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Optimizing Diorama Media to Improve Student Learning Outcomes in Elementary Madrasahs

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Abstract

One of the problems faced in learning at Madrasah Ibtidaiyah is the low learning outcomes of students, especially on abstract materials such as the food chain. The lack of contextual and interesting visual learning media makes it difficult for students to understand the concept comprehensively, so innovation is needed through optimizing diorama media. This study uses the Classroom Action Research (CAR) method of the Kemmis & McTaggart model which consists of four stages: planning, implementation, observation, and reflection. The study was conducted in two cycles by the researcher and colleagues at Madrasah Ibtidaiyah, involving 20 students. Data collection techniques included observation and tests, analyzed descriptively qualitatively and quantitatively. The results of this study indicate that the use of diorama media in science learning at Madrasah Ibtidaiyah has been proven effective in improving learning outcomes and student engagement, especially on the food chain material. This media presents abstract concepts visually and concretely, thus facilitating understanding and increasing learning interest. In addition, dioramas also develop critical and analytical thinking skills through observation and discussion activities. With significantly improved learning outcomes, dioramas are worthy of being used as applicable visual learning media in elementary education. This research contributes to enriching visual learning strategies at the Madrasah Ibtidaiyah level by demonstrating the effectiveness of dioramas in improving students' learning outcomes and critical thinking skills. These findings reinforce the importance of using concrete media appropriate to children's cognitive developmental stages. Furthermore, this research provides a reference for teachers in designing more engaging, interactive, and contextual learning to support the understanding of abstract concepts.

INTRODUCTION

In learning activities, many teachers are still unable to convey material effectively and in accordance with students' mindsets. According to Darling-Hammond et al. (2023), teaching effectiveness is greatly influenced by the teacher's ability to understand students' cognitive needs. Golden (2023) also emphasizes the importance of learning strategies tailored to student characteristics. In Natural Science (IPA) learning, Serin (2018) stated that traditional methods are still dominant, with the teacher as the center of information and students as passive listeners. This condition, as stated by Yue (2024), can reduce motivation and make students feel bored. Madrasah Ibtidaiyah, as a basic education level, plays a crucial role in developing students' scientific knowledge

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and skills from an early age (Kurnaengsih et al., 2024). Therefore, innovative approaches are needed that can foster creativity and improve science process skills. Astiana and Fauziah (2023) stated that this kind of learning model can improve the quality of science learning. One supporting media is a diorama. Wulandari and Sartika (2024) assessed that dioramas can present material visually and interactively. Aprilia and Putri (2020) highlighted that monotonous lecture methods and a lack of visual media hinder students' active engagement in learning.

Several previous studies have demonstrated the effectiveness of diorama media in learning. Sania et al. (2024) found a significant difference in understanding of science concepts between the control and experimental classes, with a t-value of 3.591 > t-table of 2.069, and an effect size of 0.4 indicating a moderate effect. Furthermore, students' responses to the use of diorama media were very positive, with a percentage of 82%. Afifah et al. (2022) also stated that diorama media was valid according to media and material experts' assessments, and was well received by students who appeared enthusiastic during the learning process. Bali and Zahroh (2023) concluded that implementing diorama media in environmental conservation-themed learning can increase student creativity and engagement. Meanwhile, Putra and Rusnilawati (2023) proved that the use of a diorama-based Project Based Learning model can significantly improve students' speaking and narrative writing skills. In contrast to these studies, the current study was motivated by the low learning outcomes of fifth grade students on the food chain material with an average score of 66.26, which was caused by the use of monotonous lecture methods, minimal learning media, and low motivation, interest, and participation of students in the learning process.

The purpose of this study was to determine the effectiveness of using dioramas in improving student learning outcomes, particularly in Natural Science (IPA) material. The use of engaging learning media such as dioramas aims to help students understand the material thoroughly, while increasing their interest and engagement during the learning process. Through visual and contextual media, it is hoped that students will not easily feel bored, and the learning process will be more meaningful. The benefits of this study include providing alternative solutions for teachers in selecting appropriate learning media to achieve the Minimum Completion Criteria (KKM). Dioramas can create a pleasant learning atmosphere, so that students are more motivated and active in participating in lessons. In addition, the results of this study can be a reference in developing innovative learning strategies that are responsive to student needs. Thus, the optimization of dioramas is expected to not only have an impact on improving learning outcomes, but also on conceptual understanding and active student participation in the learning process in the classroom.

Based on the research objectives above, the hypothesis that can be proposed in this study is that the use of diorama media has a positive effect on improving student learning outcomes in Natural Sciences (IPA) subjects in grade V of Madrasah Ibtidaiyah. Diorama media, which is visual, contextual, and interactive, is believed to be able to improve students' conceptual understanding more comprehensively compared to conventional learning methods such as lectures. With an attractive appearance, this media is expected to increase learning interest, reduce boredom, and encourage active student participation in learning. This hypothesis also includes the assumption that a pleasant learning atmosphere and the use of media that suits student characteristics will facilitate the achievement of the Minimum Completion Criteria (KKM). Therefore, it can be assumed that students who learn using diorama media will show higher learning outcomes than students who learn using conventional learning methods without the aid of visual media.

RESEARCH METHODS

The research method employed in this study is Classroom Action Research (CAR). As stated by Slameto in Cintia et al. (2018), CAR is a method used to analyze the relationship between instructional materials and classroom interactions, focusing on how knowledge is constructed through meaningful teacher-student engagement. This research was carried out directly by the researcher with support from colleagues to enhance its collaborative nature. According to Kemmis et al. (2014), the CAR model developed by Kemmis and McTaggart consists of four cyclical stages: (1) planning, (2)

acting or implementing the plan, (3) observing the process and outcomes, and (4) reflecting on the results to improve the next cycle. These stages are designed to be continuous and reflective, allowing for ongoing improvements in teaching and learning practices. The four-step model emphasizes the participatory and self-reflective nature of classroom research, aiming to bring about positive changes in educational settings. This cycle is visually presented in Figure 1.

This research was conducted in two cycles, each consisting of one meeting. Mar'ah et al. (2024) stated that if the completion criteria were not achieved in the first cycle, then the implementation of the second cycle was the next step to ensure the achievement of the learning targets. Classroom Action Research (CAR) is conducted through four main stages: planning, implementation, observation, and reflection. According to Pribadi (2024), before CAR begins, researchers need to prepare a thorough activity plan for the first cycle, including designing the learning strategy and instruments used. Emiliasari (2019) added that the planning stage includes the preparation of learning tools and observation sheets to monitor the process during the action. Next, researchers entered the action and observation stages. Pedaste et al. (2015) explained that the implementation of the action is the implementation of the previously designed strategy, while observation plays a crucial role in collecting data related to the learning process, student engagement, and the effectiveness of the media used, with the help of prepared observation instruments.

This research was conducted at an Islamic Elementary School (Madrasah Ibtidaiyah) with 20 students from a suburban area. The learning process was carried out based on a pre-designed plan. During the implementation of the action, the researcher not only carried out the learning activities but also observed student activities to gain a comprehensive understanding of their engagement in the learning process. Guo et al. (2020) emphasized the importance of student engagement as an indicator of the success of the implemented learning strategy. According to Tarusha and Bushi (2024), observation is an important technique for identifying the dynamics of the learning process directly in the classroom. In the context of this research, two main techniques were used for data collection: observation and testing, as explained by Busetto et al. (2020), who assessed both techniques as effective in action-based educational research. The research instruments included observation sheets to record teacher and student activities, as well as tests in the form of multiple-choice questions and fill-in-the-blank questionnaires tailored to competency indicators. Rahmadani and Bakri (2024) suggested the use of quantitative and qualitative descriptive analysis approaches in classroom action research to obtain a more comprehensive picture of the student learning process and outcomes in each action cycle.

After collecting observation data on teacher and student activities, the next step was to process the data using a percentage formula to determine the level of learning implementation. The results of this analysis were used to evaluate the effectiveness of the diorama media application in increasing engagement during the learning process.

$$\text{Implementation} = \frac{scores\ obtained}{Maximum\ Activity\ Score} x100\%$$

From this formula, the level of success of teacher and student activities can be determined using the criteria below:

Tabel 1. Student Learning Outcome Assessment Criteria Table

No	Value Range	Criteria
1	86 – 100 %	Very Good
2	76 – 85 %	Good
3	60 – 75 %	Fair
4	55 – 59 %	Poor
5	≤ 54 %	Very Poor

Student learning outcomes are determined by individual and classical completion. Individually, students are considered to have completed the course if they achieve a minimum passing grade of 76. Classwise, students are considered successful if they achieve a minimum passing grade of 76%. Individual scores are obtained using the formula: $N = \frac{R}{SM} \times 100$. The average class value is obtained using the formula: $X = \Sigma\Sigma x / \Sigma\Sigma n$.

This research is declared successful if it meets the following achievement indicators: First, teacher activity in learning using dioramas must reach a minimum of 76%. If it is not achieved, it will proceed to the next cycle. Second, student activity during learning must also obtain a minimum score of 76%. If this score is not met, the action will be repeated in the next cycle. Third, student learning outcomes are considered complete if they obtain a minimum score of 76, in accordance with the Minimum Completion Criteria (KKM) set by the school. Classroom learning completion is declared successful if at least 76% of the total number of students achieve or exceed this score.

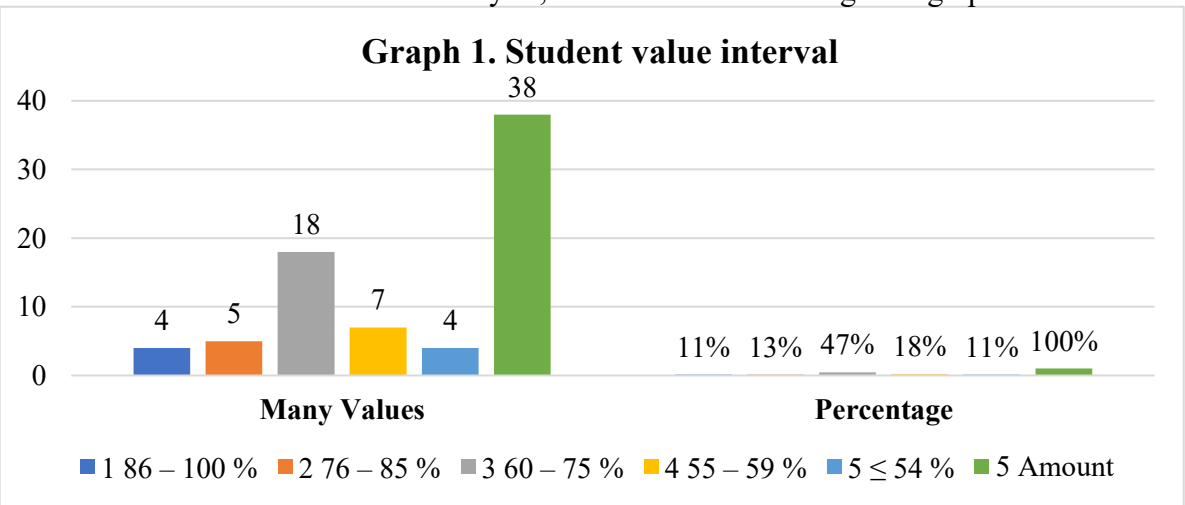
RESULTS AND DISCUSSION

Results

Pre-Cycle

The learning implementation in this study focused on the food chain topic. In the initial stage, the researcher used conventional learning methods. All fifth-grade students were present and participated in the learning activities in full. After the learning process, the researcher immediately conducted a pre-cycle daily test to determine the students' initial abilities before being given treatment. The results of the test were then analyzed and presented in descriptive form, which is attached to this research report. Based on these results, the researcher grouped the students' scores into certain intervals to facilitate data analysis, which were then arranged in graphical form.

Graph 1. Student value interval

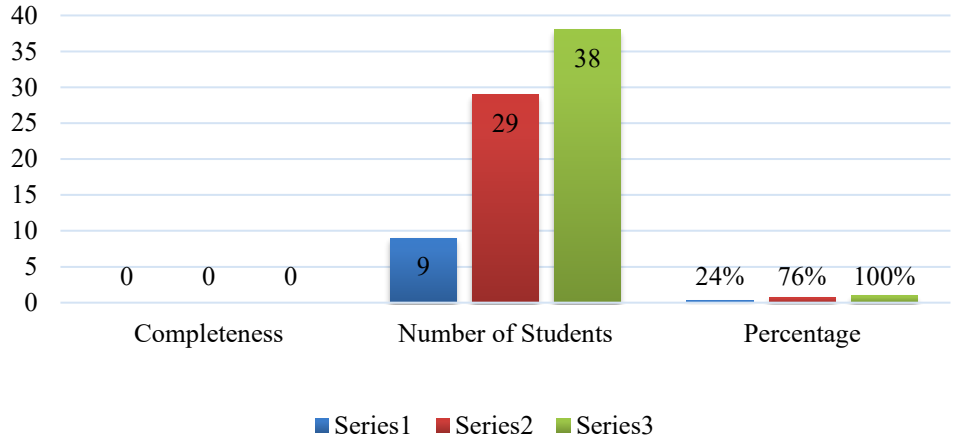


Based on the data in the graph, it is known that as many as 4 students (11%) are in the 86–100 score interval, and 5 students (13%) are in the 75–85 interval. Furthermore, as many as 18 students (47%) obtained scores in the 60–75 interval, which indicates that the majority of students are in the medium category. Meanwhile, 7 students (18%) obtained scores between 55–59, and 4 other students

(11%) obtained scores ≤ 54. These results indicate that most students have not achieved the Minimum Completion Criteria (KKM) set by the school. If seen from the student learning completeness, it can be seen in the following graph 2.

The data shows that the majority of students (47%) fall into the medium score category (60–75), while only 24% achieved scores above the Minimum Completion Criteria (≥75). On the other hand, 29% of students scored below 60, indicating low academic achievement. This suggests that the current teaching strategies are not yet effective in helping students meet the KKM. An evaluation of teaching methods and additional interventions are needed to improve learning outcomes, especially for students scoring below the standard. Graph 2 highlights this achievement gap that must be addressed promptly.

Graph 2. Student learning completion



Based on the graph presented, in the pre-cycle stage, it is known that out of a total of 38 fifth-grade students of MIMA 30 Bustanul Ulum Ambulu, only 9 students (24%) achieved learning mastery according to the established Minimum Mastery Criteria (KKM), while 29 students (76%) have not achieved mastery. This 24% completion percentage indicates that most students have not yet understood the material well. When compared to the success indicators that have been established in the study, namely a minimum of 76% of students achieving mastery classically, the results in this pre-cycle are still far from expectations. Based on the assessment category, the percentage of 24% is included in the "Very Poor" category because it is in the range of ≤54%. This confirms that further action is needed in the form of improving learning strategies, one of which is through the use of more innovative and contextual media such as dioramas, to increase student engagement, motivation, and learning outcomes in understanding the food chain material more effectively.

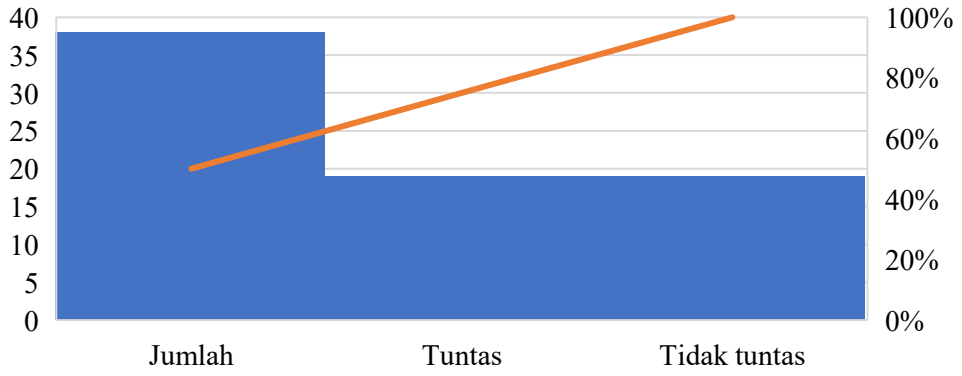
The pre-cycle data reveals a concerning reality: only 24% of fifth-grade students at MIMA 30 Bustanul Ulum Ambulu achieved learning mastery, far below the targeted 76% success indicator. This places student performance in the “Very Poor” category (≤54%), signaling a serious gap in comprehension of the food chain material. The high percentage of students not reaching the Minimum Mastery Criteria (KKM) suggests that current instructional methods may not be engaging or effective. This condition demands immediate pedagogical intervention. Traditional teaching approaches appear insufficient in fostering meaningful learning, particularly for abstract science concepts. Therefore, the integration of innovative and contextual learning media, such as dioramas, is a strategic step. Dioramas can enhance student engagement, visualize complex material, and promote deeper understanding through interactive learning experiences. Without such improvements, the learning gap may widen, hindering both individual academic growth and overall class progress.

Cycle I

Based on the results of the implementation of cycle I, data on the results of students' daily tests were obtained, which have been described and attached to this report. The distribution of student

scores shows that 9 students (24%) are in the 86–100 interval, 10 students (26%) in the 75–85 interval, 12 students (32%) in the 60–75 interval, 5 students (13%) in the 55–59 interval, and 4 students (5%) obtained a score ≤ 54. These data reflect an increase compared to the pre-cycle, although there are still a number of students who have not achieved learning mastery. To see more clearly the level of student mastery in cycle I, you can refer to Table 6 which presents the overall percentage of mastery in the learning process using diorama media.

Graph 3. Student Learning Completion



Based on the data in the cycle I results table, it is known that of the 38 fifth-grade students of MIMA 30 Bustanul Ulum Ambulu, 19 students (50%) have achieved learning completion, while the other 19 students (50%) have not achieved the Minimum Completion Criteria (KKM) set. Thus, the percentage of student learning completion in cycle I is 50%. This percentage is still in the "Very Poor" category because it is included in the range of ≤54% according to the assessment standards used. These results indicate that although there was an increase compared to the pre-cycle stage (24%), the achievement of completion in cycle I still does not meet the success indicators determined in the study, namely a minimum of 76% of students achieving classical completion. Therefore, improvements and refinements are needed in the next cycle, both in terms of learning strategies, more optimal use of diorama media, and strengthening student involvement in the learning process so that learning outcomes can improve significantly.

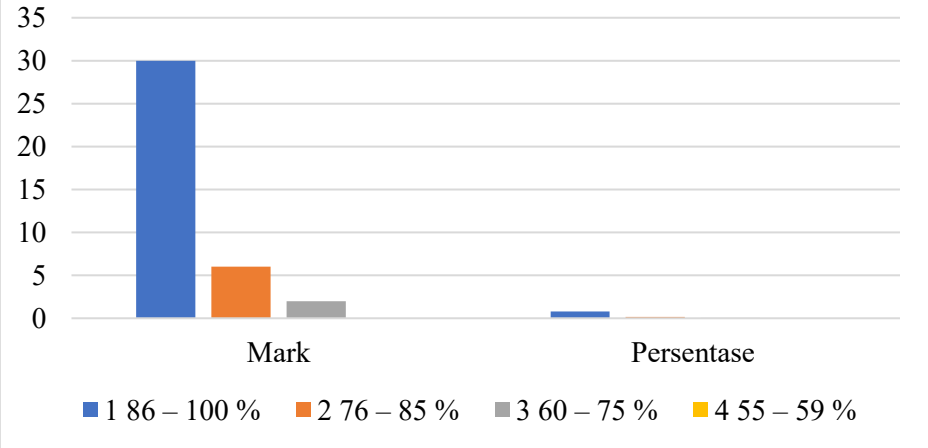
The results of cycle I show a slight improvement in student learning outcomes—from 24% in the pre-cycle to 50% completion. However, this progress remains insufficient, as it still falls within the "Very Poor" category (≤54%) and is far from meeting the success criteria of 76% classical mastery. The stagnant number of students not achieving the KKM (19 students) highlights ongoing challenges in learning effectiveness. This suggests that while the use of diorama media may have had a positive impact, its implementation was not yet optimal. To improve outcomes in the next cycle, learning strategies must be more interactive and student-centered. Greater emphasis on engaging students actively, using contextualized examples, and ensuring dioramas are used meaningfully—not just visually—will be essential to enhance understanding and mastery of the material.

CYCLE II

Based on the results of the second cycle, there was a noticeable and encouraging improvement in student learning outcomes. The students' daily test scores, which were used as the primary indicator of learning success, have been carefully analyzed and are presented in detail in the appendix of this report. These results reflect a significant increase when compared to the achievements in both the pre-cycle and the first cycle. The improvement can be attributed to the use of innovative and contextual learning media—specifically, dioramas—which played a key role in enhancing students' understanding of the food chain material. The post-learning evaluation conducted in this cycle aimed not only to assess students' knowledge but also to determine the effectiveness of the learning strategy that had been implemented. Students were given tasks and assessments aligned with the learning objectives, allowing for a fair and comprehensive measurement of their progress.

The data obtained from this evaluation show a clear upward trend in student achievement, indicating that the revisions made to the teaching strategy between cycles had a positive impact. The use of dioramas proved to be more than just a visual aid; it helped students conceptualize abstract material and engage more actively in the learning process. To support these findings, a table has been included showing the distribution of student scores across several score intervals. This table helps illustrate the extent of improvement and serves as evidence of the increased level of mastery among students. The data analysis thus confirms that the second cycle marked a substantial step forward in achieving the targeted learning outcomes.

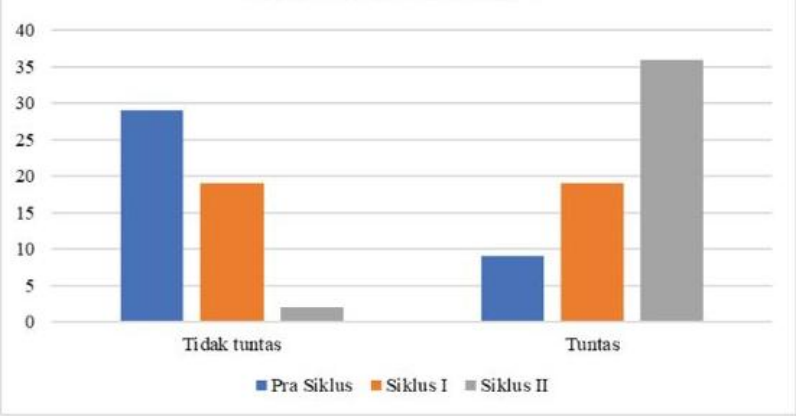
Graph 4. Student Learning Outcomes



Based on the data in the table above, it was found that 30 students (79%) were in the 86–100 score range, 6 students (16%) were in the 75–85 score range, and 2 students (5%) were in the 60–75 score range. No students scored in the 55–59 or ≤54 score range. These results indicate that the majority of students have achieved the high score category. In the classroom action research process consisting of three stages, there was a significant increase in learning outcomes in science subjects, from the pre-cycle to the second cycle. This increase reflects the success of using diorama media as an effective learning aid in improving students' conceptual understanding. The use of visual and interactive media has been proven to increase student motivation and engagement during the learning process.

When viewed from the development of the learning completion of fifth-grade students of MIMA 30 Bustanul Ulum Ambulu in the science subject, starting from the pre-research stage to cycle II, a significant increase is seen. This progress shows the effectiveness of the actions taken during the research process, especially through the application of diorama media in learning. To clarify the trend of student learning completion at each stage, Figure 3 is presented below as a visual representation of the increase in student achievement in achieving the Minimum Completion Criteria (KKM) during the implementation of the research.

Graph 5. Results of Cycle I and Cycle II



Graph 5 above clearly illustrates that the science learning outcomes of fifth-grade students at MIMA 30 Bustanul Ulum Ambulu have reached an optimal level of mastery in cycle II. This achievement indicates a significant improvement compared to the pre-cycle and cycle I. This success is inseparable from the implementation of diorama media used as a learning aid. Diorama media, with its visual and contextual nature, is able to help students understand concepts in a more concrete and interesting way, thereby increasing their motivation and active involvement during the learning process. These results are evidence that the use of appropriate learning media can have a direct impact on improving student learning outcomes. Thus, it can be concluded that the application of diorama media in science learning is an effective strategy for improving learning mastery in class V.

Discussion

Optimizing Dioramas as Visual Aids in Elementary Madrasahs

The application of diorama media in Natural Science (IPA) learning at MIMA 30 Bustanul Ulum Ambulu aims to improve students' understanding of abstract and difficult-to-visualize subject matter, particularly the topic of the food chain. Diorama media was chosen because it can present material in a concrete, contextual, and visual manner. According to Anisah (2024), presenting material using diorama media can make it easier for students to understand the relationships between living things in an ecosystem. In addition, Novak and Schwan (2021) argue that when students see real objects in three dimensions, such as producers, consumers, and decomposers in a mini ecosystem, their understanding of energy transfer becomes stronger. Ramos-Vallecillo et al. (2024) also emphasize that such visualizations enable students not only to remember information verbally but also to understand concepts more deeply through meaningful learning experiences. Furthermore, Oktaviani et al. (2023) state that visual stimulation is essential for the cognitive development stage of elementary school students. Thus, diorama media is the right solution for delivering science material in a more lively, interesting and easy-to-understand way for students.

Based on the findings and characteristics of elementary school students, learning media that are appropriate to their cognitive development needs are needed. Swider-Cios et al. (2023) stated that early childhood requires a learning approach that considers cognitive and socio-emotional aspects, so that appropriate media plays a significant role in supporting their development. Referring to Piaget's cognitive development theory, Nugraha (2017) explained that fifth-grade students are at the concrete operational stage, where they more easily understand concepts if visualized or represented through real or semi-concrete objects. Therefore, diorama media is considered appropriate because it can present clear visual forms and is easily related to the students' real world. In the context of science learning in Islamic elementary schools, Choiroh et al. (2024) emphasized the importance of strong visualization in understanding environmental concepts, relationships between living things, and the food chain. Diorama media allows students not only to recognize terms or concepts but also to relate them to real experiences and environmental conditions. Furthermore, Kandia et al. (2023) argues that this media is able to bridge the gap between abstract material and reality that can be directly observed, so that learning becomes more effective and encourages deep and comprehensive understanding.

The choice of dioramas in learning is not only based on their visual and concrete nature, but also because of their potential to increase active student engagement during the learning process. Melinda and Ariyani (2024) suggest that the use of dioramas can increase student participation and enthusiasm because this media provides a more engaging and contextual learning experience. Mardiana et al. (2023) add that students become more enthusiastic when using interactive media, making the learning process more enjoyable and less monotonous. Furthermore, according to Martin-Alguacil et al. (2024), media such as dioramas provide space for students to actively engage in discussions, observations, and present their own work, which contributes to more meaningful learning. In the context of food chain learning, Rehman et al. (2022) state that dioramas allow students to visually understand the position and role of each organism in the ecosystem, as well as the interrelationships between elements in the food chain. Resch and Schrittesser (2021) also assess that

this media is able to convey learning messages explicitly and engagingly, thereby reducing the gap in understanding between teachers and students. Therefore, optimizing diorama media is very relevant as a strategy to significantly improve the quality of student learning outcomes.

The application of dioramas in science learning at MIMA 30 Bustanul Ulum Ambulu has proven effective in helping students understand the abstract concept of the food chain. This media presents information in a concrete and visual manner, thus aligning with the cognitive developmental stage of elementary school students. The use of dioramas allows students to directly observe the relationships between living things in the ecosystem, such as producers, consumers, and decomposers, in a real three-dimensional form. In addition to strengthening conceptual understanding, this media also increases student active engagement during the learning process. Students become more enthusiastic, actively discuss, conduct observations, and directly convey the results of their work. This makes learning more enjoyable, interactive, and meaningful. Thus, dioramas not only facilitate student understanding but also create a learning atmosphere that supports emotional and cognitive engagement, and significantly improves the quality of learning outcomes at the elementary education level.

Improving Student Learning Outcomes by Using Diorama Media

Natural Science (IPA) learning on the food chain topic in grade V MIMA 30 Bustanul Ulum Ambulu was implemented in two cycles. Before the implementation of diorama media, learning activities were still carried out conventionally, relying on paper media and lecture methods. The results of the pre-cycle evaluation showed that the average student score only reached 66.26, which was still below the Minimum Completion Criteria (KKM). According to Müller et al. (2023), this low achievement reflects a less than optimal learning approach in building student understanding, especially on abstract material. Therefore, innovative learning media are needed that can attract students' attention and facilitate a more concrete understanding of concepts. Daryanes et al. (2023) argue that interactive media designed according to the characteristics of the material can increase student absorption and engagement in the learning process. One potential alternative is the use of diorama media, which, according to Baah et al. (2024), can present material visually and contextually, thereby improving student understanding and encouraging more optimal learning outcomes.

The results of the learning implementation in cycle I showed an increase in student engagement after the use of dioramas. The activity began with apperception and a pre-test that provided an initial overview of students' level of understanding before the material was presented. The presentation of the food chain concept equipped with dioramas was considered effective in helping students understand the material visually. Woolley (2014) stated that visual representations can facilitate children's understanding of abstract concepts, while Bosgraaf et al. (2020) emphasized that concrete media are very important in bridging theory and practice. Furthermore, Sukackė et al. (2022) argued that group project-based activities such as making and presenting dioramas can increase active student participation. This opinion is in line with the views of Black and Wiliam (1998), who stated that cooperative learning with visual media can strengthen learning activities in the classroom. At the end of the lesson, the teacher and students together concluded the material, as suggested by Langelaan et al. (2024), who stated that active involvement in final reflection can strengthen understanding. Based on the evaluation results, there was an increase in the average value from 66.26 to 73.63, although optimization of learning strategies is still needed in the next cycle.

The implementation of learning in Cycle II showed significant improvement compared to the previous cycle, after several improvements were made based on the results of reflection. These improvements included providing clearer and more focused instructions, more efficient time management, and more intensive teacher guidance during group activities. Stanulis and Floden (2009) stated that clear and responsive instructions have a significant impact on student engagement in learning. On the other hand, Ahshan (2021) emphasized that appropriate adjustments to teaching strategies can increase the effectiveness of classroom learning activities. In this context, the teacher strives to ensure that each group member actively participates in discussions, understands the

material, and contributes to the creation and presentation of the diorama. This approach aligns with Chang and Brickman (2018), who consider group work an effective method for developing critical and collaborative thinking skills among students.

The results of the learning evaluation in cycle II showed an increase in the average student score to 88.47. This increase reflects students' deeper understanding of the food chain concept and the effectiveness of using visual media. Cavilla (2017) argues that an exploratory and visual-based learning approach can strengthen students' conceptual understanding comprehensively. Meanwhile, O'Neill and Short (2023) emphasized that learning experiences linked to real-world contexts can encourage students' courage in asking questions, expressing opinions, and actively interacting during the learning process. Based on these findings, it can be concluded that dioramas have a real contribution in creating a more engaging, meaningful learning process, and one that is tailored to the needs and characteristics of elementary school students. This media not only helps students understand the material but also encourages emotional and cognitive engagement in learning activities.

Based on the results of the implementation of science learning on the food chain material in class V MIMA 30 Bustanul Ulum Ambulu, it can be concluded that the use of diorama media significantly increased student understanding and engagement. Before the implementation of this media, conventional learning was not able to achieve the Minimum Completion (KKM). After the use of dioramas in two learning cycles, there was an increase in students' average score from 66.26 to 88.47. This increase reflects the effectiveness of visual media in facilitating the understanding of abstract concepts, increasing active participation, and encouraging critical and collaborative thinking skills. Learning innovations with visual, exploratory, and contextual approaches have been proven to be able to create a more interesting, meaningful learning atmosphere, and in accordance with the characteristics of elementary school students. Therefore, diorama media is worthy of being an alternative learning strategy to improve learning outcomes, especially in understanding the concepts of ecosystems and the interrelationships between living things in the food chain.

Developing Critical and Analytical Thinking Skills Through Diorama Media

The use of dioramas in science learning, particularly in food chain learning, has been shown to be effective in developing students' critical thinking skills. Kim et al. (2019) stated that visual media such as dioramas can stimulate analytical thinking because they involve students in the process of constructing knowledge, not simply receiving information. In making dioramas, students are required to deeply understand the structure and flow of the food chain, not just copying or memorizing the material. Bernhard et al. (2024) emphasized that this activity requires students to analyze the relationships between living things in an ecosystem as a whole. Furthermore, according to Song and Cai (2024), understanding the roles of producers, consumers, and decomposers, as well as the flow of energy between organisms, becomes clearer through concrete representations. Gligorea et al. (2023) also argued that through this medium, students are able to map the interdependence between ecosystem components and understand the impact of the loss of one element in the food chain on environmental balance. Furthermore, Jumhur et al. (2024) reported that this activity significantly encourages students to think critically and analytically, and shows an increase in their ability to solve problems independently.

Dioramas as visual aids have great potential in stimulating students' imaginations to visualize ecosystem concepts in a concrete and holistic way. Abrahamson and Bakker (2016) stated that visual representations in learning enable students to understand abstract concepts through more concrete and meaningful experiences. When students are asked to model situations such as the extinction of a particular species in an ecosystem, they are encouraged to think more deeply about the interrelationships between organisms. This process not only activates biological understanding but also develops cause-and-effect logic in an ecological context. Miseliunaite et al. (2022) emphasize that such experiences encourage students to think systematically and consider the various interactions and dynamics within an ecological system holistically. Thus, dioramas not only present content

visually but also form a comprehensive framework for thinking about the interrelationships between elements in the environment.

In addition to building an understanding of ecosystems, the use of dioramas in learning also hones higher-order thinking skills. Tumpa et al. (2022) argue that students' ability to link changes in one element in an ecosystem to its impact on the entire system indicates an increase in in-depth analytical and evaluation skills. In the creation process, students do not work alone, but collaborate in groups. Dewi et al. (2023) state that this collaborative activity provides a space for students to express ideas, listen to the opinions of their peers, and solve challenges together. This is in line with the view of Hu et al. (2022) who emphasize that group work in the context of creative projects can strengthen communication and teamwork skills. Thus, diorama-based learning not only supports cognitive achievement but also strengthens students' social-emotional aspects, making it an effective strategy for holistic learning in elementary schools.

The use of dioramas in science learning not only helps students understand the basic concepts of the food chain but also supports the development of critical and analytical thinking skills. Ye and Xu (2023) stated that thematic learning that integrates various skills can develop higher-order thinking skills. In project-based activities such as dioramas, students are involved in observation, discussion, visualization, and problem-solving, which strengthens their understanding of ecosystems. Guerra-Tamez (2023) emphasized that an experiential approach provides deeper meaning in science learning. Bobek and Tversky (2016) also assessed that active learning activities encourage students to critically assess and evaluate information. Meanwhile, Darwin et al. (2023) argued that active engagement in the learning process equips students with relevant thinking skills to face real-life challenges. Thus, dioramas serve as an effective pedagogical strategy in elementary education.

CONCLUSION

Based on the three sub-discussions, it can be concluded that the use of diorama media in science learning in Madrasah Ibtidaiyah, especially in the food chain material, has proven effective in improving the quality of the process and student learning outcomes. This media is able to present material visually, concretely, and contextually, thereby helping students understand abstract concepts more easily and enjoyably. In addition, dioramas also contribute significantly to developing students' critical and analytical thinking skills through observation, discussion, and problem-solving activities. The significant increase in learning outcomes from the pre-cycle to the second cycle shows that diorama media not only improves conceptual understanding, but also students' active involvement in learning. Thus, dioramas are worthy of being used as an alternative visual learning media that is applicable in improving the quality of basic education, as well as supporting the development of student competencies as a whole according to their stage of cognitive development.

This study strengthens the constructivist framework and Piaget's cognitive development theory by demonstrating that dioramas, as a semi-concrete medium, effectively facilitate the shift from concrete to formal operational understanding. These findings support the concept that three-dimensional visual representations can enhance the internalization of abstract concepts, broaden the discourse on the role of media in science learning, and emphasize the importance of sensory-motor interactions in building elementary school students' cognitive schemas. Practically, teachers in Madrasah Ibtidaiyah and other elementary schools are encouraged to integrate dioramas into science lesson plans to increase motivation, participation, and conceptual understanding. The curriculum can be adapted by providing a budget and training for making simple dioramas. In addition, collaboration between students in diorama projects can be used as a project-based learning model to hone critical thinking, analytical skills, and teamwork.

This study has several limitations, one of which is its limited scope to one class and one madrasah, so the generalizability of the results is still limited. Furthermore, the implementation duration only covered two learning cycles, so the long-term effects of using dioramas are not yet fully visible. The research instrument also focused on cognitive learning outcomes, without delving deeply into the affective and psychomotor aspects. Therefore, further research is recommended to expand

the population and research locations to obtain more representative data. It is also recommended to develop instruments capable of comprehensively evaluating 21st-century skills, such as creativity, collaboration, and problem-solving. Future research can also integrate digital technology with dioramas to assess the effectiveness of a blended visual learning approach in teaching science or science at the elementary school level.

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AUTHOR CONTRIBUTION STATEMENT

AL was responsible for presenting and organizing the research data. AK contributed as the data validator and reviewer. MF was in charge of data collection and field investigation. All authors have read and approved the final manuscript.

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