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Flashcard-Supported Discovery Learning: A Strategy for Improving Vocabulary Mastery and Learning Equity in Elementary Education

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ABSTRACT

This study is motivated by the low level of English vocabulary mastery among elementary school students, which is caused by the use of predominantly verbal teaching methods and the lack of engaging visual media. Third-grade students at SDN Tambakaji 04 experienced difficulties in understanding vocabulary because they are in the concrete operational stage, requiring contextual and interactive learning support. This study aims to improve students' English vocabulary mastery through the implementation of flashcard media integrated with the Discovery Learning model. The method employed was Classroom Action Research (CAR) based on the Kemmis and McTaggart model, conducted in two cycles consisting of planning, action, observation, and reflection stages. The research subjects were 21 third-grade students. Data were collected through learning achievement tests, student and teacher observation sheets, and documentation. The findings indicate a consistent improvement in students' vocabulary mastery across cycles. In Cycle I, the average score was 79.04 with a mastery level of 76.19%, which increased in Cycle II to an average of 83.80 with 85.71% mastery. In addition to improved learning outcomes, students' participation and confidence also showed significant development throughout the learning process. The use of flashcards combined with Discovery Learning encouraged students to actively observe, discuss, and independently construct the meaning of vocabulary. The implications of this study suggest that integrating concrete visual media with discovery-based learning is effective in enhancing vocabulary mastery while reducing learning disparities in a heterogeneous classroom.

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INTRODUCTION

English instruction at the elementary school level plays a crucial role in developing students' communication abilities and global literacy (Ataeifar et al., 2019; Bosli, 2025; Ma'arif et al., 2025). Vocabulary is a fundamental component that shapes learners' skills in listening, speaking, reading, and writing (Pang, 2022; Rafida et al., 2024). However, vocabulary learning in elementary schools is often not optimal because students are still in the concrete operational stage of cognitive development, requiring visual support and engaging learning experiences (Tahir et al., 2025, 2025). In practice, lecture-based methods and rote memorization are no longer sufficient, indicating the need for strategies and media that align with the learning characteristics of young children (Arif et al., 2024; Desmiati et al., 2023; Haqqi et al., 2025).

This condition was evident among third-grade students at SDN Tambakaji 04. Preliminary observations revealed that several students experienced difficulties in understanding basic English vocabulary such as names of objects and animals. When teachers presented words verbally, students tended to feel confused or guess randomly. In addition, students' initial abilities varied considerably (Qamariah & Hercz, 2025; Susilowati et al., 2025). Some students attended English tutoring and demonstrated higher proficiency, whereas others lacked additional learning support at home, resulting in significantly lower comprehension levels (Budiyono et al., 2024; Yakubu et al., 2025). Differences in family background, media exposure, and parental involvement further influenced students' initial vocabulary mastery.

To address these challenges, concrete visual media such as flashcards are needed. Flashcards can help students understand vocabulary through clear, appealing, and memorable images. According to Paivio's Dual Coding Theory, the use of dual representations visual and verbal strengthens long-term memory retention (Indasari, 2026; Indasari et al., 2024). By using appropriate images, students are able to link foreign words with real-world concepts, making the learning process more meaningful. Besides overcoming students' verbal limitations, flashcards can also bridge differences in learning readiness arising from varied student backgrounds.

Flashcards were then integrated with the Discovery Learning model, which enables students to construct meaning independently (Azizah & Mardiana, 2024; Tamsir et al., 2025). This model encourages learners to observe images, analyze information, engage in discussion, and draw conclusions about vocabulary meanings. Bruner emphasizes that learning becomes more effective when students are actively involved in constructing their own knowledge. For elementary students, exploratory activities such as matching pictures, guessing words, and categorizing flashcards are highly suitable, as they align with their predominantly visual and kinesthetic learning tendencies.

Nevertheless, discovery-based learning does not always proceed smoothly without well-structured planning. Preliminary observations indicated that students were still passive, lacked confidence, and relied heavily on teacher guidance. Therefore, systematic instructional improvement was required, one of which involved implementing Classroom Action Research (CAR). CAR was chosen because it allows teachers to improve instructional processes gradually through cycles that include planning, action, observation, and reflection.

This study aims to improve the English vocabulary mastery of third-grade students at SDN Tambakaji 04 through the use of flashcard media integrated with the Discovery Learning model. The study also seeks to enhance students' learning activity, group participation, and confidence in learning vocabulary. Through two cycles of action, this research is expected to provide insights into the effectiveness of flashcards in improving vocabulary comprehension and reducing ability gaps among students in a heterogeneous classroom.

METHODS

This study employed a Classroom Action Research (CAR) design using the Kemmis and McTaggart model, which consists of four stages: planning, action implementation, observation, and reflection (Altrichter et al., 2002). CAR was chosen because it enables continuous instructional improvement directly within the real classroom context (Kunlasomboon et al., 2015). Through iterative action cycles, the researcher can identify learning problems, design relevant solutions, implement them in instruction, and evaluate the effectiveness of these actions based on observable changes in students. This model allows teachers to make gradual strategic adjustments so that the learning process becomes more effective and aligned with students' needs.

The research was conducted at SDN Tambakaji 04 in Semarang, with the subjects consisting of 21 third-grade students during the even semester of the current academic year. Third-grade students were selected because preliminary observations revealed difficulties in understanding and recalling the English vocabulary taught in class. The classroom teacher and the researcher collaboratively designed and implemented the interventions across two learning cycles. Each cycle comprised two meetings and included the stages of planning, implementing Discovery Learning supported by flashcard media, observing student and teacher activities, and conducting reflection to determine improvements for the subsequent cycle.

The research instruments included a learning achievement test consisting of five multiple-choice questions administered at the end of each cycle, student activity observation sheets, teacher observation sheets, and documentation in the form of activity photos and field notes. The student observation sheet assessed the level of student engagement during the learning process, such as their ability to observe images, participate in discussions, guess word meanings, and draw conclusions. Meanwhile, the teacher observation sheet evaluated the implementation of Discovery Learning steps, including providing stimulation, presenting problems, facilitating data collection, and assisting students in verification and generalization. Data collection techniques consisted of achievement tests, observations, and documentation. Quantitative data from test results were analyzed by calculating the class average score and the percentage of mastery based on the minimum mastery criterion (KKM) of 80. Qualitative data from observations were analyzed descriptively to describe changes in student behavior across cycles. The intervention was considered successful if there was an increase in the average score, a higher number of students achieving mastery, and improved student activity and engagement throughout the learning process.

FINDINGS AND DISCUSSION

Result

Cycle I Results

The implementation of actions in Cycle I focused on applying the Discovery Learning model supported by flashcard media to facilitate students' understanding of English vocabulary. The activities proceeded fairly well; however, several challenges were identified, particularly during the verification stage and independent exploration. Some students appeared enthusiastic when introduced to the illustrated flashcards, yet many were still hesitant to guess the meanings of the words and tended to wait for guidance from the teacher.

Cycle I Evaluation Results

An end-of-cycle test consisting of five multiple-choice questions was administered to measure students' vocabulary mastery after the instructional intervention. The distribution of student scores in Cycle I is presented as follows:

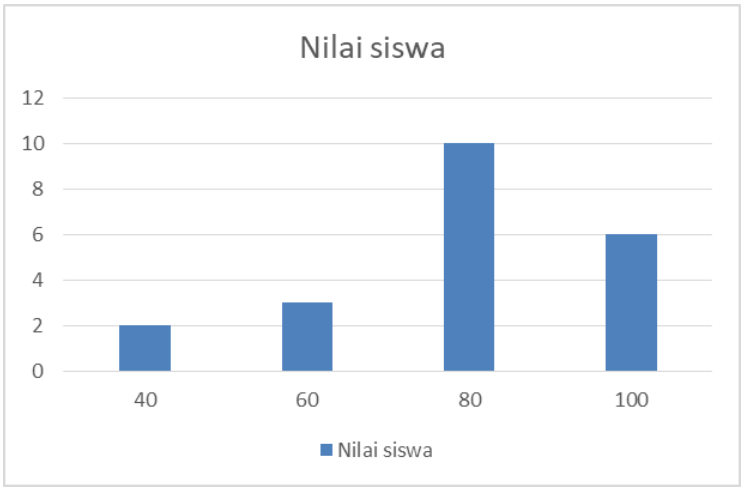

Figure 1 Distributions of Student's Score

To determine the learning outcomes in Cycle I, the average score was calculated as follows: The total score = (2×40) + (3×60) + (10×80) + (6×100) = 80 + 180 + 800 + 600 = 1,660, resulting in a mean score of 1,660 ÷ 21 = 79.04.

Mastery was determined based on scores ≥ the minimum mastery criterion (80). Thus, the number of students who achieved mastery was 16 students (10 + 6), with a mastery percentage of (16 ÷ 21) × 100% = 76.19%.

Table 1 Result CycleA 1

No.	Measure	Score
1.	Modus	80
2.	Median	80
3.	Mean	79,04
4.	Number of Students Who Achieved Mastery	16
5.	Mastery Percentage	76,19%

Reflection on Cycle I

In this cycle, student activity indicated that the learning process had not yet run optimally. Several issues were identified during implementation, including the use of small flashcards that were not clearly visible to students sitting at the back of the classroom. Although students appeared interested in the images presented, they still experienced difficulties independently determining the meanings of the words during the data collection stage. In addition, group discussions did not function optimally because some students remained passive and tended to rely on their more active peers. The learning process also continued to be dominated by teacher explanation, leaving limited opportunities for students to explore and construct understanding independently. These findings served as the basis for reflection and improvement in Cycle II to create learning that was more interactive, meaningful, and supportive of student autonomy.

Cycle II Results

In Cycle II, several improvements were introduced to enhance the effectiveness of the learning process. The flashcards were enlarged and designed with more contrasting colors, teacher instructions were simplified and clarified, and group activities were made more structured to ensure that all students were involved. These adjustments produced a positive impact on both student activity and learning outcomes.

Cycle II Evaluation Results

The Cycle II evaluation test was administered with the same level of difficulty as that used in Cycle I. The distribution of student scores is presented as follows:

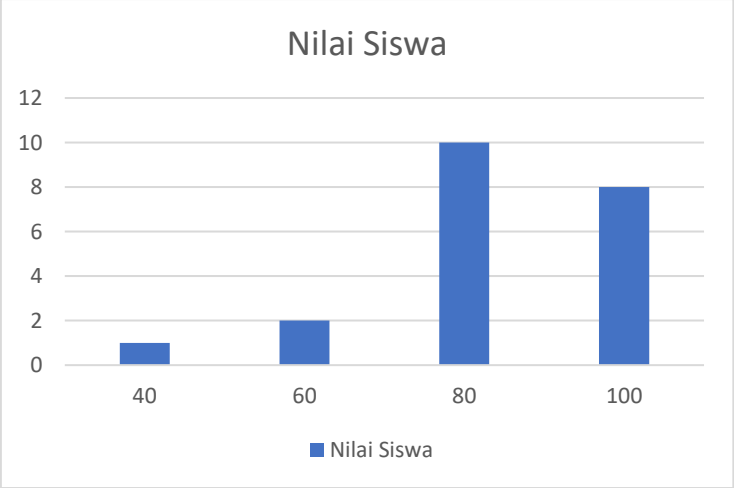

Figure 2 Distributions of Student's Score

The calculation of the average score in Cycle II was as follows: Total score = (1×40) + (2×60) + (10×80) + (8×100) = 40 + 120 + 800 + 800 = 1,760, resulting in a mean score of 1,760 ÷ 21 = 83.80.

Mastery was determined based on scores ≥ the minimum mastery criterion (80). Thus, the number of students who achieved mastery was 18 students (10 + 8), with a mastery percentage of (18 ÷ 21) × 100% = 85.71%.

Table 2 Result Cycle 2

No.	Measure	Score
1.	Modus	80
2.	Median	80
3.	Mean	83,80
4.	Number of Students Who Achieved Mastery	18
5.	Mastery Percentage	85,71%

Development of Student Activity in Cycle II

Student activity in Cycle II showed a significant improvement compared with the previous cycle. Students were able to interpret the images on the flashcards more quickly and began providing more accurate guesses of word meanings. Group discussions also became more active; nearly all students participated in guessing, matching images, and drawing conclusions about the vocabulary learned. Positive changes were particularly visible among students who had previously been passive, as they became more confident in coming to the front of the class and presenting their answers. The learning atmosphere became more lively and interactive, yet remained conducive because the teacher provided clearer instructions and a more structured sequence of activities.

Based on the results of both cycles, it can be concluded that the use of flashcards within the Discovery Learning model consistently improved students' vocabulary comprehension. Average scores and mastery levels increased in each cycle, students became more active, and the classroom environment became more conducive to learning.

Discussion

English vocabulary learning for elementary school students has distinct characteristics compared with other educational levels. Third-grade students are still in the concrete operational stage of cognitive development, during which they require visual stimuli, direct experiences, and activities that incorporate exploration and play in order to understand the concepts being taught. Therefore, vocabulary mastery cannot be effectively achieved through lecture-based instruction or verbal repetition alone (Shi et al., 2025). Without visual media, students tend to become easily bored, lose focus, and struggle to associate the form of a word with its correct meaning.

The use of flashcards in this study served as an essential step in helping students recognize vocabulary through simple and appealing images. These images function as a bridge between students' concrete experiences and the abstract concepts of a foreign language (Eilam & Poyas, 2012). Paivio's Dual Coding Theory explains that information processed through two representational systems visual and verbal is more easily retained in long-term memory (Paivio, 1978, 1991). This theoretical foundation underlies the effectiveness of flashcards in enabling students to associate words with images more quickly and accurately.

In addition, integrating the Discovery Learning model into the instructional process allowed students to construct word meanings independently through structured exploratory stages (Bicknell-Holmes & Seth Hoffman, 2000). Discovery-based learning aligns with constructivist principles, which emphasize that knowledge is built by learners through interactions with objects, their environment, and learning experiences (Reynolds, 2016). At the beginning of the study, it was evident that some students were not yet accustomed to the

discovery process. However, after improvements were implemented, students became more confident, asked more questions, and demonstrated greater initiative in observing and interpreting the flashcard images (Paldy et al., 2025).

The discussion of the findings in this study extends beyond student scores and classroom activity, considering also the influence of students' backgrounds. Some students who attended English tutoring and received academic support from their parents responded more quickly in identifying images and naming vocabulary. Conversely, students without additional learning support encountered difficulties at the beginning. Nevertheless, the use of flashcards helped reduce these gaps because the images were accessible to all students and did not require advanced reading skills. Therefore, flashcards served as an effective equalizing tool in a heterogeneous classroom such as the third-grade class at SDN Tambakaji 04.

Implementation of the Lesson Plan in Cycle I

The lesson plan in Cycle I was designed based on the Discovery Learning model, which consists of five stages. However, several challenges emerged during implementation that affected the overall effectiveness of the learning process. The activities began with the stimulation stage, during which the teacher displayed several small-sized flashcards. The teacher showed the images one by one and asked students what they saw. While some students responded enthusiastically, others—particularly those seated at the back had difficulty seeing the images clearly, which limited the intended stimulation and failed to fully evoke curiosity. This initial confusion caused some students to disengage early in the lesson.

During the problem identification stage, the teacher instructed students to guess the names of objects in English. However, many students appeared hesitant and preferred to wait for their peers to answer first. Only students with stronger initial abilities typically those who attended English tutoring or had consistent exposure to English at home took the initiative to respond. Among students with minimal learning support, weaknesses in inferential reasoning were evident because they were not yet accustomed to independent thinking during discovery-based learning. Although the teacher attempted to provide hints, the explanations were delivered too quickly, leaving students with insufficient time to analyze the information independently.

The data collection stage involved dividing students into several small groups. Each group received a set of flashcards to observe collaboratively. However, group discussions did not run effectively, as more active students dominated the activity while passive students tended merely to observe without contributing. The small size of the flashcards further hindered shared observation. Many students relied on their peers to take the lead, causing the collaborative purpose of the activity to be lost.

During the verification stage, the teacher asked students to present their guesses, but most answers remained speculative. Many students responded without a strong observational basis, resulting in the teacher providing more corrections than facilitative guidance.

In the generalization stage, students began writing the vocabulary learned into their notebooks. The teacher provided a final explanation as reinforcement, yet several students still appeared confused. They repeated the words spoken by the teacher without truly understanding the association between the image and the vocabulary.

Overall, although the lesson plan for Cycle I was implemented, it was not yet optimal. Weaknesses included the small size of the flashcards, uneven student participation, and the teacher's dominant role during the verification stage. The fact that many students remained passive indicates that the Discovery Learning stages had not yet provided sufficient space for students to think, discuss, and construct meaning independently. These shortcomings contributed to learning outcomes that remained in the moderate category for Cycle I.

Implementation of the Lesson Plan in Cycle II

The lesson plan in Cycle II was an improved version based on the weaknesses identified in the previous cycle. In this cycle, the teacher used larger flashcards with higher color contrast so that they were easily visible to all students. This change immediately produced a positive impact during the stimulation stage, as students appeared more focused and enthusiastic when the images were displayed. They responded more quickly to the teacher's questions and began showing interest in guessing word meanings, even though their answers were not always correct. This increased responsiveness indicates that appropriate media can enhance students' readiness to learn from the very beginning of the lesson.

During the problem identification stage, the teacher delivered guiding questions more slowly and clearly. Students were given time to think before responding. This adjustment encouraged many previously passive students to express their guesses. Even students who initially lagged behind in ability began to participate. This situation demonstrates that improved teacher instruction helped students build confidence in the learning process.

The data collection stage showed the most significant improvement. The teacher divided students into more balanced small groups and ensured that each member had a specific task, such as holding the cards, observing the images, providing opinions, or recording the agreed-upon vocabulary. As a result, student roles within the groups were more evenly distributed. Group discussions became more dynamic, and nearly all students actively participated. Students who were previously passive were now engaged because they were assigned clear responsibilities. The larger flashcards enabled all group members to observe the images together, allowing the data collection process to run more effectively.

During the verification stage, students began to provide more logical reasoning when presenting their guesses about word meanings. They did not merely guess based on the images but attempted to explain the relationship between the visual representation and the word they were thinking of. The teacher provided reinforcement while gradually correcting errors, ensuring that students did not feel pressured. The shift in verification strategy from "giving direct answers" to "allowing students to justify their own reasoning" made the learning process more constructive

In the generalization stage, students became more confident in summarizing the vocabulary they had learned. They were able to pronounce the words correctly, repeat them without being prompted, and even attempt to form simple sentences using the new vocabulary. Generalization became stronger because students had undergone a more effective process of observation, discussion, and verification. Additionally, the classroom atmosphere became more lively because learning felt like an engaging and challenging activity rather than mere memorization.

The implementation of the lesson plan in Cycle II demonstrated that the instructional improvements made were effective in significantly enhancing the learning process. The media were improved, instructions were delivered more clearly and slowly, group arrangements were more effective, and teacher–student interactions became more constructive. These changes led to increased student activity, participation, confidence, and learning outcomes. Discovery Learning became more purposeful, and flashcards functioned optimally as concrete media for vocabulary instruction.

Influence of Students' Backgrounds on the Learning Process and Outcomes

The learning activities across both cycles indicated that students' backgrounds had a considerable influence on the speed and quality of their vocabulary comprehension. At the beginning of the study, the teacher observed that students who attended English tutoring demonstrated stronger initial abilities compared to those who learned solely at school. They were more familiar with basic vocabulary such as cat, dog, bag, table, and ball, and they were quicker in identifying the meanings of the images on the flashcards. Students with family support such as learning facilities, access to educational books or YouTube content, or routines where parents reviewed vocabulary at home, also displayed higher confidence from the outset.

Conversely, students who lacked such support tended to be more passive and slower in following the learning process. They required more time to understand the vocabulary and were often hesitant when asked to answer questions. In Cycle I, these differences in ability were quite evident during group discussions: students with stronger learning backgrounds dominated the conversation, while others merely followed along without contributing meaningfully. This disparity resulted in uneven distribution of comprehension within the classroom.

However, in Cycle II, the use of larger flashcards, clearer teacher explanations, and more structured role assignments within groups helped reduce these gaps. Visual media allowed lower-achieving students to participate through image observation rather than memorization. When all students had equal visual access, the discovery process became more equitable (Beaumont, 2025; Courey et al., 2012). Previously passive students began offering their opinions although simple and the most significant progress was seen among students who had initially performed the lowest.

Thus, the findings suggest that flashcard media function as an equalizer, providing equal learning opportunities for students from diverse backgrounds. This media helps reduce the initial barriers faced by students who lack family support or additional learning experiences outside school.

Analysis of Learning Outcomes

The analysis of learning outcomes across both cycles shows a significant improvement in terms of average scores and mastery levels. In Cycle I, student scores varied considerably, with an average of 79.04. Although some students achieved the maximum score, others scored much lower, indicating that learning during this cycle was not yet evenly distributed. This aligns with classroom observations, which revealed that many students remained passive and had limited opportunities for independent exploration.

In Cycle II, following the instructional improvements, the average score increased to 83.80. This change demonstrates that enhanced instructional techniques, more effective group arrangements, and clearer visual media had a substantial impact on students' comprehension. Learning mastery also increased from 76.19% to 85.71%, indicating that the use of Discovery Learning supported by flashcards effectively improved students' vocabulary acquisition more evenly across the class.

This improvement cannot be attributed merely to repetition of the material. Instead, it reflects the impact of revised instructional strategies. In Cycle II, students were more active in observing, discussing, and drawing conclusions about vocabulary meanings. These activities stimulated long-term memory retention. This finding aligns with active learning theories, which suggest that comprehension improves when learners are actively involved in constructing information rather than simply receiving it verbally (Majdi et al., 2025; Markant et al., 2016).

Additionally, the growing confidence of students in asking and answering questions in Cycle II contributed to better learning outcomes. Students who were initially hesitant to guess word meanings became more confident because they felt supported by the visual media that helped them conceptualize the vocabulary. Learning became lighter and more enjoyable, and this positive psychological environment significantly enhanced students' achievement.

Comparison Between Cycle I and Cycle II

From an instructional process perspective, Cycle I reflected students' dependence on the teacher. The stages of Discovery Learning were not fully implemented because students were not yet accustomed to independent inquiry. However, after revisions in Cycle II, the learning steps became more structured and more aligned with students' characteristics. The teacher delivered simpler instructions, provided adequate thinking time, and facilitated discussions through clearer task distribution. These changes enabled Discovery Learning to function more effectively.

In terms of student activity, Cycle I was characterized by passive behavior and low confidence, particularly during the tasks of guessing image meanings and participating in group discussions. In Cycle II, student activity increased dramatically: they engaged more actively in observing the flashcards, contributed more during discussions, and demonstrated greater confidence when responding. The use of larger flashcards played a crucial role in this improvement, as they facilitated clearer visual comprehension.

From a learning outcomes perspective, improvements were clearly evident in both the average score and mastery level. In summary:

Table 1. Comparison Between Cycle I and Cycle II

Aspect	Cycle 1	Cycle 2	Improvement
Average Score	79,04	83,80	4,76
Mastery Level	76,19%	85,71%	9,52%
Student Engagement	Moderate	High	Improved
Self-Confidence	Low	High	Improved

These improvements indicate that the instructional refinements successfully addressed the initial challenges experienced by the students. The teacher also became more skilled in facilitating discovery-based activities, resulting in a more meaningful learning process. Students

were given broader opportunities to construct meaning independently, in alignment with the principles of Discovery Learning (Bicknell-Holmes & Seth Hoffman, 2000; Nadira et al., 2025).

Overall, the comparison between the two cycles demonstrates that vocabulary instruction supported by flashcards and implemented through the stages of Discovery Learning effectively enhances students' vocabulary mastery and contributes to reducing learning disparities within the classroom.

CONCLUSION

This study found that the use of flashcard media integrated with the Discovery Learning model not only improved students' English vocabulary mastery but also significantly transformed classroom learning dynamics. An important and emerging finding is that flashcards function as an equalizer in heterogeneous classrooms, helping to reduce learning gaps among students with diverse backgrounds. Moreover, improvements were not limited to cognitive outcomes but also extended to students' engagement, confidence, and participation, particularly after instructional refinements in the second cycle.

This study confirms constructivist learning theory and Dual Coding Theory, which emphasize the importance of integrating visual and verbal elements to enhance memory retention. However, it also offers a new perspective that the effectiveness of flashcard media becomes more optimal when combined with a structured Discovery Learning approach. Therefore, this research contributes by strengthening the integration of concrete instructional media with discovery-based learning models as an effective strategy in elementary education, particularly in English language learning.

This study is limited by its relatively small sample size and its focus on a single class within one school, which restricts the generalizability of the findings. Additionally, the research duration, consisting of only two cycles, may not fully capture the long-term impact of the intervention. Therefore, future research is recommended to involve larger samples, more diverse educational contexts, and more robust methodological approaches, such as experimental or mixed methods designs, in order to produce more comprehensive findings and better inform educational policy.

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