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The Role of Discovery Learning in the Learning Interest of Junior High Students

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ABSTRAK

Penelitian ini menganalisis peran model discovery learning dalam meningkatkan minat belajar matematika siswa kelas IX SMP Negeri 33 Surabaya. Metode yang digunakan adalah desain *quasi-eksperimen* dengan *posttest-only control group*. Sebanyak 62 siswa dibagi menjadi kelompok eksperimen yang menerapkan model *discovery learning* dan kelompok kontrol yang menggunakan pembelajaran konvensional. Data dikumpulkan melalui angket minat belajar dan dianalisis secara manual dengan uji normalitas, homogenitas, serta uji-t. Hasil penelitian menunjukkan bahwa minat belajar siswa pada kelompok eksperimen lebih tinggi secara signifikan dibandingkan kelompok kontrol. Temuan ini membuktikan bahwa discovery learning berperan positif dalam membentuk minat belajar matematika. Oleh karena itu, model ini direkomendasikan untuk membuat pembelajaran matematika lebih menarik dan efektif.

Kata Kunci: *discovery learning;* pembelajaran matematika sekolah; minat belajar

ABSTRACT

This study examines the role of the discovery learning model in enhancing mathematics learning interest among ninth-grade students at SMP Negeri 33 Surabaya. A quasi-experimental design with a posttest-only control group was employed. A total of 62 students were divided into an experimental group (taught using discovery learning) and a control group (taught conventionally). Data were collected through a learning interest questionnaire and analyzed manually using normality, homogeneity, and t-tests. The results revealed that the experimental group exhibited significantly higher learning interest than the control group. These findings demonstrate that discovery learning positively contributes to fostering students' interest in mathematics. Thus, this model is recommended to create more engaging and effective mathematics instruction.

Keywords: discovery learning; mathematics learning; interest learning

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1. INTRODUCTION

The rapid development of science and technology has transformed various aspects of life, including education. In the era of industrial revolution 4.0, students are not only required to master academic content, but also 21st century skills such as critical thinking, creativity, communication, and collaboration (Aldalur & Perez, 2023; Garcia & Yousef, 2023; Lee et al., 2017). These global challenges require the education system to adapt with more relevant and innovative approaches (Fitriatien, 2020; Uzel & Bilici, 2022). However, many educational institutions are still stuck in conventional methods that do not encourage active student engagement.

Modern education must shift from mere knowledge transfer to holistic competency development. Research by Fitriatien (2019) and Setiyaningsih & Subrata (2023) confirms that 21st century learning should focus on the ability to solve problems, innovate, and adapt to change. Unfortunately, many schools still rely on the lecture method, which tends to be passive and does not trigger student engagement (Dahal et al., 2022; Delogu et al., 2023; Leksono & Fitriatien, 2021; Purba et al., 2023; Trenholm, 2023). In fact, interactive learning based on technology and real-life experiences is proven to increase understanding and interest in learning (Albano et al., 2021; Ching-Chiang et al., 2022; Dahal et al., 2022; Kovacheva et al., 2022; Leksono & Fitriatien, 2021; Purba et al., 2023; Werth et al., 2022).

Based on observations at SMP Negeri 33 Surabaya during PLP 1, it was found that students showed a low level of participation. As many as 70% of students were not active in discussions, 65% of their math scores were below the KKM, and only 30% paid attention to the teacher's explanation. This is in accordance with the results of research by Wijaya et al. (2022) in SMP Negeri 1 Padang Panjang, where 60% of students were passive and preferred to wait for the teacher's instructions. Conventional teacher-centered methods are considered less effective in generating interest in learning, especially in abstract materials such as mathematics (Andriliani et al., 2022; Du et al., 2021; Zhou et al., 2021; Zulkarnain et al., 2021).

One of the learning models that can handle these problems is discovery learning. This model stimulates students to actively discover concepts through independent exploration, thus increasing deep understanding (Callaghan et al., 2020; Hulu & Telaumbanua, 2022; Nurhayani et al., 2020) Research (Inda & Widjajanti, 2019; Kamaluddin & Widjajanti, 2019; Samsyu et al., 2022) proves that discovery learning significantly increases interest in learning chemistry compared to traditional methods. Similarly, studies (Bere et al., 2022; Marion et al., 2023; Reni Humaira et al., 2019) showed a 25% increase in learning outcomes on colloid material after the application of this model. However, its effectiveness in math materials, especially rotation, has not been widely studied.

Rotation is an abstract geometry material that requires strong visual-spatial understanding. The lack of research on the application of discovery learning for this material is a critical gap, considering that rotation is an important foundation for physics, engineering, and computer graphics. Without the right approach, students tend to memorize formulas without conceptual understanding, which results in low knowledge retention (Purwowidodo & Zaini, 2023).

This research offers innovation through the application of discovery learning to visualize the concept of rotation in geometry. This approach was tested in SMP Negeri 33 Surabaya, a unique context with characteristics of urban students who have access to technology but low interest in learning. Unlike in the study of Yahya et al. (2024) study that relied on digital media, this study developed a learning strategy without interactive tools, making it more relevant for a school environment where technology utilization is not optimal. In addition, the exploration of discovery learning in this context has not been done in previous studies.

Initial data showed that 75% of students had difficulty understanding rotation through the lecture method, and only 20% were able to apply it in contextual problems. This finding was reinforced by Jeluna et al. (2023), who stated that determining the right learning model can increase learning interest by 40%. Thus, this research not only fills an academic gap, but also offers practical solutions for teachers to increase student engagement.

Based on the description above, this study aims to examine the role of discovery learning in junior high school students' learning interest in rotation material. This research is expected to contribute theoretically in the development of mathematics learning methods, as well as practically for educators in developing more interesting and meaningful learning plans.

2. METHOD

This study used a quantitative approach with a quasi-experimental design type posttest-only control group design, because it was not possible to conduct full randomization of research subjects who had joined their respective classes (Astutik & Fitriatien, 2016). The sample was selected by purposive sampling based on the recommendation of the math teacher and the equality of students' initial learning interest based on the results of preliminary observations.

The research subjects consisted of 62 ninth grade students of SMPN 33 Surabaya who were divided into two groups, namely the experimental group and the control group, each totaling 31 students. Both groups had balanced characteristics in terms of gender and academic ability. The research was conducted in November 2024 for two meetings. The experimental group received learning with the discovery learning model, while the control group used conventional methods.

The research instrument was a learning interest questionnaire consisting of 20 statements, consisting of 10 positive and 10 negative statements, using a 4-point Likert scale. The content validation of the questionnaire was carried out by mathematics education lecturers and junior high school mathematics teachers to ensure the relevance and clarity of the statement items to the learning interest indicators. The questionnaire was administered after the treatment, with direct supervision from the researcher to avoid bias. Students filled out the questionnaire independently without intervention.

Data analysis was done manually. The normality test used Chi-Kuadrat to ensure normal data distribution, and the homogeneity of variance test used the F-test. If the assumptions of normality and homogeneity are met, hypothesis testing is carried out using the t-test, which is suitable for comparing two independent groups with interval-scale data and meets parametric requirements. Table 1 presents the grouping of student learning interest levels based on research proposed by Safari (in Wahyuni et al., 2023).

Table 1. Category of Student Learning Interest Questionnaire

Value Score	Category of Student Learning
$20 \leq x \leq 32$	Not Interested
$33 \leq x \leq 44$	Less Interested
$45 \leq x \leq 56$	Quite Interested
$57 \leq x \leq 68$	Interested
$69 \leq x \leq 80$	Very Interested

3. RESULT AND DISCUSSION

Based on the results of the questionnaire data analysis of student learning interest in rotation material, some students in the experimental group (class IX-E) proved a strong level of interest in learning the material. This is reflected in the strong interest and enthusiasm in participating in learning. The percentage of students' learning interest in class IX-E (experimental group) is presented in the form of a graph, as presented in Figure 1.

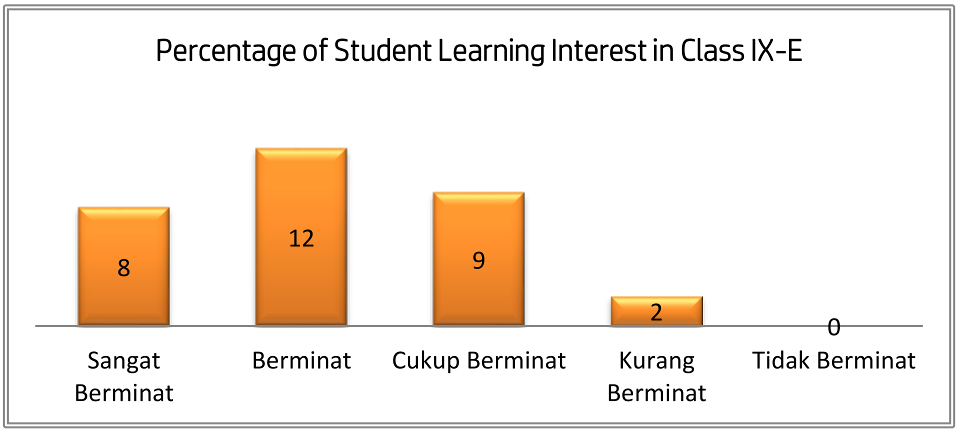

Figure 1. Experiment Group Learning Interest Percentage

A total of 8 students showed very high interest in learning, characterized by active involvement during learning, deep curiosity, and a desire to learn more. Meanwhile, 12 students showed good interest, with signs of considerable interest although sometimes there was still a tendency to lack focus. Furthermore, for the other 9 students, they showed sufficient interest, although they were often distracted by their playing habits or lack of focus, but still able to follow the learning well. However, there were 2 students who showed less interest in learning, who were more often involved in play activities and paid less attention to learning.

On the other hand, in the control group (class IX-H), the majority of students showed low interest in learning. There was 1 student who had no interest at all in the rotation material, who preferred to skip class or just pretended to go to the toilet without any intention of returning to class. A total of 15 students showed less interest in learning, which can be seen from their tendency to play, talk to friends, or not focus during learning. Some of them also felt bored and lacked interest in the material being taught. This is illustrated in the percentage of students' interest in learning through a graph, as presented in Figure 2.

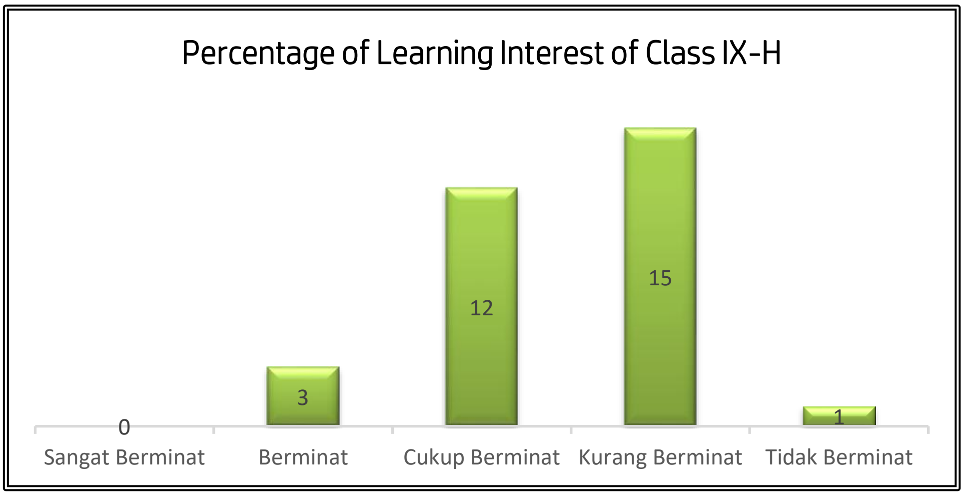

Figure 2. Control Group Learning Interest Percentage

Although there were 12 students who showed sufficient interest in learning, they were often bored and not fully engaged in learning. Only 3 students showed good interest in learning, which was reflected in their curiosity and interest in learning mathematics, although not as many as students in the experimental group.

To obtain a more objective conclusion regarding the difference in learning interest between the experimental and control groups, further statistical analysis is needed. Therefore, a series of statistical tests were carried out, namely the normality test to ensure that the data was normally distributed, the homogeneity test to determine the similarity of variances between groups, and the hypothesis test to test the significance of differences between the two groups.

As a basis for the statistical analysis, the posttest data of students' learning interest from class IX-E (experimental group) and class IX-H (control group) are presented in Table 2.

Table 2. Research Data Results

Data	Eksperiment Group	Control Group
Maximum Value	73	58
Minimum Value	40	29
Mean	59,22	44,09
Standard Deviation	8,89	6,3

(Source: Olah Data Primer, 2025)

a. Normality Test

The criteria for testing are (see Table 3):

If ${\chi^2}_{hitung} < {\chi^2}_{tabel}$ then the data is normally distributed.

If ${\chi^2}_{hitung} > {\chi^2}_{tabel}$ then the data is not normally distributed.

Table 3. Normality Test Result

Data	Eksperiment Group	Control Group
Number of Students	31	31
Mean	58,95	43,74
Standard Deviation	8,89	6,3
${\chi^2}_{hitung}$	5,3879	2,3339
${\chi^2}_{tabel}$	11,0705	11,0705
Conclusion	Normally Distributed	Normally Distributed

(Source: Olah Data Primer, 2025)

b. Homogenity Test

If $F_{hitung} \leq F_{tabel}$ accept H_0 (homogeneous variance)

If $F_{hitung} > F_{tabel}$ reject H_0 (inhomogeneous variance)

(see Table 4)

Table 4. Homogenity Test Result

Data	Eksperiment Group	Control Group
Varians	73,7139	44,9569
F_{hitung}	1,6396	1,6396
F_{tabel}	1,8409	1,8409
Conclussion	Homogeneous	Homogeneous

(Source: Olah Data Primer, 2025)

c. Research Hypothesis Test

In this study, hypothesis testing was applied through t-test analysis. Hypothesis testing criteria are (see Table 5):

H_o is accepted if: $t_{tabel} \leq t_{hitung} \leq t_{tabel}$

H_o is rejected if: $t_{hitung} < t_{tabel}$ atau $t_{hitung} > t_{tabel}$

Table 5. Research Hypothesis Test Result

Class	N	t_{hitung}	t_{tabel}
9E	31	7,7324	2,000
9H	31		
Conclusion	H_0 rejected		

(Source: Olah Data Primer, 2025)

Based on the significant level of 0.05, it is obtained that t_{hitung} > t_{tabel} (7.7324> 2.000). Thus H_0 is rejected, which means that there is a difference in the average interest in learning between students who are treated using a conventional learning model and students who are treated using a discovery learning model.

This study found that there was a significant difference in interest in learning mathematics between students who were treated with the discovery learning model (experimental group) and students who were treated conventionally (control group). The experimental group obtained an average interest in learning of 59.22 which is included in the "interested" category, while the control group only reached 44.09 which is classified as "less interested". The statistical test results show that this difference is statistically significant with a t-count value of 7.7324 which far exceeds the t-table of 2.000 at the 0.05 significance level, so the null hypothesis (H_0) is rejected.

Further analysis of the data revealed some important findings. In the experimental group, the distribution of students' interest in learning was more evenly distributed with 8 students (25.8%) showing very high interest, 12 students (38.7%) had good interest, 9 students (29%) were at the moderate level, and only 2 students (6.5%) were still less interested. In contrast, in the control group, the majority of students (15 students or 48.4%) fell into the less interested category, with only 3 students (9.7%) showing good interest and 12 students (38.7%) at the moderate level. The higher standard deviation in the experimental group (8.89 compared to 6.3 in the control group) indicates that the discovery learning model produced a greater variety of responses among students, with some showing high enthusiasm while others still needed a special approach.

The findings of this study strengthen the empirical evidence that the application of discovery learning model effectively increases junior high school students' learning interest in rotation material. This result is consistent with previous studies Yahya (2024) and Maisari and Usman (2024) which show that discovery-based approaches not only improve academic achievement, but also foster students' active involvement in the learning process. Theoretical support from the perspectives of constructivism (Piaget & Vygotsky) and self-determination theory (Ndoa et al., 2024) clarifies the psychological mechanism behind this increased interest in learning, where through independent exploration, students can fulfill their basic needs such as autonomy, competence, and social attachment.

In the context of geometry learning, especially abstract rotation material, the discovery learning model shows advantages over conventional models. Direct involvement of students in the manipulation of concrete objects and visualization of concepts creates a more meaningful and relevant learning process (Lumbanbatu & Gultom, 2024; Rustam, Bistari, & Novianti, 2024). However, its implementation at the junior high school level requires special consideration given the cognitive development of students who are still in the transition stage. The finding of the need for teacher assistance during the exploration process confirms the results of previous research (Mutmainnah, 2020; Arwadi, Sidjara, & Suarlin, 2023) on the importance of balance between freedom of exploration and adequate learning structure.

The results of this study are a valuable contribution to the preparation of mathematics learning strategies in junior high school. The application of discovery learning with a structured approach, including the stages of stimulation, guided exploration, and reflection, proved to be able to create a learning environment that stimulates students' affective engagement. For further optimization, integration with interactive learning media and adjustment of the difficulty level of exploration activities can be the focus of future development. At the practical level, these findings emphasize the importance of teacher training in designing and facilitating discovery learning activities that are in accordance with the developmental characteristics of junior high school students, as well as providing adequate learning resources to support the exploration process of geometry concepts.

4. CONCLUSION

This study proves that discovery learning plays a significant role in influencing the learning interest of students in grade IX in junior high school on rotation material. This finding shows the uniqueness of the model in transforming mathematics learning from an abstract approach to a concrete experience that involves active exploration. Students no longer just passively receive information, but independently construct understanding through manipulation of real objects and solving contextual problems - a pedagogical breakthrough that is still rarely applied systematically at the junior high school level.

For math teachers, effective implementation can begin by designing structured discovery activities using simple media such as origami paper or basic design applications during the first two to three meetings. The development of worksheets that guide students through the stages of exploration, discovery and application progressively is key to success, along with the insertion of a brief ten-minute reflection at the end of each session to strengthen conceptual understanding. At the institutional level, schools are advised to form a community of discovery learning practitioners among mathematics teachers while providing basic supporting tools such as protractors, grid paper, and simple geometry software.

This finding also opens up opportunities for further research related to optimizing the duration of the discovery phase for adolescents, integrating simple technology in rotation activities, and exploring the influence of gender factors on student responses. Thus, discovery learning not only proves its effect on learning interest scientifically, but more importantly offers a learning paradigm that is in line with the characteristics of cognitive development and psychological needs of junior high school students, while answering the specific challenges of teaching geometry transformation materials.

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