



Effect of Small Group Discussion Method Learning on Concept Understanding of Senior High School Students

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Abstract

This study was motivated by limited comprehension of mathematical concepts among students in mathematics. One potential solution is implementing the small group discussion learning method. The objective of this study is to ascertain the efficacy of the acquisition of small-group discussion methods in mathematics subjects on students' comprehension of mathematical concepts. This form of research is a quasi-experiment with a non-equivalent control group design. The samples in this study were class XM_1 , which consisted of 27 students as the experimental class, and XM_2 , which consisted of 28 students as the control class, selected using Simple Random Sampling. The t-test results indicated a substantial difference in the comprehension of mathematical concepts between the experimental and control class students. Consequently, H_0 was rejected, and H_1 was accepted. It can be concluded that the small group discussion method is more effective than conventional learning in enhancing students' comprehension of mathematical concepts. The small group discussion method effectively enhances students' comprehension of concepts by involving them directly in the learning process. The small group discussion method has the potential to enhance students' comprehension of concepts, as demonstrated by the empirical findings of this study. Thus, this study suggests that this method is an effective teacher learning strategy.

Keywords: mathematics learning; small group discussion; understanding of mathematical concepts

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INTRODUCTION

The new paradigm in education underscores that students are unique individuals with the capacity to learn and develop actively. Students are expected to engage in the learning process by actively pursuing and developing knowledge through discussion, conveying ideas, receiving input from others, and being creative in problem-solving (Deslauriers et al., 2019; Lin et al., 2017; Winstone et al., 2017). This is pertinent to the requirements of mathematics education, which necessitates students to comprehend concepts in depth to complete assignments and integrate them into their daily lives (Rakhmalinda et al., 2024; Suyitno & Karomah, 2020). Teachers play a critical role in developing innovative and



effective learning as educators. Small group discussion is one method that may be implemented, in which students are encouraged to collaborate, exchange ideas, and participate in solving mathematical problems (Annamalai et al., 2015; Johanna et al., 2023). It is anticipated that this approach will enhance students' comprehension of mathematical concepts and their communication and self-assurance (Wester, 2021).

Mathematics is one of the subjects that significantly contributes to developing students' potential in the classroom. Nevertheless, mathematics can be enjoyable and simple to comprehend when taught with the appropriate method, which is challenging for students due to their poor comprehension of mathematical concepts (Latip et al., 2023).

Mathematics is understood to be significant in education due to its ubiquitous presence in all aspects of daily life (Wikasari, 2020). Math courses should be mastered by all students, regardless of their educational level, due to the significance of mathematics. Furthermore, it is imperative to inculcate the concepts of mathematics education. Students must comprehend this concept to comprehend the material they have learned more effectively and more easily follow the learning process at a higher level. Students will be better equipped to develop more intricate mathematical abilities if they comprehend concepts. Understanding concepts is the most critical component of mathematics education, as mathematical comprehension is essential to learning (Wikasari, 2020). Understanding is mastering a subject through the use of the intellect. The term "understanding" is derived from the verb "understand," which denotes the ability to comprehend accurately (Yuliani et al., 2018).

Students are expected to solve math problems using their conceptual understanding when presented with them. Their comprehension of concepts enhances their ability to solve problems effectively. The capacity of students to comprehend mathematical concepts, retain mathematical concepts and formulas and employ them to predict the truth of a statement is referred to as the ability to comprehend mathematical concepts (Latip et al., 2023).

Several factors contribute to the student's lack of comprehension of mathematical concepts, as evidenced by interviews and observations with mathematics teachers at SMA Negeri 1 Bangkinang. Students' lack of enthusiasm for mathematics education is a primary contributing factor. This results in students paying less attention to the material presented, ultimately leading to a lack of comprehension of the concept. In addition, students frequently memorize formulas or concepts without truly comprehending them during the learning process. Consequently, they encounter challenges when implementing the concept in various circumstances. Another contributing factor is the absence of diversity in the types of learning methods teachers employ when instructing mathematics (Novitasari, 2016).

The learning methods significantly influence the learning process. The successful implementation of appropriate learning methods in teaching and learning activities will facilitate the achievement of learning objectives. Implementing small-group discussion methods substantially impacts student learning outcomes (Darmayani, 2023; Flosason et al., 2015). The small group discussion method was viewed as a path or method that must be followed in order to achieve a specific objective. It is anticipated that teachers will be capable of effectively managing the entire learning process, including selecting the appropriate method (Yuwono, 2016).

Students are more likely to comprehend the teacher's material when the teaching method aligns with the classroom environment. In contrast, students will encounter challenges in comprehending the material if the teaching method does not align with the circumstances and requirements of the class (Beku et al., 2023). As indicated by Dilantika (2020) and the researcher's observations, the students were not actively engaged in the learning process. The only thing they did was attend and take notes without expressing any

opinions or asking many questions. Consequently, the interaction between students and their peers and between students and their teachers has not been thoroughly established. The interaction between teachers and students and students with other students is not optimal due to the teacher's exclusive focus on one method, which is lecture (Dilantika, 2020).

A teacher must devise innovative strategies to determine and align the appropriate learning method with the material being taught. Consequently, the learning process can be conducted efficiently, altering students' perspectives regarding mathematics (Pradika & Syamsuri, 2019). Facilitating small group discussions is a critical skill that every teacher must possess. Both students and teachers can actively participate in the learning process through discussion. Active learning can also be facilitated through discussion. The teacher is obligated to establish a student-centred learning process and serve as a teacher who explains the material in front of the class using the lecture method (teacher-centred). One method to accomplish this is to establish small groups where students can discuss the issues presented (Jumaidi, 2022).

The small group discussion method can bring students closer to the teacher or students in the process of analyzing, solving problems, and exploring a specific problem. The Latin term for discussion is *discussion* or *discussion*, which refers to exchanging ideas (Elwin, 2023; Yarah et al., 2024). Small group discussion methods can enhance students' motivation to engage in the learning process. Students' attention will be directed toward the material due to their direct involvement or experience in the learning process. The comprehension of mathematical concepts can be enhanced through the direct involvement of students in the learning process (Rusmiati, 2022).

This study aims to determine the impact of the small group discussion method on the comprehension of mathematical concepts among senior high school students. It is anticipated that the findings of this study will have a beneficial impact on the advancement of more effective learning strategies. Teachers who employ this method are anticipated to enhance students' active engagement in the learning process, enhance their comprehension of mathematical concepts, and establish a more engaging and interactive learning environment in the classroom.

METHOD

This study employed a quantitative approach and an experimental procedure in the form of a nonequivalent control group design of the quasi experimental design. This design comprised experimental and control groups that were not entirely random, as per Sugiyono (2022). The study was conducted at SMA Negeri 1 Bangkinang during the odd semester of the 2023/2024 academic year. The sample consisted of two classes: the experimental class (XM_1), consisting of 27 students and the control class (XM_2), consisting of 28 students, totalling 55 students. The research population consisted of all class X students. The simple random sampling technique was employed to select the sample. The data collection methods were as follows: assessments to evaluate students' comprehension of concepts, documentation to accumulate supporting data, and observation to document teacher and student activities during the learning process. Quantitative techniques were employed to evaluate the hypothesis and analyze the data, including descriptive analysis, prerequisite tests (normality and homogeneity), and inferential statistical tests.

The instrument used in this study was a validated question sheet. The test questions were composed of seven questions that were based on indicators of concept understanding. Indicator question 1 summarized a concept that had been acquired, Indicator question 2 categorized objects according to whether or not the prerequisites for the formation of a concept are satisfied, Indicator question 3 offered examples and non-examples of a concept,

Indicator question 4 presented concepts in a variety of mathematical representations, Indicator question 5 established the necessary and sufficient conditions for a concept, Indicator question 6 employed and selected specific procedures or operations, and Indicator question 7 applied concepts or problem-solving algorithms. The quality of the questions used is shown in Table 1.

Table 1 The quality of the questions utilized

Question	Validity	Reliability	Differentiating Power	Difficulty Index
1	Valid	Reliable	Very Good	Medium
2	Valid		Very Good	Medium
3	Valid		Very Good	Medium
4	Valid		Good	Medium
5	Valid		Very Good	Medium
6	Valid		Good	Medium
7	Valid		Good	Medium

The data was analyzed using validation, reliability, differentiating power, and difficulty index tests after the results of the post-test questions in the Table 1 were obtained using assessments in the trial class. The validation test was employed to evaluate the question's ability to measure the intended outcome accurately. A reliability test was conducted to ascertain how the question produced consistent results when tested on multiple occasions. Differentiating power was used to determine the degree to which the question can differentiate between students of high and low ability. The difficulty index was used to ascertain the level of difficulty of the questions.

RESULTS AND DISCUSSION

The small group method was employed in this study to actively engage students in collaborative discussions by dividing them into groups of 3-5 individuals to solve problems or comprehend the material together. This approach promotes direct student involvement and encourages active interaction. In contrast, the traditional approach emphasizes the teacher's transmission of material through lectures or direct explanations, followed by student individual exercises. This approach is more passive and teacher-centered. Figure 1 illustrates the small group discussion method's student learning activities.



Figure 1 The small group discussion method is employed to facilitate student learning

Data analysis in this study is a statistical test. The experimental and control class students' pre-test and post-test results were the data analyzed in this study. The results of data processing with statistical tests on pre-test values are shown on Table 2.

Table 2 Statistical test data results of pre-test and post-test score

Statistics	Pre-test		Post-test	
	Experiment class	Control class	Experiment class	Control class
Mean	40.37	48.39	69.37	57.86
Median	45.00	50.00	70.00	57.00
Maximum	65	70	89	86
Minimum	10	20	40	39
Deviation Standard	15.868	11.308	14.006	12.201
Variants	251.781	127.877	196.165	148.868

Table 2 shows that the experimental class's score distribution became more uniform following the treatment, as indicated by the standard deviation and variance. This suggests that the treatment administered to the experimental class was successful in enhancing students' comprehension of concepts.

Prerequisite Test for Analysis

Normality Test: The normality test was implemented to ascertain whether the data from each class was normally distributed. The pre-test and post-test scores of the control and experimental classes are the data analyzed in this normality test. The Shapiro-Wilk test was implemented in this study to evaluate normality because the samples were less than 30. If the normality test results exceed the significance level of 0.05 ($> 0,05$), the data is considered to be normally distributed. Conversely, the distribution is considered aberrant if the significance level is less than 0.05 (< 0.05). The results of the normality test with the Shapiro-Wilk test are listed in Table 3.

Table 3 The results of the normality test with the shapiro-wilk test

Test Results	Class	Pre-test			Post-test		
		Statistic	df	Sig.	Statistic	df	Sig.
	Control	0.931	28	0.064	0.945	28	0.148
	Experiment	0.955	27	0.276	0.938	27	0.111

Table 3 shows that the post-test data of the control and experimental classes are normally distributed, while the experimental class pre-test and post-test have a normal distribution.

Homogeneity Test: The homogeneity test was performed to ascertain whether the data from each class had the same variance (homogeneous) or not (inhomogeneous) prior to receiving distinct treatments. The sample is declared homogeneous if the results of the homogeneity test indicate that the significance level is $> 0,05$, indicating that the variance possessed by the sample is not significantly distinct. The results of the homogeneity test are listed in Table 4.

Table 4 The result of homogeneity test

Livene's Test		Pre-test		Livene's Test		Post-test	
2.735	df1	df1	Sig	0.623	df1	df2	sig
	1	53	0.104		1	53	0.433

Table 4 shows that both data sets are homogeneous.

Hypothesis Testing: The Independent sample t-test was employed in this study for hypothesis testing. This test aims to ascertain whether the hypothesis is accepted or rejected. The post-test results serve as the basis for the independent sample t-test decision.

If the significance value (2-tailed) < 0.05 , H_0 is rejected, and H_1 is accepted. H_0 is accepted, and H_1 is rejected if the significance value (2-tailed) > 0.05 . The results of the independent sample t-test are listed in Table 5.

Table 5 The result of the independent sample t-test

Levene's Test for Equality of Variances						
		F	Sig.	T	df	Sig.(2-tailed)
PostTest	Equal variances assumed	0.623	0.433	3.254	53	0.002
	Equal variances not assumed			3.246	51.446	0.002

Table 5 shows that the comprehension of mathematical concepts among students who employ the small group discussion method, which involves them in the learning process directly through activities such as exchanging opinions and working on task sheets in groups, is demonstrated to be superior to that of students who adhere to traditional learning methods. In this study, conventional learning is defined as the lecture method or teacher-centred learning, in which the teacher assumes a dominant position in delivering the material. At the same time, students are inclined to remain passive. Compared to conventional learning, it also demonstrates that the small group discussion method effectively enhances students' comprehension of mathematical concepts (Hidayatullah, 2017).

The results of Sari and Nurlaeli's research (2016) indicate that the small group discussion method can enhance students' active learning of mathematics. The small group discussion method is characterized by elements that facilitate the comprehension of concepts at various critical phases. Secondly, during the collaborative problem-solving phase, students can apply concepts to real-world scenarios, create representations in various formats, and select the most suitable methods to resolve issues (Johnson & Johnson, 1999). Dilandika (2020) has demonstrated that the active participation of students in the discussion significantly enhances their capacity to think critically and communicate ideas, improving student learning outcomes in various subjects.

The experimental class exhibited superior results in each indicator of mathematical concept understanding ability compared to the control class, as indicated by the research results. The following items and indicators of mathematical concept comprehension ability are used to describe these results in order to provide a more comprehensive analysis:

The first indicator is the repetition of a concept that has been acquired. This indicator is assessed through question number 1, with an average result of 57% in the experimental class, which meets the necessary criteria (Khairani et al., 2021). We can attribute this increase to the small group discussion learning method. Students actively re-explain concepts to their groupmates during the discussion process. In theory, the act of elucidating concepts to others can enhance comprehension. Students can ruminate on their comprehension and articulate ideas in their language due to social interaction, which facilitates the comprehension of concepts.

The second indicator involves classifying objects based on specific characteristics. This indicator is located in question number 2, with a percentage achievement of 36.11%, which is classified as insufficient (Yopi et al., 2021). The low scores on this indicator suggest that students require additional practice to comprehend the characteristics and properties of power numbers.

The third indicator involves providing both examples and non-examples of concepts. In question number 3, students identified examples and non-examples of power numbers. The result was 94.44%, classified as high (Hoiriyah, 2019). This accomplishment demonstrates the substantial influence of small-group discussions on learning. Because of

the discussion process, students are more likely to comprehend the distinction between examples and non-examples during the discussion.

The fourth indicator involves presenting concepts in a variety of mathematical representations. This indicator is located in question number 4, with an average percentage of 83.33%, which is classified as very good (Fajriah & Sari, 2016). The small discussion method allows students to collaboratively compile tables or diagrams, enhancing their capacity to communicate the concept of power numbers. Students can exchange diverse representational methods through group interaction.

The fifth indicator involves the development of the necessary or sufficient condition of a concept. This indicator is assessed through question number 5, which yields an average percentage of 69.44%, placing it in the "good" category (Gusmania & Agustyaningrum, 2020). This capacity is enhanced by the fact that students are encouraged to assess the conditions of the problem and determine whether they satisfy the necessary conditions to accomplish the objective during the discussion. This discussion enhances students' critical thinking abilities by facilitating joint reflection and logical analysis.

The sixth indicator includes utilizing, employing, and selecting specific procedures or operations. The average percentage in question number 6 was 86.11%, which is classified as very good (Azzahra & Hidayati, 2023). The small discussion method allows students to practice and share the appropriate procedures for operating power numbers. Students with a more comprehensive understanding of the process assist their peers, fostering a collaborative and mutually supportive learning environment. In this indicator, students are required to match the appropriate power number formula.

The seventh indicator is the application of algorithms or problem-solving concepts. The percentage of 36.88% in question number 7 indicates that this indicator is in the low category (Suherly et al., 2023). This value indicates that students continue to encounter challenges when utilizing the repeated multiplication algorithm to determine the number of books, particularly when the question is intricate. This challenge may be attributed to the absence of problem-solving exercises in small group discussions, which means that students are not yet entirely proficient in applying the algorithm to real-world scenarios.

In general, the small group discussion method has a beneficial effect on students' comprehension of mathematical concepts. This is because discussions allow students to actively share their comprehension, contemplate concepts, and practice problem-solving collaboratively. This interactive learning process is consistent with constructivism theory, which underscores the significance of students' active participation in comprehension development. Nevertheless, for specific indicators, such as algorithm application and classification, it is necessary to implement supplementary strategies, such as extending the discussion time or assigning individual assignments to supplement group learning.

CONCLUSION

Based on the study's results, it has been determined that the small group discussion method substantially influences the comprehension of mathematical concepts among high school students. The analysis revealed that the average post-test results of students in the experimental class were superior to those of the control class. The experimental and control classes exhibited a substantial disparity in students' comprehension of mathematical concepts, as evidenced by statistical testing conducted using the t-test. This suggests that H_0 is rejected, and therefore H_1 is accepted. This implies that the results of students' comprehension of mathematical concepts through the small group discussion method are superior to those obtained through conventional learning procedures. The small discussion method impacts the comprehension of mathematical concepts among high school students. The small group discussion method is effective in enhancing students' comprehension of

concepts by involving them directly in the learning process. The small group discussion method has the potential to enhance students' comprehension of concepts, as demonstrated by the empirical findings of this study. Thus, this study suggests that this method is an effective teacher-learning strategy. Mathematics teachers are anticipated to implement the small group discussion method as one of the most effective learning models for enhancing students' comprehension of mathematical concepts. They may employ a variety of methods that are tailored to the unique abilities and requirements of their students. Additionally, schools are anticipated to facilitate the implementation of more innovative and creative interactive learning methods by socializing them to teachers and providing the necessary infrastructure and facilities to facilitate the attainment of learning objectives. It is anticipated that future researchers will be able to employ the small group discussion method more creatively, focusing on implementing learning, material, and time. It is anticipated that additional research will be conducted to investigate the application of this method to other mathematics materials, as this study was conducted exclusively on rank numbers.

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