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The Effect of the Genius Learning Strategy Using Flash Cards on Students' Learning Outcomes in Curved Surface Geometry

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Abstract

The level of student proficiency in mathematics, especially geometry, was still very low and did not achieve good results. Factors that influenced this included students having difficulty understanding the concepts of the material and the use of inappropriate learning methods. This study aimed to determine the level of learning outcomes in the material of curved side solid shapes using the genius learning strategy with flash card media, as well as the effect of implementing this strategy on mathematics learning outcomes. This type of research was an experiment with a quantitative approach. Data collection techniques included written tests, observation, interviews, and documentation. Data were analyzed using normality tests, homogeneity tests, and hypothesis tests. The results of this study showed that mathematics learning outcomes on the material of curved side solids, by applying the genius learning strategy using flash card media, had an average score of 83.72 in the good category, and there was an influence of the application of the genius learning strategy using flash card media on students' mathematics learning outcomes.

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INTRODUCTION

Findings from an interview with a mathematics teacher at MTsN 1 Barito Kuala indicate that students' comprehension of geometry remains considerably low and has not yet achieved the expected level of proficiency. Errors frequently arise when students attempt to solve geometric problems, which are not solely attributable to difficulties in recalling formulas but are more fundamentally rooted in conceptual misunderstandings. Students tend to rely on rote memorization of formulas without a thorough understanding of their underlying meaning and applicability within geometric contexts. Consequently, they struggle to establish meaningful connections among different mathematical concepts, which hampers their ability to solve more complex problems. The teacher further noted that the instructional approaches employed thus far have remained predominantly conventional, which may not effectively address these conceptual difficulties. In the teaching of geometry, instructional aids are utilized, including learning media created collaboratively by students at the beginning of each academic year and the use of real-life objects resembling the three-dimensional figures under study. Nevertheless, despite the incorporation of such media, these approaches have not

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proven sufficiently effective in assisting students to overcome persistent misconceptions regarding fundamental concepts in geometry.

According to data from the Ministry of Education and Culture (Kemendikbud), the diagnostic results of the 2019 National Examination for junior high school students in Barito Kuala Regency show that the percentage of students who correctly answered questions in the domains of geometry and trigonometry was 43.80%. This achievement is lower when compared to the percentage in the domain of statistics, which reached 54.17% (Rapor UN, 2019). Furthermore, the 2023 Indonesian Education Report published by Kemendikbud states that the numeracy skills of students at the junior high school level (SMP/MTs and equivalent) remain at a moderate level, namely 40.63% (Rapor Pendidikan Indonesia, 2023). Meanwhile, based on PISA 2022, Indonesian students scored 366 points in mathematical literacy, a result significantly below the average score of OECD member countries, which ranges from 465 to 475 points. With this score of 366, in 2022 Indonesian students' mathematical ability was categorized at Level 1a (Ahdiat, 2024).

The Genius Learning strategy is a learning approach that accommodates various student learning styles, including visual, auditory, and kinesthetic modalities. This strategy draws upon knowledge of brain mechanisms, motivation, self-concept, thoughts, emotions, and several learning techniques. Its foundation lies in the accelerated learning method designed by Dr. George Lozanov. Essentially, the primary aim of this method is to make the learning process more effective, efficient, and enjoyable (Nasution, 2017). Genius Learning is implemented as an effort to enhance conceptual understanding by utilizing students' individual learning styles (Nurhayati, 2014). Within the Genius Learning framework, information is organized systematically and structurally to assist students in comprehending and organizing knowledge, thereby facilitating their understanding of new concepts. Moreover, Genius Learning often involves the application of knowledge in real-life contexts, enabling students to observe the practical use of the concepts they learn in everyday life, which in turn strengthens their conceptual understanding.

Flashcards are two-dimensional image-based learning media in which each side contains pictures, text, or symbols. Flashcards serve as an instructional medium that facilitates the transfer of messages from the source to the receiver of information more effectively through the use of visual representations related to the topic under discussion (Muryanti, 2019). They can also be employed as a game-based learning tool, are easy to create, and require minimal financial resources. Moreover, flashcards provide teachers with an additional option for instructional media. The use of flashcards in learning has been proven effective in developing students' abilities to recognize shapes, objects, animals, mathematical concepts, and various other learning aspects. By providing strong visual support, flashcards help clarify abstract concepts and facilitate better comprehension for students across different educational levels. Through flashcards, teachers can design interactive and engaging learning experiences, such as introducing new vocabulary, practicing spelling, reinforcing mathematical concepts, or reviewing previously learned material (Inaru, 2025).

From the explanation above, there is a connection between the Genius

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Learning strategy, the use of flashcards, and geometry material, which continues to show relatively low achievement levels. According to Adi W. Gunawan (DA, 2017), the Genius Learning strategy consists of eight steps: creating a conducive atmosphere, connecting, presenting the big picture, setting goals, inputting information, conducting activities, demonstrating, and reviewing and anchoring. Within the "activity" stage, games that involve students—such as quick question-and-answer sessions with peers—can be implemented. In such games, flashcards may serve as the instructional medium, containing questions related to the material previously studied. Through this game mechanism, students are encouraged to respond to the questions on the flashcards. This approach fosters concentration, strengthens memory retention, and motivates students to think both quickly and accurately. As a result, learners can discover the true meaning of the material they have studied. The integration of flashcards into the Genius Learning strategy is essentially aimed at enhancing students' comprehension after the "information input" stage (delivery of subject matter), particularly in mathematics topics such as solid geometry involving curved surfaces. In summary, the Genius Learning strategy provides students with a broader understanding of the concepts being studied, while flashcards offer an efficient way to reinforce memory and assess their grasp of these concepts.

Based on the aforementioned background, this study has two objectives. First, to examine the level of students' mathematics learning outcomes in grade IX of MTsN 1 Barito Kuala on the topic of three-dimensional solids with curved surfaces after the implementation of the Genius Learning strategy using flashcard media. Second, to investigate the effect of implementing the Genius Learning strategy with flashcard media on students' mathematics learning outcomes in the same topic and grade level at MTsN 1 Barito Kuala.

RESEARCH METHOD

Research Design

The research employed a quasi-experimental design, specifically the nonequivalent control group design. In this study, the experimental class was given treatment while the control class served as a comparison group, and neither the experimental nor the control class was randomly assigned (Abdullah et al., 2022).

Table 1. Research Design

Group	*Treatment*	*Postest*
Experimental	X	O_1
Control	Y	O_2

Participants

The population of this study consisted of all ninth-grade students at MTsN 1 Barito, comprising four classes, with two classes selected as the sample through purposive sampling. Purposive sampling was employed because the researcher selected specific elements of the population considered representative or particularly informative with respect to the research topic (Rasyid, 2022). The

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sampling procedure was based on the recommendation of the Grade IX mathematics teacher at MTsN 1 Barito Kuala and the students' abilities. The sample was determined according to the supervising teacher's assessment, which indicated that the two classes had comparable levels of activeness and an equal number of students, namely 22 in each class.

Instruments

The research instrument used in this study was a posttest, administered to measure students' learning outcomes on the topic of three-dimensional solids with curved surfaces. The test consisted of five open-ended questions designed to assess students' understanding of the material.

Validity And Realibility of Test Instrument

To ensure the appropriateness of the research instrument, the test items were first validated by experts (expert judgment) with extensive knowledge in the relevant field. The validation process covered three main aspects: content, construct, and language. The validators consisted of two lecturers, namely Ms. Mayang Gadih Ranti, S.Si., M.Pd., and Dr. Lathifaturrahmah, M.Si.

Table 2. Results of Instrument Validity Test by Validators

No	Observed Aspect	Test Item Number				
		1	2	3	4	5
1.	Alignment of items with indicators	0.75	1	1	1	1
2.	Clarity and comprehensibility of statements	0.5	0.75	1	0.5	0.5
3.	Use of correct and appropriate language	1	1	1	0.75	0.75
	Average V-index	0.75	1	1	0.75	0.75
	Validation Category	Medium	High	High	Medium	Medium
	Criteria	Valid	Valid	Valid	Valid	Valid

Based on the analysis conducted using IBM SPSS 30, the Cronbach's Alpha value was 0.865 for the first validator and 0.714 for the second validator. These results indicate that the data fall within the strong coefficient interval. Therefore, it can be concluded that the instrument is reliable, since both values, $0.865 > 0.60$ and $0.714 > 0.60$, exceed the minimum reliability threshold.

Data Collection

The research data were obtained from respondents (research sample), informants (stakeholders at MTsN 1 Barito Kuala, particularly mathematics teachers), and documents. The data collection techniques employed included written tests, observation, interviews, and documentation.

Data Analysis

The data analysis techniques for the prerequisite tests consisted of normality and homogeneity tests. The normality test was employed to determine whether the data

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obtained from the research results were normally distributed (Fitri et al., 2023). If the data were normally distributed, parametric analysis would be more valid to apply. The homogeneity test was then conducted after the normality test to ensure that the variances of the two data groups being compared were equal. For hypothesis testing, an independent sample t-test was used, as the data were normally distributed and homogeneous. This test was applied to examine the mean difference between two independent populations/data groups (Nuryadi et al., 2017). The t-test was appropriate for this study because the data were measured on an interval or ratio scale, were normally distributed, and met the homogeneity assumption.

RESULTS AND DISCUSSION

Based on the objectives of this study—namely, to examine students' mathematics learning outcomes on the topic of three-dimensional solids with curved surfaces after the implementation of the Genius Learning strategy using flashcards, as well as to determine the effect of this strategy on learning outcomes for Grade IX students at MTsN 1 Barito Kuala—a posttest was administered. The posttest was conducted to measure students' learning outcomes after the treatment, which consisted of implementing the Genius Learning strategy with flashcard media in the experimental class, while the control class was taught using conventional methods. The results of the posttest, which represent the students' learning achievement in both the experimental and control classes, are presented in the following table:

Table 3. Descriptive Statistics of Posttest Scores

Description	Experimental	Control
Maximum Score	96.00	91.00
Minimum Score	60.00	47.50
Mean	83.72	73.11
Standard Deviation	103.06	156.09

Based on the results presented in Table 4, the experimental class obtained a maximum score of 96.00 and a minimum score of 60.00. The mean score of the experimental class was 83.72 with a reported standard deviation of 103.06. In contrast, the control class achieved a maximum score of 91.00 and a minimum score of 47.50. The mean score of the control class was 73.11 with a reported standard deviation of 156.09. These findings indicate that the students in the experimental class, which was taught using the Genius Learning strategy with flashcard media, demonstrated higher average learning outcomes compared to those in the control class taught using conventional methods.

Normality Test

The normality test was conducted to examine whether the data distribution was normal. In this study, the normality test employed the Shapiro-Wilk method, which is widely recognized as an effective and valid approach for small sample sizes. The results of the Shapiro-Wilk normality test are presented in the following table:

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Table 4. Normality Test Results of the Final Test

Description	Eksperimental Group	Control Group
N	22	22
Significance Values	0.118	0.259
a	0.05	0.05
Criterian	Sig. > 0.05	Sig. > 0.05
Conclusion	Normally distributed	Normally distributed

Based on the results of the normality test, it was found that the experimental class had a significance value (p-value) = 0.118, where 0.118 > 0.05. Therefore, it can be concluded that the data were normally distributed. Meanwhile, for the control class, the significance value (p-value) = 0.259, where 0.259 > 0.05. Thus, it can also be concluded that the data were normally distributed.

Homogeneity Test

The homogeneity test was conducted to determine whether the learning outcomes between the experimental class and the control class were homogeneous. This test serves as a prerequisite for the subsequent analysis using the independent sample t-test. If the test results indicate homogeneity, then the independent sample t-test can be appropriately applied.

Table 5. Homogeneity Test Results of the Final Test

Levene Statistic	Sig.	a	Kesimpulan
1.249	0.270	0.05	Homogen

Based on the table, the significance level is α = 0.05, with the obtained value of F = 1.249 and Sig. = 0.270. Since Sig. > 0.05, it can be concluded that the test results of both classes have homogeneous variances.

Hypothesis Testing

This study employed a *t-test* as the hypothesis testing method. The *t-test* is a difference test used when the data are normally distributed and homogeneous. In this research, the *Independent Sample T-Test* was applied, as the data involved two independent or unpaired groups. The test was conducted to determine whether there was a significant effect of implementing the Genius Learning strategy using flashcard media on students' learning outcomes in the topic of curved-surface solids among Grade IX students at MTsN 1 Barito Kuala. Based on the analysis using IBM SPSS 30 software, the significance (two-tailed) value obtained was 0.04. Since this value is smaller than the significance threshold of 0.05, it can be concluded that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted. This means that there is a significant difference between the mathematics learning outcomes of students in the experimental class and those in the control class. This difference indicates that the implementation of the Genius Learning strategy supported by flashcard media has a significant positive effect on improving student learning outcomes. These findings suggest that the use of interactive and visual learning media, such as flashcards, enhances students' understanding of curved-surface solids compared to other teaching approaches that do not incorporate such media. Moreover, the Genius Learning strategy, which emphasizes the balanced

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stimulation of both the right and left hemispheres of the brain, facilitates a more effective and enjoyable learning process, thereby contributing positively to students' achievement.

The findings of this study are consistent with those of Mainur Nilawati, which indicated that students' learning outcomes taught using the Genius Learning strategy were better compared to those taught using conventional learning methods (Nilawati, 2016). Furthermore, Harahap (2021) reported that the implementation of the Genius Learning strategy was proven effective in enhancing students' conceptual understanding of mathematics and their self-confidence. This was evidenced by the increase in the average scores of the mathematical conceptual understanding test as well as the improvement in students' self-confidence. Similarly, the study conducted by Akifatul Jannah demonstrated that students' learning outcomes through the application of the Genius Learning strategy combined with flashcards were significantly more effective compared to those achieved through conventional teaching methods (Jannah, 2010). In addition, research by Nurhikmah (2024) revealed that students' comprehension ability improved, where the category increased from "moderate" before the implementation of the Genius Learning strategy to "high" after its application. These previous studies reinforce the evidence that the Genius Learning strategy using flashcards can effectively enhance students' learning outcomes.

Based on observations during the data collection stage, it was found that several students in the experimental class had already achieved satisfactory learning outcomes, as shown by the posttest results in which more than 50% of the students scored above the average. Furthermore, there was a significant difference between the learning outcomes of students who applied the Genius Learning strategy with the use of flashcards compared to those taught through conventional methods. This difference can be attributed to several factors, including the activity phases in the Genius Learning strategy, which helped students retain the material more effectively, and the use of flashcards as an alternative to ice-breaking activities during the learning process, making the lessons more engaging and enjoyable. The flashcards used in this study are presented in the following figure.

Figure 1 Flashcard Learning Media

There are eight steps in the Genius Learning strategy applied in this study. The first step is *creating a conducive atmosphere*, in which the teacher ensures that the classroom environment is comfortable and supportive for learning. The second step is *connecting*, where the teacher links the new material to students' prior

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experiences. The third step is *overview*, during which the teacher provides a general outline of the material before starting the lesson. The fourth step is *setting objectives*, in which the teacher explains the learning goals to be achieved after the lesson. The fifth step is *input of material*, where the teacher delivers the learning content by accommodating students' three learning styles with the aid of presentation slides. The sixth and seventh steps are *activity* and *demonstration*. In this study, these steps were implemented through interactive games using flashcards, carried out alternately among students. The eighth step is *review and anchoring*, where the teacher facilitates a review of the lesson and concludes the key concepts learned during the session

Figure 2 Learning Process

To broaden the application of the Genius Learning strategy, teachers may integrate this approach across various subjects, not only in mathematics. In this way, a technique that has already proven effective in mathematics can be adapted to strengthen the understanding of concepts in other disciplines, such as social sciences or natural sciences. To ensure the wider implementation of Genius Learning across different classrooms, professional development through training and workshops is essential. Such training would enable teachers to design and apply the Genius Learning strategy with flashcard media effectively in diverse contexts and subject areas. Furthermore, continuous monitoring of the implementation is necessary. Teachers can routinely evaluate students' learning outcomes and adjust instructional activities to ensure that flashcards and other related activities genuinely contribute to improving students' comprehension and skills.

Based on the findings of this study, there is a significant difference between the learning outcomes of students in the experimental class and those in the control class. The experimental class demonstrated higher achievement compared to the control group. Students taught using the Genius Learning Strategy with flashcard media achieved better performance than those who received conventional instruction. Nevertheless, although these results are promising, it is important to further examine the reasons why and how this strategy is effective, as well as the challenges that may arise in its implementation. One of the main reasons for the effectiveness of the Genius Learning strategy lies in its active and student-centered approach, which engages learners more directly in the learning process. The structured steps of Genius Learning, particularly activities involving flashcards, provide opportunities for students to reinforce and better retain the material presented. However, despite its effectiveness within the tested context, potential challenges in applying Genius Learning more broadly should be

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considered. These challenges include the availability of adequate resources, particularly sufficient flashcard media, as well as the need to align the strategy with the existing curriculum.

Overall, the Genius Learning strategy, particularly through the use of flashcards, has been proven effective in enhancing student learning outcomes. Its active nature, which integrates both theory and practice while fostering students' self-confidence, makes it a highly valuable approach in creating an interactive and enjoyable learning environment. Nevertheless, its implementation must be carefully considered, especially in relation to challenges concerning resources and classroom contexts. With appropriate adjustments and proper management, this strategy holds significant potential to improve both the quality of instruction and student achievement.

CONCLUSION

Based on the results of the data analysis, it can be concluded that the mathematics learning outcomes of ninth-grade students at MTsN 1 Barito Kuala on the topic of *curved-surface three-dimensional shapes* after the implementation of the *Genius Learning* strategy using flash card media were categorized as good, with an average test score of 83.72. Furthermore, the implementation of the *Genius Learning* strategy using flash card media had a significant effect on students' mathematics learning outcomes for this topic, as indicated by the hypothesis test. The two-sided significance value obtained was 0.04, which is less than 0.05; therefore, H_0 is rejected and H_a is accepted, indicating that the strategy significantly improved students' learning outcomes.

One of the advantages of the *Genius Learning* strategy is its flexibility in accommodating various student learning styles. By using flash cards, students do not merely receive information passively but actively participate in activities that enhance their understanding. The successful implementation of the *Genius Learning* strategy opens opportunities for applying similar methods in other subjects or learning topics. Therefore, teachers can expand the use of this technique not only in mathematics but also in other fields of study that involve concepts requiring deep understanding and visualization, such as physics, geography, or language learning.

This study has several limitations. First, it was conducted in only one school and with a specific class, so the results may not be generalizable to students in other schools. In addition, the study measured student learning outcomes solely through test scores based on the topic of *curved-surface three-dimensional shapes*. This provides a limited perspective on the overall effectiveness of the *Genius Learning* strategy, as it does not assess other aspects such as critical thinking skills, creativity, or conceptual understanding in a broader context. For future improvement, further research could explore the effect of the *Genius Learning* strategy using flash card media on enhancing students' mathematical problem-solving skills.

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