Pedagogy Review

ISSN: 3025-6771 | Journal's DOI: 10.61436/pedrev

Homepage: https://imrecsjournal.com/journals/index.php/pedrev

Analysis of the Effectiveness of Diorama in Visualizing Science Concepts and Fostering Creative Thinking Skills Among Elementary School Students: A Systematic Literature Review

Lingling Diliyanti*, Rohmani

Elementary Teacher Education Study Program, Universitas Muhammadiyah Kotabumi, Indonesia

ARTICLE INFO

Article History:

Received: 02 May 2026

Accepted: 08 June 2026

Published: 30 June 2026

Keywords:

Diorama media;

Elementary school science;

Creative thinking skills.

Corresponding Author:

diliyantilingling76@gmail.com

ABSTRACT

Science teaching in primary schools often faces challenges in explaining abstract material, making it difficult for pupils to fully grasp the concepts. One medium that can aid in visualizing these concepts is the diorama, a three-dimensional display that presents objects or events in miniature, resembling real-life conditions. This study aims to explore the use of dioramas to visualize science concepts and their relationship to the development of creative thinking skills in primary school pupils. The method used in this study is a Systematic Literature Review (SLR) conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The research stages include identification, screening, eligibility assessment, and article inclusion. Data were obtained through a search of scientific articles in the Google Scholar database covering the publication period 2021–2025 using relevant keywords. The articles found were then selected based on inclusion and exclusion criteria, resulting in several articles suitable for further analysis. Subsequently, the articles were analyzed descriptively to identify patterns of findings regarding the use of dioramas in science learning in primary schools. The study's findings indicate that dioramas play a positive role in helping pupils understand abstract science concepts more concretely. Furthermore, dioramas enhance pupil engagement through activities such as observation, discussion, and the expression of ideas. The diorama supports the development of flexible thinking, original ideas, and the ability to elaborate on them. Several studies also indicate that integrating dioramas with project-based learning yields more optimal results in enhancing pupils' creativity. The implications of this research suggest that dioramas can serve as an effective alternative teaching method to improve the quality of science education in primary schools, both in terms of conceptual understanding and the development of pupils' creative thinking skills.

To cite this article:

Diliyanti, L., & Rohmani. (2026). Analysis of the effectiveness of dioramas in visualizing science concepts and fostering creative thinking skills among elementary school students: A systematic literature review. *Pedagogy Review*, *5*(2), 245-255. doi: https://doi.org/10.61436/pedrev/v5i2.pp245-255

■ INTRODUCTION

Creative reasoning skills are an important competency that needs to be developed in elementary school students, particularly in science learning (Rahmadina et al., 2024; Washinawatok et al., 2017). These skills help students generate new ideas, identify various alternative solutions, and understand concepts more deeply through flexible and innovative thinking processes (Difford, 2017). In science learning, students are not only required to master scientific facts and concepts but also to connect these concepts to real-world phenomena, develop interpretations, and construct solutions to everyday problems. However, in practice, the development of students' creative thinking skills in science learning remains suboptimal. Learning often emphasizes content mastery and memorization of concepts rather than the exploration of ideas and creative problem-solving processes. This condition limits students' ability to develop flexibility of thinking, originality of ideas, and elaboration of ideas during the learning process.

Therefore, science learning needs to be designed in a more engaging, contextual, and meaningful way by providing students with concrete learning experiences (McGregor & Gadd, 2018; Washinawatok et al., 2017). Concrete learning experiences can help students build connections between science concepts and real-life situations, so that their thinking processes are not limited to

memorizing information but also involve understanding, linking, and developing ideas based on their experiences. Through this process, students are given opportunities to explore multiple possible answers, view concepts from different perspectives, and develop ideas in greater detail. Thus, concrete learning experiences can support the development of students' creative thinking patterns in science learning.

In practice, science learning in elementary schools still faces various challenges that may hinder the development of students' creative thinking skills (Dawnay et al., 2025). The learning process is still frequently conducted in a conventional manner through lecture-based methods and textbook-centered instruction (McGregor & Gadd, 2018). Such learning patterns tend to make students passive and offer limited opportunities to explore ideas, develop imagination, and construct concepts creatively during the learning process (Scheersoi & Tunnicliffe, 2018; Reiss, 2018).

This condition is consistent with the results of the Programme for International Student Assessment (PISA), which indicate that Indonesian students' abilities in solving reasoning-based, problem-solving, and higher-order thinking questions remain relatively low compared to the international average (OECD, 2023). These findings suggest that learning processes that still emphasize memorization and information transfer have not fully fostered students' development of creative thinking skills and deep conceptual understanding. As a result, creative thinking skills such as flexibility of thinking, originality of ideas, and elaboration of ideas have not yet developed optimally in elementary school science learning.

Another issue affecting science learning is students' difficulty in visualizing abstract concepts (Schlatter et al., 2020; Arévalo et al., 2026). Much of the science curriculum involves natural processes, structures, and relationships between components that cannot be directly observed by students. This condition often leads students to struggle in forming accurate mental representations of the concepts being learned, especially when instruction is delivered without sufficient visual support.

If teachers rely solely on verbal explanations or textbook-based instruction, students will find it difficult to visualize the forms and processes being studied. This situation can reduce students' learning interest and negatively affect their creative thinking ability in understanding science concepts (Gray et al., 2019; Garibay & Gyllenhaal, 2014), as students do not receive concrete learning experiences that are necessary to explore and develop their ideas optimally.

One learning medium that can support the visualization of science concepts is the diorama. A diorama is a three-dimensional visual learning medium that presents objects, events, or phenomena in miniature, providing students with a more concrete and easier-to-understand representation (Smith et al., 2023; Vital et al., 2025). Through their realistic, lifelike presentation, dioramas help students overcome difficulties in understanding abstract science concepts that are often hard to imagine through verbal explanations or text alone.

Through the use of dioramas, students can observe the relationships between components, the shapes of objects, and the processes occurring within a phenomenon in a clearer, more engaging, and meaningful way (Vine, 2025; Yeh, 2021). In addition, this medium provides opportunities for students to actively engage in the learning process, such as observing directly, discussing with peers, and expressing ideas and opinions related to the phenomena being presented (Jung et al., 2020). These activities not only enhance conceptual understanding but also stimulate more active and reflective thinking processes. Thus, dioramas have the potential to support the development of students' creative reasoning skills in elementary school science learning. Several previous studies have also shown that the use of visual and concrete learning media positively impacts science learning. Rahmiati et al. (2025) found that three-dimensional media can improve elementary school students' mastery of science concepts. Lee et al. (2025) also reported that visual media can increase student engagement in learning activities. In addition, Huber & McRae (2025) concluded that engaging learning media can encourage students to think more creatively and actively during the learning process.

Although various studies have examined the use of visual learning media in science education, research specifically exploring the use of dioramas to develop elementary school students' creative thinking skills remains very limited. Previous studies have mainly focused on improving students' learning outcomes or conceptual understanding, without closely examining the relationship between integrating diorama media and the development of creative reasoning skills (Rahayu et al., 2020; Greene, 2026). Therefore, this study employed a Systematic Literature Review (SLR) to examine findings from prior research on the use of diorama media in elementary school science learning. This approach is expected to provide a

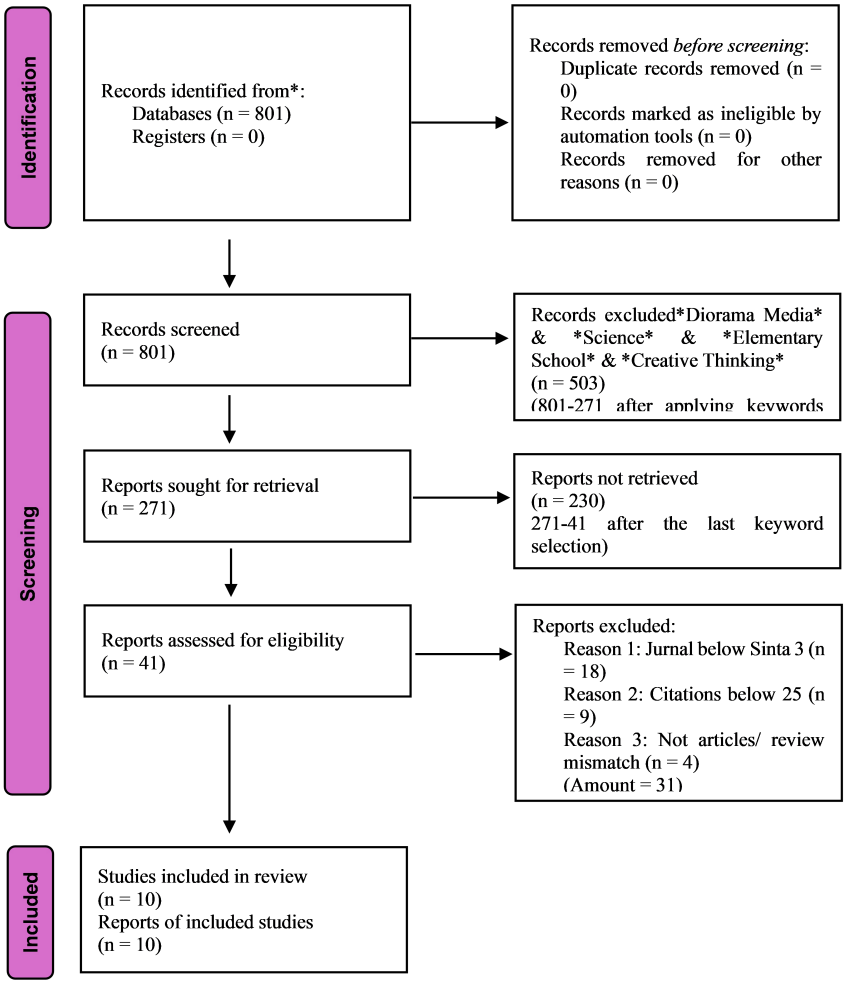

Figure 1. PRISMA flowchart

comprehensive overview of the use of diorama media and its potential contribution to the development of students' creative thinking skills.

Based on this background, the research questions of this study are: (1) how can diorama media be integrated as a solution for visualizing science concepts in elementary school science learning, and (2) how does its use affect the development of students' creative reasoning skills? The objective of this study is to analyze various findings from previous research on the use of diorama media in science learning through an SLR approach. In addition, this study also aims to identify the contribution of diorama media in supporting the visualization of science concepts and fostering the development of elementary school students' creative thinking skills.

■ METHOD

Research Design

This study employed a Systematic Literature Review (SLR) approach guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to ensure that the stages of identification, screening, and analysis of scientific articles were conducted systematically and transparently (Akmal et al., 2025). The SLR approach was applied to provide a comprehensive overview of prior research on the use of diorama media to visualize science concepts and foster creative thinking skills among elementary school students. Additionally, this method aims to identify key findings and opportunities for future research related to students' creative reasoning skills (Mancheño et al., 2024)

Search Strategy

Data collection was conducted by searching the Google Scholar database indexed by SINTA (minimum SINTA 3) for scientific articles, with a publication range from 2021 to 2025. The search process used a combination of Indonesian and English keywords to ensure broader coverage and greater relevance to the

research topic. The keywords used included "media diorama," "science learning," "elementary school," "creative thinking," "media diorama," "science learning," "elementary school," and "creative thinking." These keywords were combined using Boolean operators AND and OR to obtain articles relevant to the research focus.

The retrieved articles were then progressively screened against the inclusion and exclusion criteria, as shown in the PRISMA flow diagram, until 10 articles aligned with the research focus were identified. The selected articles were subsequently analyzed based on the research objectives, methods used, and findings on the use of diorama media to visualize science concepts and develop elementary school students' creative thinking skills.

Inclusion and Exclusion Criteria

The articles analyzed in this study were identified through a literature search in the Google Scholar database. The initial search was conducted using the keyword "media diorama," which yielded various articles and scientific publications related to learning media. Subsequently, the search was focused on articles published between 2021 and 2025 to ensure that the sources were up to date and relevant to current research developments.

To narrow the scope of the study, an advanced search was conducted by adding the keywords "Science," "elementary school," and "creative thinking" to identify articles relevant to the research topic. The retrieved articles were then screened using inclusion and exclusion criteria: specifically, scientific articles relevant to the use of dioramas to visualize science concepts and foster creative thinking skills among elementary school students were included. At the same time, sources such as books and non-article publications were excluded. After applying the PRISMA flowchart, 10 articles were identified as most relevant for further analysis and served as the basis for this study, as shown in Figure 1.

Data Analysis

The literature selection process began with the identification phase, using the keyword "Diorama Media," which yielded 801 articles. Moving into the screening stage, the number of articles was reduced to 641 by limiting the search to publications from 2021 to 2025, and further to 435 by specifying the second keyword, "Science." The search focus was further narrowed using the third keyword, "Elementary School," yielding 271 articles, and was reduced to 41 articles after applying the fourth keyword, "Creative Thinking." In the final analysis stage, a feasibility test was conducted based on publication quality, with criteria requiring journals to be at least Sinta 3-indexed, to have at least 25 citations, and to focus solely on articles. This resulted in a final selection of 10 articles deemed suitable for further examination in this study.

■ RESULTS AND DISCUSSION

The data in this study were obtained from scientific articles retrieved via a literature search on Google Scholar. The article search was conducted using several main keywords, namely diorama media, science learning, elementary school, and creative thinking. The literature identified was then screened and focused on scientific articles relevant to the use of diorama media in elementary school science learning and its impact on students' creative thinking skills. To make the results section more systematic and directly address the research questions, the presentation of the findings was restructured into several thematic subsections, namely: (1) publication trends of diorama media research in elementary school science learning during the 2021–2025 period, (2) the effect of diorama media on students' understanding of science concepts, and (3) the impact of diorama media on students' creative thinking skills. The development of research publications during the 2021–2025 period is presented in Figure 2.

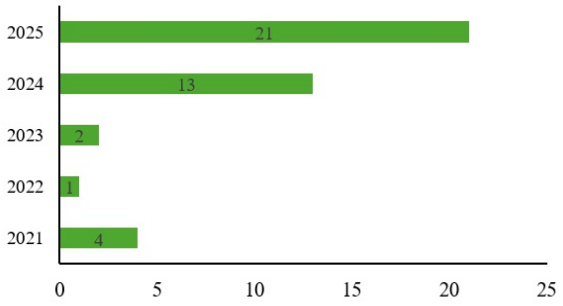

Figure 2. Trends in Articles from 2021 to 2025

Based on Figure 2, there is a trend of increasing numbers of articles discussing the use of dioramas in elementary school science lessons in the Google Scholar database from 2021 to 2025. In 2021, 4 articles were found; the number of publications then increased in 2022 but decreased to 1 article relevant to the research topic. The increase in the number of publications became more evident in 2023, with 2 articles, and saw a significant rise in 2024, reaching 13 articles. Meanwhile, in 2025, the number of publications surged to 21.

Based on the integration of diorama media in elementary school science lessons to

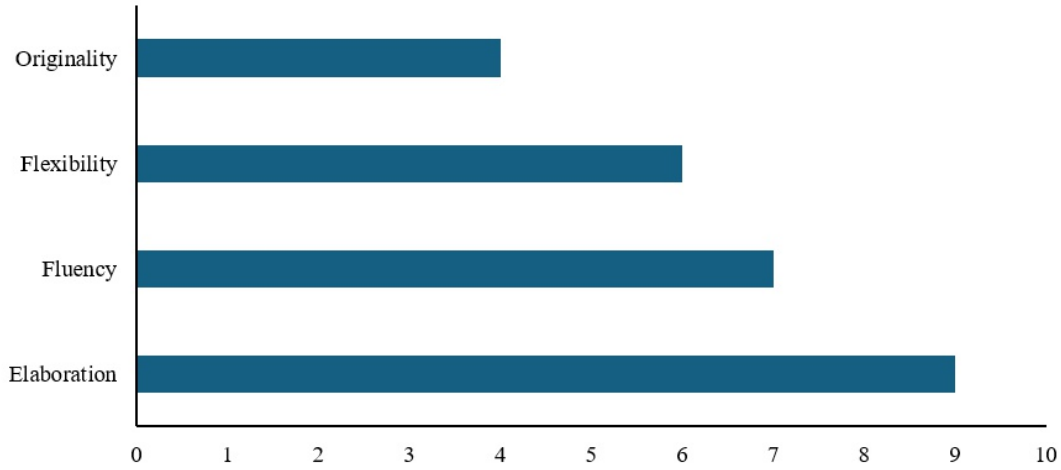

Figure 3. Frequency of creativity components identified in Diorama-based learning studies

enhance students' creative thinking skills from 2021 to 2025, there is a variation in the contribution of publications each year. In 2021, there were 4 articles, or about 10% of the total publications, while in 2022, this decreased to 1 article, or about 2%. In 2023, the number of articles increased to 2, representing about 5%, and then saw a significant surge in 2024 with 13 articles, or about 32%. Meanwhile, in 2025, the number of publications reached 21, accounting for about 51% of all articles identified.

In line with the increasing number of publications, this study focuses on articles on the use of diorama media in science learning to improve elementary school students' creative thinking skills. Using the Systematic Literature Review (SLR) approach, a systematic article screening process was conducted, resulting in 10 articles that met the inclusion criteria and were suitable for further analysis. Based on an analysis of ten articles, dioramas are an effective teaching tool in elementary school science classes because they help students grasp abstract concepts in a concrete and engaging way. Its use has been shown to enhance creative thinking skills, including fluency, flexibility, originality, and elaboration, as well as student engagement in learning, as presented in Figure 3.

Based on the ten articles analyzed, elaboration was the component of creativity most frequently supported by diorama media, appearing in eight articles. Furthermore, fluency was found in seven articles and flexibility in six, indicating that diorama media can help students generate diverse ideas and understand concepts from multiple perspectives. Meanwhile, originality was found in four articles, making it the least frequently identified component of creativity. This finding indicates that diorama media contribute more to enriching and developing students' ideas than to encouraging the emergence of truly new ideas (Aeni et al., 2024; Melinda & Ariyani, 2024; Nata & Somantri, 2025; Dewi & Tyas, 2025; Putra & Suniasih, 2021). In addition, dioramas can foster critical thinking skills, collaboration, and learning outcomes, especially when combined with innovative approaches such as Project-Based Learning and three-dimensional media, as shown in Figure 4.

An analysis of ten articles revealed that dioramas were most frequently used without integration with a specific learning model, as seen in three articles (Farda et al., 2025; Putra & Suniasih, 2021; Ritonga & Zunidar, 2025). However, articles that integrated dioramas with innovative learning models such as Contextual Teaching and Learning (CTL), Project-Based Learning (PBL), and Problem -Based Learning (PBL) demonstrate more comprehensive results, not only improving learning outcomes but also developing students' creative thinking abilities and higher-order thinking skills (Aeni et al., 2024; Dewi & Tyas, 2025). These findings indicate that the effectiveness of diorama media tends to be more optimal when used as part of student-centered learning activities that require active engagement in problem-solving or projects. Therefore, the stacked bar chart showing the distribution of articles by accompanying learning models can reinforce the argument that the success of diorama media is determined not only by the characteristics of the media itself but also by the learning strategies that integrate it. An explanation of the topics most frequently studied using diorama media is provided in Figure 5

Figure 5 shows that the topics most frequently studied using dioramas are the Water Cycle and General Science, with three articles each (Nasution & Anas, 2024; Dewi & Tyas, 2025; Putra & Suniasih, 2021; Aeni et al., 2024; Farda et al., 2025; Rahmiati et al., 2025). The high frequency of these two topics suggests that material involving abstract processes and concepts tends to require three-dimensional visualization to help students understand more easily. Meanwhile, the topics of Food Chains/Ecosystems and Earth's Rotation were each found in one article (Mulyono et al., 2025; Ritonga & Zunidar, 2025), which also highlights the importance of concrete media in aiding the understanding of science phenomena that are difficult to observe directly.

However, in this review, critical and creative thinking skills are treated as two distinct cognitive abilities, although both may develop through the use of diorama media. Critical thinking is more closely related to students' ability to analyze, evaluate, and draw logical conclusions from information or problems. In contrast, the operational definition of creativity in this Systematic Literature Review (SLR) refers to students' ability to generate diverse ideas (fluency), view problems from multiple perspectives (flexibility), produce unique or novel ideas (originality), and develop ideas in depth (elaboration). Therefore, the focus of creativity in this study is not on evaluating the correctness of information, but rather on students' ability to generate and develop new ideas during the learning process using diorama media.

However, this synthesis also identified an important supporting factor: the level of students' active engagement with the media. The impact of diorama media is evident not only in improved learning outcomes but also in the development of creative thinking skills when students are directly involved in creating diorama projects. Such active involvement provides students with opportunities to explore ideas, develop imagination, and construct conceptual representations based on their own understanding. Aeni et al. (2024) demonstrated that integrating the Contextual Teaching and Learning (CTL) model and Project-Based Learning (PjBL) with diorama media can significantly improve students' creative reasoning skills. These findings indicate that the effectiveness of diorama media becomes more optimal when learning is designed in a participatory manner and provides space for students to engage actively in the learning process.

Furthermore, the highest effectiveness in stimulating creative thinking skills was found in studies that integrated dioramas with innovative learning models. Dewi & Tyas (2025) found that Project-Based Learning (PjBL)- based dioramas are effective in improving learning outcomes for fifth-grade students by providing opportunities for active exploration, discussion, and problem-solving. Meanwhile, Farda et al. (2025) and Putra & Suniasih (2021) state that integrating dioramas into science lessons can foster meaningful learning and positively impact student learning outcomes. These findings confirm that optimizing dioramas as a medium requires more than merely using them as visual aids; they must be integrated into active, contextual, and student-centered pedagogical approaches.

The improvements reported in various studies generally fall into the moderate-to-high range, as evidenced by increases in student

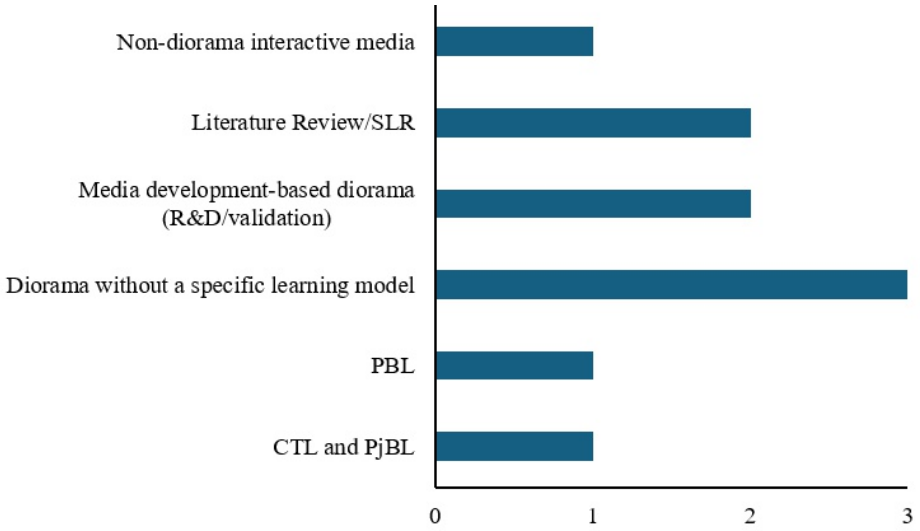

Figure 4. Diorama-integrated learning model

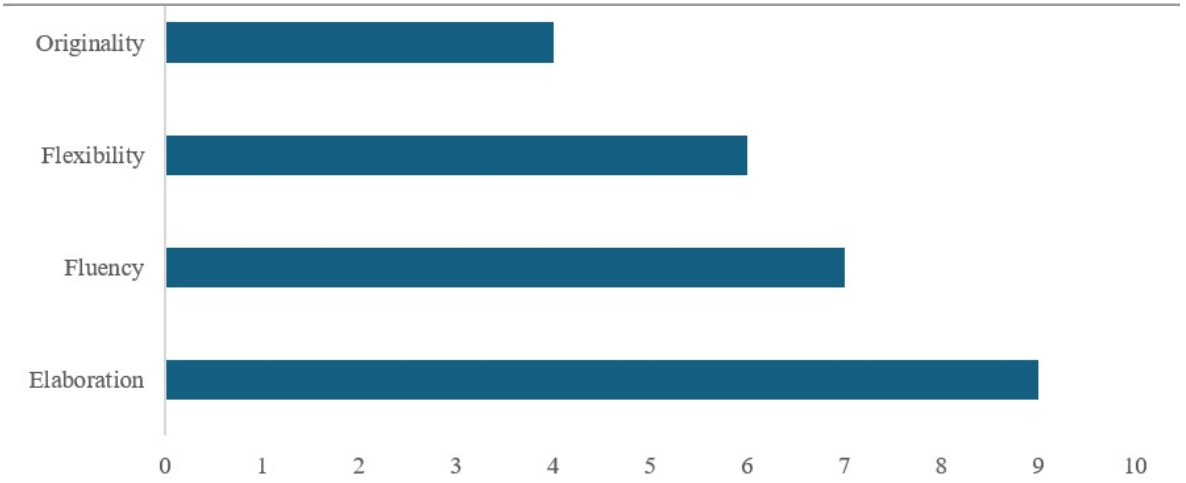

Figure 5. Science topics addressed in the reviewed articles

learning outcomes, conceptual understanding, critical thinking skills, and creativity following the use of diorama media. However, most studies still have methodological limitations, such as relatively small sample sizes, a focus on specific subjects, a predominance of R&D and simple experimental methods, and a lack of detailed quantitative data, including effect sizes. Furthermore, reviews by Nata & Somantri (2025) and Rahmiati et al. (2025) indicate that research on creative thinking among elementary school students still requires more comprehensive measurement instruments. Therefore, further research with stronger experimental designs and long-term testing remains highly necessary.

It should be noted that the research by Nata & Somantri (2025) and Mulyono et al. (2025) does not directly examine diorama media. These two articles were intentionally included as control or theoretical comparison articles in the literature synthesis process. The study by Nata & Somantri (2025) provides an overview of various factors influencing elementary school students' creative thinking abilities, including the role of instructional media and the learning environment (Nata & Somantri, 2025), while Mulyono et al. (2025) demonstrate the effectiveness of digital-based interactive learning media in enhancing understanding of science concepts (Mulyono et al., 2025). Thus, these two articles were used to compare the impact of digital learning environments with that of three-dimensional physical media, such as dioramas, on students' creativity and learning outcomes.

The Use of Dioramas to Visualize Science Concepts and Foster Creative Thinking Skills in Elementary School Students

A diorama is a three-dimensional learning tool that presents objects or events in miniature form, thereby providing students with a more realistic representation (Scripps, 2020; Gaber et al., 2025). In elementary school science lessons, this medium helps explain difficult material that might be hard to grasp if presented only verbally or through textbooks (Hasanah et al., 2023; Hoekstra, 2019). Through concrete visualizations, students can more easily understand the processes and relationships between components within a natural phenomenon

In the learning process, dioramas can directly engage students through activities such as observing, discussing, and explaining their components. Teachers can utilize dioramas to clarify topics such as the solar system, ecosystems, or the water cycle, making it easier for students to grasp the concepts being taught (Fernandez et al., 2025). Student engagement in such activities can motivate them to think actively during the teaching and learning process.

The connection between three-dimensional visualizations in dioramas and students' cognitive processes lies in their ability to facilitate more concrete, in-depth information processing (Efe, 2017; Gray et al., 2019). Three-dimensional visual representations help activate visual and spatial memory, making it easier for students to understand and connect various concepts they are learning. This process fosters the formation of connections between pieces of information in the brain, which serves as the foundation for divergent thinking, the ability to generate diverse ideas, perspectives, and solutions. Thus, the use of dioramas not only aids in conceptual mastery but also supports the development of students' creative reasoning skills (Trowbridge, 2018; Fernandez et al., 2025).

From a cognitive psychology perspective, the effectiveness of diorama media can be

explained through Sweller's cognitive load theory, which states that visual media can reduce extraneous cognitive load, making the learning process more manageable and focused (Sweller, 1988; Sweller et al., 2011). Presenting information in a three-dimensional form helps students understand abstract concepts more concretely without requiring excessive mental effort to imagine objects or relationships between concepts. By reducing extraneous cognitive load, students' working memory capacity can be directed more effectively toward meaningful information processing (germane load), such as connecting concepts, analyzing phenomena, and constructing new understanding.

Operationally, this condition provides space for the development of divergent thinking and students' creativity. When students are no longer burdened by difficulties in understanding the basic representation of the material, their available cognitive resources can be used to explore various possibilities, ask questions, and generate diverse solutions or explanations. Through diorama media, students can view phenomena from different perspectives, add specific details, and develop interpretations based on their own understanding. This process encourages the emergence of flexibility in thinking, originality of ideas, and elaboration of concepts, which are key indicators of creative thinking skills. Therefore, reducing cognitive load through diorama media not only supports students' understanding of scientific concepts but also creates cognitive space that enables them to develop their creativity more effectively.

Thus, theoretically, the use of dioramas is supported not only by visualization but also by cognitive mechanisms that enable students to process information more effectively, thereby contributing to the development of their thinking skills. In addition to aiding conceptual understanding, dioramas also contribute to the development of students' thinking skills, including creative thinking, which encompasses the domains of fluency (the ease of generating ideas), flexibility (the ability to consider diverse perspectives), originality (the uniqueness of ideas), and elaboration (the ability to develop ideas in depth). Not only that, but dioramas can also aid conceptual understanding and positively impact students' reasoning skills (Efe, 2017; Kasie, 2025). Various studies indicate that the use of this medium can foster critical thinking skills, collaboration, and learning outcomes in science education. Moreover, when dioramas are integrated into Project-Based Learning, students are more motivated to develop ideas and creativity in completing learning tasks.

The use of diorama media in science learning not only helps students understand abstract concepts more concretely but also facilitates the development of creative thinking skills that are evident throughout the learning process. In terms of fluency, students can generate a variety of ideas, questions, and explanations about the phenomena depicted in the diorama. Regarding flexibility, students demonstrate the ability to view and explain a phenomenon from different perspectives. In terms of originality, students express unique ideas or interpretations that differ from their peers'. Meanwhile, elaboration is reflected in students' ability to expand their ideas by adding details and providing more comprehensive explanations of the concepts being studied (Cecchi, 2026).

These behaviors can be explained by Jean Piaget's theory of cognitive development, which posits that elementary school students are in the concrete operational stage. At this stage, students learn more effectively through direct experiences and the manipulation of tangible objects. Therefore, the use of dioramas as visual and physical representations in science learning serves not only as a visualization tool but also as a medium for developing conceptual understanding and creative thinking skills.

■ CONCLUSION

Based on the findings of this study, diorama media has proven effective in elementary science education by helping transform abstract concepts into more concrete, easily understandable representations for students. The use of diorama media also contributes to the development of students' creative thinking skills, as reflected in their ability to generate multiple ideas (fluency), view problems from different perspectives (flexibility), propose unique ideas (originality), and develop ideas in greater detail (elaboration).

Therefore, teachers are advised to use diorama media more variedly in science lessons to help students understand concepts while developing creative thinking skills. Schools are also expected to support the integration of engaging teaching media by providing the necessary resources and opportunities for teachers to develop creativity in designing learning media. Future research could examine the most effective strategies for using diorama media in science lessons and their impact on students' development of creative reasoning skills. With proper implementation, diorama media has the potential to enhance the quality

of science education in elementary schools.

■ DECLARATION OF AI USE

The authors used several artificial intelligence (AI)-based tools in preparing this manuscript. ChatGPT (OpenAI) was used to assist with organizing ideas, paraphrasing, refining language, and improving the clarity of academic writing. In addition, DeepL was used to support translation and language checking, enhancing the manuscript's readability and linguistic accuracy. All outputs generated by these tools were carefully reviewed, edited, verified, and approved by the authors. The authors take full responsibility for the content of this manuscript, including its accuracy, interpretation, and academic integrity. The AI tools were used solely to support the writing, translation, and language-editing processes and did not contribute to the research design, data collection, data analysis, interpretation of findings, or the final scientific conclusions.

■ REFERENCES

Aeni, N., Muhardini, S., & Muhdar, S. (2024). The effects of CTL and PjBL models assisted by diorama media on students' creative thinking abilities. *MIMBAR PGSD Undiksha*, *12*(3), 472–481. https://doi.org/10.23887/jjpgsd.v12i3.76468

Arévalo, M. B., Muntaner-Perich, E., Freixenet, J., & Peracaula-Bosch, M. (2026). Culturally responsive-sustaining computer science in elementary education supported through coding with ScratchJr. *IEEE Revista Iberoamericana de Tecnologías del Aprendizaje*, *21*, 241–247. https://doi.org/10.1109/RITA.2026.3679511

Cecchi, M. E. (2026). Framing atmospheres: the display window as a dioramic device for atmospheric experimentation in historical and contemporary exhibit design culture. *Architecture*, *6*(1), 14. https://doi.org/10.3390/architecture6010014

Dawnay, L., Tidy, H., Brown, K., Dawson, L., Macaulay, I., & Dawnay, N. (2025). PedaLEGOgy–Using LEGO® crime scenes as an inclusive way to 'build'student learning, engagement and educational experience in forensic science. *Science & Justice*, 65(6), 101347. https://doi.org/10.1016/j.scijus.2025.101347

Dewi, R. P., & Tyas, D. N. (2025). The development of PBL-based water cycle diorama media to improve Grade V learning outcomes. *Jurnal Prima Edukasia*, *13*(2), 256-272. https://doi.org/10.21831/jpe.v13i2.83639

Difford, R. (2017). Infinite horizons: Le Corbusier, the Pavillon de l'Esprit Nouveau dioramas and the science of visual distance. *The Journal of Architecture*, *22*(5), 825–853. https://doi.org/10.1080/13602365.2017.1351762

Efe, H. A. (2017). The effects of using diorama on 7th grade students' academic achievement and science learning skills. In *Asia-Pacific Forum on Science Learning and Teaching*, 18(1), 1–14. https://eric.ed.gov/?id=EJ1160070

Farda, U. J., Martanti, F., Nada, A. Q., & Pitriani, D. (2025). Improving the learning outcomes of natural and social science (IPAS) through diorama media: a meaningful learning study at Madrasah Ibtidaiyah. *Al-Bidayah: Jurnal Pendidikan Dasar Islam*, *17*(2), 1–21. https://doi.org/10.14421/al-bidayah.v17i2.11965

Fernandez, S. M., Madelo, P. K., Suico, R. A. L., Cane, J. F., Magsayo, J., Capuyan, M., & Acut, D. (2025). Thinking what no one else has thought: investigating the scientific creativity of primary school students in a science class. *Center for Educational Policy Studies Journal*, *15*(3), 95–124. https://doi.org/10.26529/cepsj.1514

Gaber, S. A., Shahat, H. A., Al-Duqail, A. A. A. R., & Al-Ruwaili, H. A. (2025). Diorama: an effective approach to reduce social withdrawal behavior in children with Autism Spectrum Disorder. *European Journal of Educational Research*, *14*(2), 601–612. https://doi.org/10.12973/eu-jer.14.2.601

Garibay, C., & Gyllenhaal, E. (2014). Habitat dioramas and sense of place: Factors linked to visitors' feelings about the natural places portrayed in dioramas. In *Natural History Dioramas: History, Construction and Educational Role*. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-017-9496-1_16

Gray, P., Rule, A. C., & Gordon, M. (2019). Black fifth graders make dioramas of traditional African cultures to explore racial identity, cultural universals, and spatial thinking. *Urban Education*, *54*(2), 274–308. https://doi.org/10.1177/0042085915613552

Greene, T. F. (2026). ScienceOnShore (SOS): A Wake-up Call from the Ocean Literacy Movement. In *Ocean Literacy: The Foundation for the Success of the Ocean Decade, Volume I: Transforming Education, Research, and Engagement*.

Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-98145-6_4

Hasanah, U., Astra, I. M., & Sumantri, M. S. (2023). Exploring the need for using science learning multimedia to improve critical thinking elementary school students: teacher perception. *International Journal of Instruction*, *16*(1), 417–440. https://doi.org/10.29333/iji.2023.16123a

Hoekstra, M. (2019). A Place for stupidity: Investigating democratic learning spaces in the diorama. *International Journal of Art & Design Education*, *38*(3), 649–658. https://doi.org/10.1111/jade.12240

Huber, A., & McRae, C. (2025). *Small Stages: Cabinets, Dioramas, and Other Tiny Performances*. Routledge.

Jung, J., Chang, J., & Park, J. (2020). An analysis of different grade levels of elementary school students' reasoning about the changes of state of water within a learning progression. *Asia-Pacific Science Education*, *6*(2), 548–563.

Kasie, A. (2025). Daguerre's 'natural diorama': Landscape design and picturesque retreat in nineteenth-century Bry-sur-Marne. *Garden Retreat in Asia and Europe: Ways of Dwelling in A Torn World.*

Lee, S., Cho, H., & Choi, S. M. (2025). AquARium: augmented reality integration for enhanced tourism experiences in a diorama fish tank. In *2025 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct)*. 795–796. https://doi.org/10.1109/ISMAR-Adjunct68609.2025.00194

Mancheño, M. J., Agui, M. L., Elvira, E., Hernández-Cornejo, D., Osío Barcina, J., Hernández Cornejo, J., & Parra, M. (2024). A chemistry laboratory miniature model: a window to science. *Journal of Chemical Education*, *101*(5), 1925-1931. https://doi.org/10.1021/acs.jchemed.3c01266

McGregor, D., & Gadd, J. (2018). Constructing and reviewing dioramas: supporting beginning teachers to think about their use to help children understand the work of natural history scientists. In *Natural History Dioramas–Traditional Exhibits for Current Educational Themes: Science Educational Aspects*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-00175-9_10

Melinda, W., & Ariyani, Y. D. (2024). Development of diorama based learning media to improve elementary school students' creative thinking ability. *Indonesian Journal of Classroom Action Research*, *2*(20), 5–9. https://doi.org/10.53866/ijcar.v1i2.310

Mulyono., Slamet, St. Y., & Chumdari. (2025). The effectiveness of interactive learning media in improving students' understanding of the food chain concept in elementary schools. *Jurnal Penelitian Pendidikan IPA*, *11*(6), 340–348. https://doi.org/10.29303/jppipa.v11i6.11099

Nata, A., & Somantri, M. (2025). Systematic literature review of creative thinking for primary school students: trends, influencing factors, and assessment instruments. *International Conference on Elementary Education*, 8(1), 245–272. https://doi.org/10.65478/ICEE.v8i1.3976

Nasution, N. S., & Anas, N. (2024). Development of water cycle diorama media to improve students' critical thinking ability. *Scaffolding: Jurnal Pendidikan Islam Dan Multikulturalisme*, *6*(2), 58–72. https://doi.org/10.37680/scaffolding.v6i2.5204

OECD. (2023). *Pisa 2022 results (volume I): the state of learning and equity in education.* OECD Publishing. https://doi.org/10.1787/53f23881-en

Putra, I. K. D., & Suniasih, N. W. (2021). *Media diorama materi siklus air pada muatan IPA kelas V sekolah dasar* [Diorama media for water cycle material in science content for grade V elementary school]. *Jurnal Ilmiah Pendidikan Dan Pembelajaran*, *5*(2), 238–246. https://doi.org/10.23887/jipp.v5i2.32878

Rahayu, M., Sudarma, I. K., & Dibia, I. K. (2020). Enhancement of science learning outcomes through two stay two stray learning model assisted with mind mapping media. *Journal of Education Technology*, *4*(3), 218–227. https://doi.org/10.23887/jet.v4i3.25688

Rahmadina, A., Rohmani, R., & Haryadi, R. N. (2024). Introducing learning models focusing on elementary school science activity in terms of a systemic literature review. *Journal of Science and Education (JSE)*, *4*(2), 109–124. https://doi.org/10.56003/jse.v4i2.318

Rahmiati, D., Sarwi, S., Sudarmin, S., & Cahyono, A. N. (2025). The use of augmented reality diorama media in natural and social sciences subjects for fourth grade elementary school. *Journal la Edusci*, *6*(1), 61–78. https://doi.org/10.37899/journallaedusci.v6i1.1871

Reiss, M. J. (2018). The use of natural history dioramas for science education. In

Natural History Dioramas–Traditional Exhibits for Current Educational Themes: Science Educational Aspects. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-00175-9_14

Ritonga, Y., & Zunidar, Z. (2025). The effect of earth rotation diorama learning media on the critical thinking ability of science subjects in state elementary school. *Scaffolding: Jurnal Pendidikan Islam dan Multikulturalisme*, *7*(1), 289–302. https://doi.org/10.37680/scaffolding.v7i1.7083

Scheersoi, A., & Tunnicliffe, S. D. (2018). *Natural history dioramas–Traditional exhibits for current educational themes: Science educational aspects*. Springer.

Schlatter, E., Molenaar, I., & Lazonder, A. W. (2020). Individual differences in children's development of scientific reasoning through inquiry-based instruction: who needs additional guidance?. *Frontiers in Psychology*, *11*(2), 1-14

Scripps, S. M. (2020). The downfall of the diorama: science fair displays in contemporary america. *Nuncius*, *35*(3), 660–684. https://doi.org/10.1163/18253911-03503009

Smith, G., Najwa, N. A., Kuncoro, T., & Alfan, M. (2023). Creative thinking ability of elementary school students based on learning models. *KnE Social Sciences*, 197–203. https://doi.org/10.18502/kss.v8i10.13446

Sweller, J. (1988). Cognitive load during problem solving: Effects on Learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog12024

Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive load theory*. New York, NY: Springer. https://doi.org/10.1007/978-1-4419-8126-4

Trowbridge, C. A. (2018). Dioramas and teachers: Looking, thinking, drawing, and talking. In *Natural History Dioramas–Traditional Exhibits for Current Educational Themes: Science Educational Aspects* (pp. 159–170). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-00175-9_11

Vine, T. (2025). Innovative pedagogies in critical management education: the role of the diorama. In *Research Handbook of Critical Management Education*. Edward Elgar Publishing.

Vital, L. B., Jr, V. C. O., & Barbosa, V. C. F. (2025). Robust 3D magnetic inversion for targeted source with interfering signals. *Geophysical Prospecting*, *73*(8), e70090. https://doi.org/10.1111/1365-2478.70090

Washinawatok, K., Rasmussen, C., Bang, M., Medin, D., Woodring, J., Waxman, S., & Faber, L. (2017). Children's play with a forest diorama as a window into ecological cognition. *Journal of Cognition and Development*, *18*(5), 617–632. https://doi.org/10.1080/15248372.2017.1392306

Yeh, J. H. (2021). Real-world problem: Connecting socio-scientific contexts and dioramas. In *Addressing wicked problems through science education: The role of out-of-school experiences*. Cham: Springer International Publishing.

Zakirman, Z., Gusta, W., & Rahayu, C. (2022). Analysis of problems in science learning at the elementary school. *Jurnal Ilmiah Profesi Pendidikan*, *7*(1), 24–29. https://doi.org/10.29303/jipp.v7i1.349