techniques and conventional learning implementation in students' self-efficacy ($p < 0.05$), and there is a difference between guided inquiry implementation without scaffolding and conventional learning in students' self-efficacy ($p < 0.05$). To make it easier to see the comparison of self-efficacy scores in the three classes, the following comparison is presented in Figure 1.

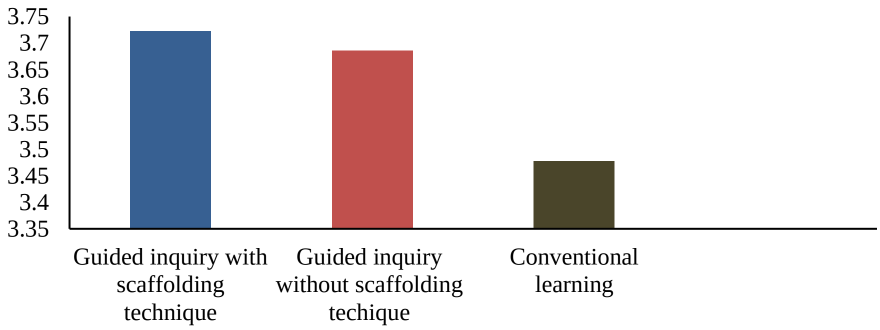

Figure 1. Comparison of average self-efficacy scores

Figure 1 displays the average self-efficacy score between classes. The highest average self-efficacy score is obtained by guided inquiry with scaffolding technique with a score of 3.72, followed by guided inquiry without scaffolding technique class with a score of 3.69, and the lowest is conventional class learning with a score of 3.48. This result shows that guided inquiry with the scaffolding technique is more effective in enhancing students' self-efficacy than guided inquiry without the scaffolding technique and conventional learning. Based on the results of the assumption test of the two experimental classes, a one-way ANOVA test was conducted through a significant level of $\alpha = 0.05$. After data processing, the output display can be seen in Table 6.

Table 6. Self-efficacy in guided inquiry with and without scaffolding

Inter-Within-Groups	SS	df	MS	F	P
Inter-group	1.737	1	1.737	.617	.435
Within-group	151.977	54	2.814		
Total	153.714	55			

Description
SS: Sum of Squares df: Degrees of Freedom MS: Mean Square F: F-Ratio P: P-value

Based on the results of the one-way ANOVA test in Table 6. The analysis is based on two statistical hypotheses (H0 and H1). H0 is that students' self-efficacy in guided inquiry implementation with scaffolding techniques is not better or equal to students in inquiry implementation without scaffolding techniques. H1 is that students' self-efficacy in guided inquiry implementation with scaffolding techniques is not better or equal to students in inquiry implementation without scaffolding techniques.

The p-value < 0.05 so that H0 is rejected and H1 is accepted, it can be concluded that the self-efficacy in implementing guided inquiry with scaffolding techniques is better than that without scaffolding techniques. Based on the results of the assumption test of the two classes, namely the implementation of inquiry with scaffolding techniques and the implementation of conventional learning, the one-way ANOVA test was conducted through a significant level of α = 0.05. After data processing, the output display can be seen in Table 7.

Table 7. Self-efficacy in guided inquiry with scaffolding and conventional learning

Inter-Within-Groups	SS	df	MS	F	P
Inter-groups	124.190	1	124.190	28.919	<,001
Within-groups	223.310	52	4.294		
Total	347.500	53			

Description
SS: Sum of Squares df: Degrees of Freedom MS: Mean Square F: F-Ratio P: P-value

Based on the results of the one-way ANOVA test in Table 7. The analysis is based on two statistical hypotheses (H0 and H1). H1 is that students' self-efficacy in implementing guided inquiry with scaffolding techniques is not better or the same as in implementing conventional learning. H1 is that students' self-efficacy in guided inquiry implementation with scaffolding techniques is better than students in conventional learning implementation.

The p-value < 0.05 appears, so H1 is rejected, and H1 is accepted. It can be concluded that self-efficacy in guided inquiry implementation with scaffolding techniques is better than conventional learning implementation. Based on the results of the assumption test of the two classes, namely the implementation of guided inquiry without scaffolding techniques and the implementation of conventional learning, the one-way ANOVA test was conducted through a significant level of α = 0.05. After data processing, the output display can be seen in Table 8.

Table 8. Self-efficacy in guided inquiry without scaffolding and conventional learning

Inter-Within-Groups	SS	df	MS	F	P
Inter-groups	93.853	1	93.853	18.283	<.001
Within-groups	256.667	50	5.133		
Total	350.519	51			

Description

SS:	Sum of Squares	df:	Degrees of Freedom	MS:	Mean Square	F:	F-Ratio	P:	P-value

Based on the results of the one-way ANOVA test in Table 8. The analysis is based on two statistical hypotheses (H0 and H1). H1 is that students' self-efficacy in guided inquiry implementation without scaffolding techniques is not better or the same as in conventional learning implementation. H1 is that self-efficacy in guided inquiry implementation without scaffolding techniques is better than that of students in conventional learning implementation. The p-value <0.05 appears, so H1 is rejected, and H1 is accepted. It can be concluded that self-efficacy in implementing guided inquiry without scaffolding techniques is better than implementing conventional learning. Based on the post hoc analysis of score distribution based on self-efficacy indicators from when the class is produced in detail in Table 9.

Table 9. Distribution of scores on the self-efficacy dimension

Class	Magnitude (M±SD)	Generality (M±SD)	Strength (M±SD)
Guided inquiry with scaffolding technique	13.66 ± 0.55	11.93 ± 0.26	50.59 ± 1.59
Guided inquiry without scaffolding technique	13.63 ± 0.56	11.78 ± 0.51	50.00 ± 2.48
Conventional learning	12.96 ± 1.24	11.16 ± 0.99	46.92 ± 3.83

Table 9 shows self-efficacy differences across magnitude, generality, and strength among the three learning groups. In the magnitude dimension, which measures task difficulty students can handle, the guided inquiry with scaffolding group had the highest score (M = 13.66, SD = 0.55), followed by guided inquiry without scaffolding (M = 13.63, SD = 0.56), and conventional learning with the lowest (M = 12.96, SD = 1.24). This indicates that scaffolding enhances students' confidence in tackling mathematical challenges. In the generality dimension, reflecting self-confidence across situations, the guided inquiry with scaffolding group again scored highest (M = 11.93, SD = 0.26), slightly above guided inquiry without scaffolding (M = 11.78, SD = 0.51), while conventional learning had the lowest score (M = 11.16, SD = 0.99). This interpretation that guided inquiry fosters greater confidence in diverse mathematical contexts, especially with scaffolding.

On the other hand, in the strength dimension, which measures the extent to which students' confidence persists in facing challenges, the guided inquiry group with scaffolding again showed the highest score (M = 50.59, SD = 1.59), followed by guided inquiry without scaffolding (M = 50.00, SD = 2.48), and conventional learning had the lowest score (M = 46.92, SD = 3.83). This indicates that using scaffolding in guided inquiry enhances students' confidence in solving math problems and makes them more persistent in dealing with them. Thus, the guided inquiry approach with scaffolding techniques proved more effective than the other two methods in enhancing the three dimensions of students' self-efficacy.

Thus, the strength dimension experienced the most significant enhancement, with the largest score difference between the guided inquiry with scaffolding and conventional learning groups (50.59 vs. 46.92). This suggests that this approach is most effective in enhancing students' resilience in facing mathematical challenges. The magnitude dimension came in second, with moderately high enhancing (13.66 vs. 12.96), indicating that students were more confident in completing mathematical tasks. The generality dimension showed the least enhancement (11.93 vs. 11.16). However, it was still better than the other methods, indicating that this approach also helped students to apply their beliefs in various situations. Thus, the order of influence from greatest to least is strength, magnitude, and generality.

The first finding of our study shows that guided inquiry with scaffolding techniques is most effective in enhancing students' mathematical self-efficacy compared to guided inquiry alone and conventional learning. This finding is in line with Amelia & Nindiasari (2022), which found that inquiry learning with scaffolding strategies significantly enhances the mathematical communication skills of vocational school students. Similarly, Nofiansyah study (2021) showed that the implementation of scaffolding is effective in enhancing students' self-efficacy in economic mathematics courses. However, a study by Sopari et al. (2022) found that although using worksheets based on the guided inquiry method effectively enhanced students' mathematical communication skills, there was no significant change in students' self-efficacy.

Meanwhile, the second finding found that strength, magnitude, and generality influence the dimensions of self-efficacy in mathematics in primary school students in a row from the largest to the smallest. This finding is in line with Herzamzam (2021), which shows that implementing problem-based learning can enhance motivation and self-efficacy in primary school students' mathematics learning, with significant enhancement in strength. Similarly, the study by Negara et al. (2023) revealed that the problem-based learning approach effectively enhances students' mathematics self-efficacy, especially regarding strength dimension, which reflects students' confidence in completing mathematical tasks. However, the study by Arifin et al. (2018) found that although a realistic mathematics approach can develop students' overall self-efficacy, the enhancement of the generality dimension was not as strong as that of the other dimensions, suggesting that students still face challenges in applying their mathematical skills in a broader context.

Guided inquiry with scaffolding techniques effectively enhances the magnitude dimension of self-efficacy compared to conventional learning because it provides a structured challenge in learning mathematics. In problem orientation, students face contextual problems supported by offering explanations to help initial understanding (Calleja et al., 2024). In hypothesis design and designing experiments, students formulate predictions and develop problem-solving strategies, assisted by inviting student participation and modeling of desired behaviors, which enhances their confidence (Riben et al., 2024). During conducting experiments, the teacher verifies and clarifies student understanding so that students understand the solution steps better (Amelia & Nindiasari, 2022). Finally, in making conclusions, students conclude by inviting students to contribute clues so that they are more confident in solving math problems independently (Diani et al., 2024).

The generality dimension of self-efficacy in learning mathematics increases through guided inquiry with scaffolding because students are accustomed to applying problem-solving in various contexts. At the problem orientation stage, students are introduced to various problems by offering explanations so that they understand the relevance of concepts in various situations (Suryani et al., 2021). In hypothesis design and designing experiments, inviting student participation encourages students to think flexibly in designing solutions that can be applied in real-life (Chinn, 2021). During conducting experiments, students test their strategies and are supported by verifying and clarifying student understanding, ensuring broader concept implementation (Aynufa et al., 2020). Finally, in making conclusions, students conclude by inviting students to contribute clues so that they have confidence that the skills learned can be used in various mathematical and real-life situations (Oers, 2020).

The strength of the self-efficacy dimension increases in guided inquiry with scaffolding because students are encouraged to persist in solving mathematical challenges independently. In problem orientation, students face initial challenges that are assisted by offering explanations and building strong conceptual understanding (Langdon & Pandor, 2020). In hypothesis design and designing experiments, modeling desired behaviors helps students develop more persistent thinking strategies when facing difficulties (Sichangi, 2024). During conducting experiments, verifying and clarifying student understanding ensures students do not give up easily by providing constructive feedback (Amelia & Nindiasari, 2022). In making conclusions, inviting students to contribute clues allows them to reflect on their success, strengthening their resilience in future mathematical challenges (Sulistiyo & Wijaya, 2020).

Enhancing students' self-efficacy in this study aligns with Bandura's theory (1997), which highlights success experiences, vicarious experiences, social persuasion, and emotional conditions. Guided inquiry with scaffolding provides success experiences through offering explanations and verifying student understanding, enabling gradual understanding (Anwar et al., 2020). Modeling desired behaviors strengthens vicarious experiences by demonstrating problem-solving strategies to students (Wang et al., 2021). Inviting student participation and contributing clues enhance social persuasion, boosting confidence in solving mathematics problems (Oktarianto et al., 2024). Additionally, scaffolding reduces academic anxiety and fosters resilience, supporting previous findings on inquiry-based learning and self-efficacy (Chinn, 2021; Guo et al., 2023).

This study makes a unique contribution to primary school mathematics education by integrating guided inquiry and scaffolding for enhancing students' self-efficacy, which were previously studied separately (Dorier & Maass, 2020; Guo et al., 2023). Practically, this study's results can help teachers design inquiry-based learning with appropriate scaffolding strategies, such as verifying and clarifying student understanding to enhance students' self-efficacy. Scientifically, this study enriches the literature on the effectiveness of integrated approaches in building students' self-efficacy in mathematics. Future study recommendations are to test variations of scaffolding, such as dynamic scaffolding, and explore digital technology in inquiry-based learning. In addition, the results of this study can be a reference in the development of a primary school mathematics curriculum that emphasizes exploratory approaches to enhancing students' self-efficacy.

▪ CONCLUSION

Based on the study's results, it can be concluded that guided inquiry learning with scaffolding techniques can enhance primary students' self-efficacy. In this case, there are differences in the results in each class and different interferences have been given. The class results better when an intervention is given through guided inquiry-based learning with scaffolding techniques. More specifically, the increase in self-efficacy was significant in the strength, magnitude, and generality dimensions, respectively. On the other hand, although the study's results showed positive results, this study was conducted with a relatively small sample of participants. Therefore, researchers recommend that future studies conduct further studies on guided inquiry learning with scaffolding techniques and involve a broader research sample.

▪ REFERENCES

Alanazi, A. A., Osman, K., & Halim, L. (2024). Effect of scaffolding strategies and guided discovery on higher-order thinking skills in physics education. Eurasia Journal of Mathematics, Science and Technology Education, 20(9), em2496. https://doi.org/10.29333/ejmste/14980

Amelia, I., & Nindiasari, H. (2022). *Efektivitas pembelajaran inquiry dengan strategi scaffolding untuk meningkatkan kemampuan komunikasi matematis siswa.* GAUSS: Jurnal Pendidikan Matematika, 5(1), 27–36. https://doi.org/10.30656/gauss.v5i1.4525

Anwar, N., Kristiadi, D. P., Novezar, F. A., Tanto, P. A., Ardhia, P., Evan, K., Chrysler, A., & Abraham, J. (2020). Learning math through mobile game for primary school students. https://www.researchgate.net/publication/343305550

Arifin, P., Trisna, B. N., & Atsnan, Muh. F. (2018). *Mengembangkan self-efficacy matematika melalui pembelajaran pendekatan matematika realistik pada siswa kelas vii d SMP Negeri 27 Banjarmasin tahun pelajaran 2016-2017.* Math Didactic: Jurnal Pendidikan Matematika, 3(2), 93–104. https://doi.org/10.33654/math.v3i2.59

Arifin, S., Wahyudin, & Herman, T. (2021). The effect of students' mathematics self-efficacy on mathematical understanding performance. İlköğretim Online, 20(1). https://doi.org/10.17051/ilkonline.2021.01.52

Aryal, H. P. (2022). The effect of inquiry-based learning on calculus I students' math anxiety [Ohio University]. http://rave.ohiolink.edu/etdc/view?acc_num=ohiou1659124270423852

Aynufa, C. N., Alman, A., & Astutik, H. S. (2020). *Pengaruh guided inquiry learning terhadap hasil belajar matematika siswa di SD inpres 103 HBM Kota Sorong.* Jurnal Papeda: Jurnal Publikasi Pendidikan Dasar, 2(1), 49–55. https://doi.org/10.36232/jurnalpendidikandasar.v2i1.407

Bandura, A. (1997). Self-efficacy: The exercise of control. Worth Publishers. https://books.google.co.id/books?id=eJ-PN9g_o-EC

Bikmaz, F. H., Özer, E., Soyak, Ö., & Reçber, H. (2010). *Strategi perancah yang diterapkan oleh guru mahasiswa untuk mengajar matematika.* http://ijrte.eab.org.tr/1/spc.issue/3f.hazir.pdf

Bopo, G., Ngura, E. T., Fono, Y. M., & Laksana, D. N. L. (2023). *Peningkatan kemampuan numerasi dengan media pembelajaran papan pintar berhitung pada anak usia 6-7 tahun.* Jurnal Ilmiah Pendidikan Citra Bakti, 10(3), 468–480. https://doi.org/10.38048/jipcb.v10i3.1998

Calleja, J., Foster, C., & Hodgen, J. (2024). Teachers' structuring of mathematical inquiry lessons: Shifting from "task-first" to "scaffolded inquiry". Research in Mathematics Education, 26(3), 460–493. https://doi.org/10.1080/14794802.2023.2176915

Chinn, C. A. (2021). Inquiry and learning. In R. G. Duncan (Ed.), International handbook of inquiry and learning (1st ed., pp. 1–14). Routledge. https://doi.org/10.4324/9781315685779-1

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches. SAGE Publications.

Diani, R., Asyhari, A., & Putri, L. P. (2024). Empowering minds: How guided inquiry enhances scientific reasoning in students with varied self-efficacy levels. Indonesian Journal of Science and Mathematics Education, 7(1), 170. https://doi.org/10.24042/ijsme.v7i1.22625

Dorier, J.-L., & Maass, K. (2020). Inquiry-based mathematics education. In S. Lerman (Ed.), Encyclopedia of Mathematics Education (pp. 384–388). Springer International Publishing. https://doi.org/10.1007/978-3-030-15789-0_176

Dou, L. (2021). The design of scaffolding for inquiry learning. 2021 International Symposium on Educational Technology (ISET), 33–37. https://doi.org/10.1109/ISET52350.2021.00017

Fitria, Y. (2022). *Perangkat pembelajaran matematika berbasis guided discovery untuk kemampuan pemecahan masalah peserta didik sekolah dasar.* 6. https://doaj.org/article/7f845674ad014d8ebda22b8102d661a8

Guo, Y., Wang, Y., & Ortega-Martín, J. L. (2023). The impact of blended learning-based scaffolding techniques on learners' self-efficacy and willingness to communicate. Porta Linguarum Revista Interuniversitaria de Didáctica de Las Lenguas Extranjeras, 40, 253–273. https://doi.org/10.30827/portalin.vi40.27061

Hastuti, I. D., Surahmat, S., Sutarto, S., & Dafik. (2020). The effect of guided inquiry learning in improving metacognitive skill of elementary school students. International Journal of Instruction, 13(4), 315–330. https://doi.org/10.29333/iji.2020.13420a

Herzamzam, D. A. (2021). *Peningkatkan motivasi dan self efficacy belajar matematika melalui model pembelajaran berbasis masalah pada siswa sekolah dasar.* Jurnal Basicedu, 5(4), 2133–2144. https://doi.org/10.31004/basicedu.v5i4.1177

Isran, D., Haji, S., Sumardi, H., & Syafri, F. S. (2024). Exploring the impact of guided inquiry learning with a scientific approach on mathematical conceptual understanding. https://doi.org/10.25217/numerical.v8i1

Jatisunda, M. G., Suciawati, V., & Nahdi, D. S. (2020). Discovery learning with scaffolding to promote mathematical creative thinking ability and self-efficacy. Al-Jabar : Jurnal Pendidikan Matematika, 11(2), 351–370. https://doi.org/10.24042/ajpm.v11i2.6903

Kurniawati, V. (2018). *Pengembangan perangkat pembelajaran matematika berbasis guided inquiry dan learning trajectory berorientasi pada kemampuan pemecahan masalah.* 7. http://journal.institutpendidikan.ac.id/index.php/mosharafa

Langdon, A., & Pandor, J. (2020). An investigation of scaffolding strategies to support structured inquiry language teaching to novice learners in a primary school setting. Language Value, 1–22. https://doi.org/10.6035/LanguageV.2020.13.1

Luce, S. M. (2024). Guided inquiry approach to chemistry instruction to improve the self-efficacy levels of students with individualized education programs. http://www.proquest.com/en-US/products/dissertations/individuals.shtml

Luzyawati, L. (2018). *Analisis kemampuan berpikir kritis siswa sma materi alat indera melalui model pembelajaran inquiry pictorial riddle.* Edu Sains: Jurnal Pendidikan Sains & Matematika, 5(2), 9. https://doi.org/10.23971/eds.v5i2.732

Magfirotin, E. S., & Amir, M. F. (2024). Elementary school students' conceptual and procedural knowledge in solving fraction problems. https://doi.org/10.15294/0m58xs24

Mahmudah, W. N. & Hermanto. (2024). Self efficacy on mathematics learning outcomes of elementary school students the impact of online learning. JPI (Jurnal Pendidikan Indonesia), 13(1), 129–137. https://doi.org/10.23887/jpiundiksha.v13i1.43030

Masitoh, L. F., & Fitriyani, H. (2018). Improving students' mathematics self-efficacy through problem based learning. Malikussaleh Journal of Mathematics Learning (MJML), 1(1), 26. https://doi.org/10.29103/mjml.v1i1.679

Negara, F. P., Abidin, Z., & Faradiba, S. S. (2023). *Meningkatkan self-efficacy matematika siswa melalui pembelajaran berbasis masalah.* Jurnal Cendekia : Jurnal Pendidikan Matematika, 7(1), 455–466. https://doi.org/10.31004/cendekia.v7i1.1943

Nofiansyah, W. (2021). *Efektivitas penerapan scaffolding terhadap self efficacy mahasiswa pada mata kuliah matematika ekonomi di program studi pendidikan ekonomi stkip kumala lampung.* ARITHMETIC: Academic Journal of Math, 3(2), 163. https://doi.org/10.29240/ja.v3i2.4031

Oers, B. V. (2020). Scaffolding in mathematics education. In S. Lerman (Ed.), Encyclopedia of Mathematics Education (pp. 759–762). Springer International Publishing. https://doi.org/10.1007/978-3-030-15789-0_136

Oktarianto, M. L., Akbar, S., Mas'ula, S., Hanisvana, D., & Farizza, R. A. (2024). Developments in self-efficacy at the elementary school level. 10(4). http://dx.doi.org/10.31949/jcp.v10i4.11757

Özcan, B., & Kültür, Y. Z. (2021). The relationship between sources of mathematics self-efficacy and mathematics test and course achievement in high school seniors. Sage Open, 11(3), 21582440211040124. https://doi.org/10.1177/21582440211040124

Prasanti, N. P., Suarjana, I. M., & Wira Bayu, G. (2023). The guided inquiry learning model aided by audiovisual media improves students' mathematics learning outcomes. Jurnal Pedagogi Dan Pembelajaran, 6(2), 247–254. https://doi.org/10.23887/jp2.v6i2.61707

Puozzo, C., & Audrin, C. (2021). Improving self-efficacy and creative self-efficacy to foster creativity and learning in schools. Thinking Skills and Creativity, 42, 100966. https://doi.org/10.1016/j.tsc.2021.100966

Puspitaningsih, F., & Handayanto, S. K. (n.d.). *Pengaruh PBL dengan scaffolding prosedural terhadap kemampuan berpikir tingkat tinggi ditinjau dari kemampuan tinggi dan rendah siswa.* 2018. https://doi.org/10.17977/jptpp.v3i7.11333

Riben, S., Arsyad, M., & Helmi, H. (2024). Guided inquiry method and self-efficacy on high school students' physics learning outcomes. Jurnal Penelitian Dan Pengembangan Pendidikan, 8(2), 356–364. https://doi.org/10.23887/jppp.v8i2.68657

Rodriguez, J.-M. G., Hunter, K. H., Scharlott, L. J., & Becker, N. M. (2020). A review of research on process oriented guided inquiry learning: Implications for research and practice. Journal of Chemical Education, 97(10), 3506–3520. https://doi.org/10.1021/acs.jchemed.0c00355

Rusmansyah, R., Rahmah, S. A., Syahmani, S., Hamid, A., Isnawati, I., & Kusuma, A. E. (2023). *Implementasi model PJBL-STEAM konteks lahan basah untuk meningkatkan kemampuan berpikir kritis dan self-efficacy peserta didik.* JINoP (Jurnal Inovasi Pembelajaran), 9(1). https://doi.org/10.22219/jinop.v9i1.23493

Schunk, D. H., & DiBenedetto, M. K. (2022). Academic self-efficacy. (pp. 268–282). Routledge. https://doi.org/10.4324/9781003013778-21

Sichangi, M. N. W. (2024). Effect of inquiry-based learning on mathematics learning achievement in stem-integrated secondary schools in kenya [University of Nairobi]. https://erepository.uonbi.ac.ke/handle/11295/166854

Simamora, R. E., Saragih, S., & Hasratuddin, H. (2018). Improving students' mathematical problem solving ability and self-efficacy through guided discovery learning in local culture context. International Electronic Journal of Mathematics Education, 14(1). https://doi.org/10.12973/iejme/3966

Sopari, Y. W., Daniarsa, Y., & Ulfatushiyam, N. (2022). *Pembelajaran inkuiri terbimbing untuk peningkatan kemampuan berpikir kritis, komunikasi matematis, efikasi diri matematis.* Pasundan Journal of Mathematics Education : Jurnal Pendidikan Matematika. https://doi.org/DOI: 10.23969/pjme.v12i1.5278

Sulistiyo, M. A. S., & Wijaya, A. (2020). The effectiveness of inquiry-based learning on computational thinking skills and self-efficacy of high school students. Journal of Physics: Conference Series, 1581(1), 012046. https://doi.org/10.1088/1742-6596/1581/1/012046

Suryani, Y., Ningrum, A. R., Hidayah, N., & Dewi, N. R. (2021). The effectiveness of blended learning-based scaffolding strategy assisted by google classroom toward the learning outcomes and students' self-efficacy. Journal of Physics: Conference Series, 1796(1), 012031. https://doi.org/10.1088/1742-6596/1796/1/012031

Suyanti, Manurung, E. S., Nurayati, S., Ramadhani, R., & Iziati. (2024). The influence of conventional learning methods on students' understanding of commendable behavior material in students at elementary school 098021 Kampung Prapat. https://journal.mgedukasia.or.id/index.php/etnopedagogi

Tergravida, B. A., & Prihastiwi, W. J. (2023). Perceived teacher support on student engagement through self-efficacy as a mediator in elementary school students' mathematics lesson. https://dergipark.org.tr/en/pub/jmetp/issue/81482/1367735

Usher, E. L. (2009). Sources of middle school students' self-efficacy in mathematics: A qualitative investigation. American Educational Research Journal, 46(1), 275–314. https://doi.org/10.3102/0002831208324517

Vallejo, nilson valencia, Vargas, omar lopez, & Rodriquez, luis sanabria. (2019). Effect of a metacognitive scaffolding on self-efficacy, metacognition, and achievement in e-learning environments. Knowledge Management & E-Learning: An International Journal, 1–19. https://doi.org/10.34105/j.kmel.2019.11.001

Wale, B. D., & Bishaw, K. S. (2020). Effects of using inquiry-based learning on EFL students' critical thinking skills. Asian-Pacific Journal of Second and Foreign Language Education, 5(1), 9. https://doi.org/10.1186/s40862-020-00090-2

Wang, H.-S., Chen, S., & Yen, M.-H. (2021). Effects of metacognitive scaffolding on students' performance and confidence judgments in simulation-based inquiry. Physical Review Physics Education Research, 17(2), 020108. https://doi.org/10.1103/PhysRevPhysEducRes.17.020108

Wulandari, S., & Hayati, I. (2022). Studi literatur: Peran questioning sebagai scaffolding dalam pembelajaran matematika. https://doi.org/10.35974/jpd.v5i2.2898

Yıldız, P., Çiftçi, S. K., & Özdemir, İ. E. Y. (2019). Mathematics self-efficacy beliefs and sources of self-efficacy: A descriptive study with two elementary school students. International Journal of Progressive Education, 15(3), 194–206. https://doi.org/10.29329/ijpe.2019.193.14

Zakariya, Y. F. (2022). Improving students' mathematics self-efficacy: A systematic review of intervention studies. Frontiers in Psychology, 13, 986622. https://doi.org/10.3389/fpsyg.2022.986622

Živković, M., Pellizzoni, S., Doz, E., Cuder, A., Mammarella, I., & Passolunghi, M. C. (2023). Math self-efficacy or anxiety? The role of emotional and motivational contribution in math performance. Social Psychology of Education, 26(3), 579–601. https://doi.org/10.1007/s11218-023-09760-8