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PEDAGOGICAL INNOVATION IN SOCIAL SCIENCE: DEVELOPING A WATER CYCLE DIORAMA TO SUPPORT EXPERIENTIAL LEARNING IN MADRASAH IBTIDAIYAH

Dwi Pitriani[1)], Fitria Martanti[2)], Ummu Jauharin Farda[3)*]
[1,2,3]Universitas Wahid Hasyim, Indonesia
E-mail: ummujauharinfarda@unwahas.ac.id

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Abstract

The learning media for this water cycle diorama is a teaching aid, such as an aquarium, that can help students learn science in class. Material discussing the water cycle is included in this diorama. This media shows how the water cycle occurs on Earth, which students cannot see directly. One of the aims of this research is to evaluate the needs of teachers and students to make water cycle diorama media for class V, MI As Salam. Another objective is to determine the validity of the water cycle diorama learning media for class V MI, As Salam. Development research (R&D) is a type of research. This research uses the Richey and Klein research model, using three stages. Data collection techniques use qualitative and quantitative descriptive analysis techniques. Questionnaires that describe the needs of teachers and students are also used for validation by media experts and material experts. The research results show that the water cycle diorama learning media in science subjects for class V M is very valid to be tested on students. Media experts received a score of 98, an average of 4.9, and a validity percentage of 98%. In contrast, material experts received a score of 72, an average value of 4.8, and a validity percentage of 96%. It can be concluded that the water cycle diorama learning media is declared "very valid."

Keywords: water cycle, dioarama, social science, madrasah Ibtidaiyah

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INTRODUCTION

Effective learning media are those that bridge abstract concepts into more concrete ones, encourage active student involvement, and align with developmental characteristics and learning objectives (Baihaqi et al., 2025). This kind of media not only enhances conceptual understanding but also creates a meaningful and sustainable learning experience (Ummu Jauharin Farda, Fitria Martanti, Ana Quthratun Nada, 2025). Educators in learning need to develop learning media that help students understand the subject matter (Hidayat et al., 2022). Learning media is a tool that explains part of the entire learning program that is difficult to explain verbally (Lisnawati, 2021,Prawira et al., 2023). Learning materials will be easier and more precise if learning uses learning media (Putra et al., 2020, Irhasyuarna et al., 2022). The function of learning media is to assist teachers in conveying abstract concepts to students in concrete terms (Ninghardjanti et al., 2021, Wardhono et al., 2018).

Education is the process of shaping students' personalities and developing their potential. Madrasah education is an initial education designed to develop quality human resources so they can achieve success at the next level. Education allows people to acquire knowledge, improve their social status, and benefit their surrounding community (Manikyam & Lakshminath, 2018).

One factor that determines the success of improving the quality of education is the applied learning process (Naixin & Leong, 2024). Teachers prepare for the learning process to achieve the determined learning objectives, one of which is in science lessons. Not all students master the expected scientific competencies because they often face abstract concepts, many foreign terms, and scientific names. Despite extensive research on science learning media at the elementary level, significant gaps remain in the development of instructional tools that effectively address abstract and process-based concepts such as the water cycle, particularly within the context of Islamic primary education. Previous studies have predominantly focused on digital simulations, textbook-based illustrations, or generic hands-on materials, which often lack contextual relevance to Madrasah Ibtidaiyah settings and are not always feasible given infrastructural limitations. Moreover, many existing studies emphasize learning outcomes without sufficient attention to systematic needs analysis and expert validation during the media development process. As a result, there is limited empirical evidence on the design and validation of concrete, contextually appropriate, low-cost learning media that visually represent the dynamic processes of the water cycle in elementary science classrooms.

This study addresses these gaps by addressing a clearly identified pedagogical problem: fifth-grade students at MI As Salam experience difficulties understanding the water cycle due to the abstract nature of the material and the absence of effective instructional media that can concretize invisible natural processes. Teachers primarily rely on verbal explanations and static images, which limit students' conceptual understanding and engagement. Therefore, there is an urgent need to develop and validate a three-dimensional, diorama-based learning medium that

enables students to observe and explore the water cycle processes in a tangible manner. This study not only designs the learning media based on teacher and student needs but also rigorously evaluates its validity through expert judgment, thereby offering a methodologically sound and context-specific contribution to elementary science education research.

To improve social science learning activities, teachers must realize that learning is a collection of processes and values that can be applied in real life. It is also caused by many factors, both internal and external. Internal factors come from within a person, such as confidence, motivation, interests, ideals, and learning habits (Raunić, 2023). External factors come from outside, such as limited learning media, too dense material, and many foreign terms (Laily et al., 2025).

Etymologically, the word "medium" comes from the Latin word "medium", which means "between" or "intermediary", generally used as a means of communication to describe everything that carries or transmits information between the source and the recipient of the message (Teodorescu et al., 2025). To achieve high-quality learning media that significantly influences the learning process, selecting and planning appropriate media is necessary. Selecting the right learning media makes learning more effective. The criteria for selecting media are derived from the concept that teaching media is part of the overall instructional system (Saputra et al., 2021).

Teachers use learning media to communicate learning objectives, helping students easily absorb the material presented, making learning more meaningful. One media type that can be used is diorama media. A diorama is a presentation of a scene in small size (miniature), equipped with figures and details of the environment that reflect the original and combined with a natural-colored background, a three-dimensional pattern, a pattern of a scene, or a scene made by placing an object in front of the background with an actual perspective so that it can depict the actual situation.

Water cycle material explains how the water cycle occurs, human actions that can affect it, and how to save water. MI students need to study this material to understand how they should behave towards nature and to develop a caring attitude towards it. Students will never see the water cycle process directly in nature, so media is needed to help them understand the material. In addition, material on the water cycle can be taught through learning resources (learning media). Based on the existing literature, studies on water cycle instruction at the elementary level generally emphasize the use of visual media, such as pictures, videos, textbooks, and simple experiments, to support students' conceptual understanding of abstract natural processes. Previous research has shown that learning media can improve students' cognitive achievement and engagement in science, particularly when explaining phenomena that cannot be directly observed, such as evaporation, condensation, and precipitation. Some studies also integrate environmental education values by linking the water cycle to human activities and water conservation behavior. However, most prior studies focus primarily on learning outcomes in terms of knowledge acquisition, with limited attention to character formation, especially the development of environmental care attitudes among MI students. In addition, many learning media used in previous research are still

passive and two-dimensional, providing limited interactivity and experiential learning opportunities (Nikmah & Qohar, 2023). There is also a lack of studies that explicitly examine the effectiveness of concrete, three-dimensional instructional media in helping MI students connect water cycle concepts with responsible behavior toward nature. These limitations indicate the need for further research to develop and validate interactive learning media that simultaneously enhance conceptual understanding and foster environmental care character in MI students.

This learning media can also make learning more enjoyable for students. In this study, the learning media that will be developed is the Water Cycle Diorama. The media developed for the water cycle diorama will help students understand the water cycle. This is because the press includes illustrations of objects in the water cycle. Like the illustration of the ocean, the water in the sea will evaporate, then condense to form water droplets, and drip as rain. In addition, water cycle diorama media can help students carry out scientific activities, namely those contained in the student worksheet for the water cycle diorama media, including observing, reasoning, conducting experiments, and communicating.

The expected result of this study is that water cycle diorama media can be effectively used to study water cycle process material in science subjects in grade V at MI As Salam school. Students are also expected to be more active, innovative, and independent in finding the concepts of the material studied. They are also likely to be highly interested in social studies and enjoy taking lessons.

Learning at MI As Salam is still predominantly delivered through conventional media such as textbooks, student worksheets, and lecture-based methods, which can make the learning process monotonous, less interactive, and unengaging. As a result, students often lose focus, particularly those sitting at the back of the classroom, and show low participation during lessons. This condition affects students' understanding of the material, even though social studies and science learning at the Madrasah Ibtidaiyah level aims to foster belief in God Almighty, enhance understanding of concepts applicable to daily life, develop curiosity, environmental awareness, critical thinking skills, and the ability to solve problems and make decisions. Based on classroom observations, the limited availability of learning resources and instructional media, especially in Grade V science lessons such as day and night processes, has contributed to students' boredom and lack of engagement. Therefore, the development of innovative, attractive, and interactive learning media is necessary to increase students' motivation, involvement, and comprehension in the learning process.

This study aims to identify the needs of teachers and students in developing water cycle diorama learning media for Grade V MI and to examine the validity of the developed media in supporting science learning. This study contributes to the field of educational science by providing empirical evidence on the feasibility and validity of three-dimensional, concrete learning media for teaching abstract scientific concepts that cannot be directly observed. The findings strengthen existing knowledge on instructional media development by demonstrating that a diorama-based water cycle model can meet pedagogical needs and achieve high validity from both media and content experts. Consequently, this research enriches the discourse on science education at the elementary Islamic school level by offering a validated instructional innovation

that supports conceptual understanding and serves as a reference for future learning media development and research in similar educational contexts.

METHODS

This research uses the Research and Development (R&D) approach, a method that focuses on developing and testing the effectiveness of a product (Umarin et al., 2023,Bartel, 2006). This approach not only aims to produce an innovation or media (Dieterich et al., 2023,Ali & Ateeq, 2025), but also to ensure that the product developed has real benefits and can be effectively applied in the context of its use (Rodrigues & Delfim, 2022, Ramot & Bialik, 2023) In the context of this research, the product developed is a learning medium in the form of a diorama designed to support a more interactive and engaging learning process.

In developing the diorama media, the researcher adopted the learning media development model by Richey and Klein, consisting of three main stages: Planning, Production, and Evaluation (Vongtathum & Chaijaroen, 2019). The Richey and Klein model was chosen because it provides a systematic, flexible framework for developing, validating, and refining instructional media aligned with real educational needs. This model emphasizes iterative evaluation and expert validation, making it well-suited for ensuring that the developed water cycle diorama is pedagogically appropriate, scientifically accurate, and feasible for classroom implementation.

The Planning stage includes identifying needs, analyzing materials, and formulating learning objectives (Qu & Chaijaroen, 2025). The Production stage involves creating diorama media based on the results of previous planning (Nurhayati et al., 2023). Meanwhile, the Evaluation stage is carried out to assess the quality and effectiveness of the media developed. (Sosa et al., 2020, Anwar et al., 2021). Both through limited trials and evaluations from experts. These three stages are the basis for designing innovative media that is relevant and effective in supporting the learning process.

The needs analysis in this study was conducted through field research and a literature review to identify the actual needs of teachers and students while strengthening the theoretical foundation of the study. Based on valid and representative data, a learning media product was designed and developed, followed by expert validation by media and subject-matter specialists to ensure its quality and suitability. After revisions, the media was tested at MI As Salam, which was selected as reflects the real learning context for teaching the water cycle and demonstrates a clear need for concrete instructional media. The participants included qualified experts and purposively selected students to ensure that the feedback accurately represented classroom conditions and learning needs, supported by an instrument grid developed by the researcher to guide data collection. The researcher has compiled a general grid containing the indicators and aspects observed to support the data collection process, as presented in Table 1.

Table 1. Research Data Collection

Data	Data Source	Instrumen
To analyze the need for water cycle diorama media in science learning in class V MI As Salam	Class VI students	1. Needs Questionnaire 2. Interview Guidelines
Identifying the validity of water cycle diorama learning media in science class V MI, As Salam	1. Learning Media Expert 2. Learning Material Expert	1. Product Evaluation Sheet

Based on Table 1, the research instruments were developed by referring to the competency standards and basic competencies outlined in the syllabus, with items designed to capture students' responses regarding the suitability, clarity, attractiveness, and usefulness of the water cycle diorama media, as well as expert evaluations of content accuracy and media design. The validity of the instruments was ensured through expert judgment from media and subject- matter specialists, while reliability was supported by the consistency of student questionnaire responses and the triangulation of data obtained from questionnaires, interviews, and observations.

The research involved Grade V A students of MI As Salam, selected in accordance with the relevant syllabus competencies, and was conducted in compliance with research ethics, including informed consent, confidentiality, and voluntary participation. The study utilized both quantitative data from student questionnaires to evaluate media effectiveness and qualitative data in the form of expert feedback to assess media feasibility, with data collected through questionnaires, interviews, and observations to ensure a comprehensive evaluation of the developed learning media.

RESULTS AND DISCUSSION

The study's results indicate that using learning media makes it easier for students to understand the material. The developed diorama media can be effectively used in science subjects, particularly to support students' understanding of abstract concepts such as the stages of the water cycle. The use of diorama media helps develop students' abilities more optimally by increasing engagement, focus, and conceptual comprehension. Interview results revealed that prior to using the diorama, teachers relied mainly on conventional media such as student worksheets, textbooks, and lecture methods, which made learning monotonous and less interesting for students. Limited learning media facilities and low student interest in reading were identified as major obstacles at MI As Salam, hindering students' ability to imagine abstract processes and leading to decreased concentration during learning.

Based on field observations and interviews, the researcher determined the need to

develop a medium that would facilitate the learning process, making it easier. The product made by the researcher in this study is the Water Cycle Diorama Media class V, which has been adjusted to the needs of educators and students at MI As Salam, providing an understanding of Water Cycle material to students and fostering students' interest in social science subjects, so that they can help students in understanding social science subject matter.

The results of the research analysis of the development of water cycle diorama learning media in class V science subjects can be seen in the analysis of educators' and students' media needs and in the media validity analysis. This stage of analysis can be a reference in producing learning media. There are two stages to this needs analysis: educators' needs and students' needs. Looking at the results of the needs of educators and students, the researcher will develop a 3- dimensional media, namely the water cycle diorama, which is critical and valuable for teaching and learning activities, so that students can more easily grasp the material that has been learned and seen by students through the water cycle diorama learning media that illustrates the original form. The desired media format for educators and students is a 3D water cycle diorama made of acrylic, measuring 40x20, with icons to form the original shape and plants. The analysis of the questionnaire data indicates that both teachers and students experience difficulties in understanding water cycle concepts when learning relies solely on textbooks and verbal explanations. Most respondents expressed a strong need for concrete, visual learning materials that illustrate the stages of the water cycle in a more realistic and engaging way. These findings confirm that developing a water cycle diorama is relevant and necessary to support learning needs and improve students' comprehension and motivation.

Design validation in this study was conducted to assess the feasibility and potential effectiveness of the developed learning media compared to previously used methods through rational and expert-based evaluation. The validity test involved two types of expert assessments, namely media experts and material experts, whose evaluations were used to identify the strengths and weaknesses of the product and to determine its overall validity before field implementation.

Media experts evaluated technical aspects such as visual design, attractiveness, clarity, ease of use, and media effectiveness using 20 indicators across eight aspects, while material experts assessed content accuracy, conceptual correctness, relevance to competency standards, clarity, and usefulness through 15 indicators across seven aspects. The results of these expert validations served as the basis for revising and refining the learning media to ensure they met established quality standards prior to being tested with students.

Table 2. Material Expert Validation Results

Indicators	Score Obtained	Maximum Score
Comformity	50	50
Servingg	50	50
Accuracy	46	50
Clarity	50	50
Aspect Coverage	40	50
Actualization	40	50
Involvement	50	50
Number of Screws	**326**	**350**
Present Criteria	**96% Highly Valid**	

Table 2 presents the validation results from the assessment of subject matter experts, reviewed across several aspects: material suitability, material presentation, truth and accuracy, topic clarity, adequacy of aspects, actualization, and involvement. Showing the indicators assessed in this aspect is very good. The material validation produced a score of 72, and the average score obtained was 4.8. After converting using the media validity criteria in Table 2, the results indicate 96% very valid criteria and no revisions from the validator.

The development of the water cycle diorama learning media was guided by questionnaire data on educators' and students' needs, which indicated that the learning media uses acrylic materials as a framework. To make it look livelier, this medium is also given blue stickers to replicate the sky. Then, the media is also given the impression of the sea in blue, using blue stereophotography. The water cycle diorama media is designed with a 3-dimensional model and uses replicas or icons for each material, so that students not only see and read, but can also apply them directly and clearly to the material presented.

Table 3. Media Expert Validation Results

Indicator	Score Obtained	Maximum Score
Involvement	50	50
Serving	46	50
Color	50	50
Size	50	50
Neatness	50	50
Graphic	50	50
Use	50	50
Effectiveness	50	50
Total Scores	**396**	**400**
Present Criteria	**98% Highly Valid**	

Table 3 presents validation results from media expert validators, reviewed from several aspects: student involvement, media presentation, color, size, neatness, graphics, use, and media effectiveness. Showing the indicators assessed in this aspect is very good. The validation of the learning media produced a total of 98 scores, with an average score of 4.9. After converting to the

media validity criteria in Table 4.3, based on the results from the validity criteria table in Table 3.8, a percentage of 98% with very valid criteria was obtained.

The development of the water cycle diorama learning media was guided by questionnaire data on educators' and students' needs, which indicated that the learning media uses acrylic materials as a framework. This medium is also given blue stickers to replicate the sky and make it look livelier. Then, the media is also given the impression of blue color as a replica of the sea using blue stereophotography cycle diorama media is designed with a 3- dimensional model and uses the replicas or icons needed for each material, so that students not only see and read, but can also apply directly and clearly according to the material presented.

The water cycle diorama media was also created as an evaluation material: a Snakes and Ladders board equipped with smart cards that contain questions about the water cycle. The water cycle diorama learning media were also tested for media validity with validators and for material validity with validators for Class V MI As Salam teachers. Furthermore, after the media are tested, the validity of the media experts and the material is declared very high. The media can be used in learning, especially in teaching science class V material on the water cycle.

The material and characteristics make the media selection stage for students. Then, the tools and materials used to manufacture the media will be collected. These materials include acrylic for aquariums, stickers to add color to the sky, Styrofoam, glue, ping pong balls, Dakron, bulbs/LED lights, aquarium sponges, switches, water pumps, plants, magnets, and steam USB machines. Meanwhile, the tools used include scissors, syringes, solder, solation, grenda, cutter, meter, and tools for drilling acrylic (drill). The following are the stages for creating a water cycle diorama learning media for science subjects on the water cycle.

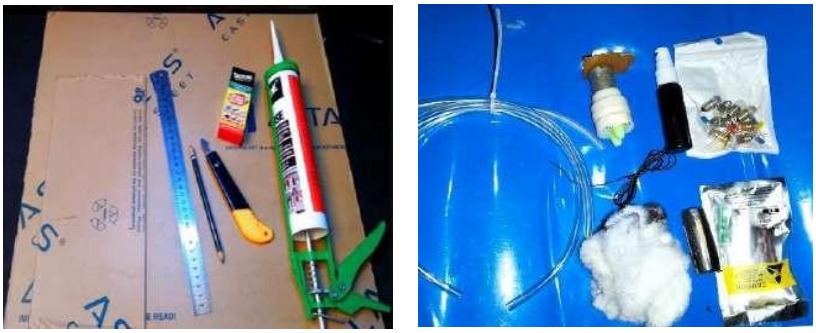

Figure 1: Tools and Materials

The image illustrates the materials and tools used to develop a diorama-based learning medium on the water cycle, with acrylic serving as the main structural component due to its strength and transparency. Supporting materials such as foam, synthetic grass, miniature plants, stickers, lights, water pumps, and steam devices were used to represent natural elements and water movement, while various tools, including cutters, glue, soldering tools, and drills, were utilized to assemble the components. The combination of these materials and tools resulted in an interactive, functional, and visually engaging diorama that effectively supports the learning process.

Figure 2 Media Frame Design

Acrylic cut to size. Next, assemble the media using injection glue, coat it with silicon glass glue to prevent leaks, and assemble it into a rectangular shape like an aquarium. The highest part of the acrylic is coated with blue stickers, and the base is coated with blue styrene. Perforation of high acrylic wall parts by drilling or up to a hole. These holes in acrylic are used for rain hoses, sunlight, cloud lights, and water vapor. Then, social science is illustrated.

Figure 3: Electrical Networking

At this stage, on the back, there is a box where an electrical circuit connects the adapter to the cable, which is then connected to a switch. Four switches can operate according to their function: switch 1 to turn on LED lights in the sun, switch 2 to turn on water vapor, switch 3 to turn on LED lights for clouds, and switch 4 to lower rainwater.

Figure 4: Illustration of the Front of the Water Cycle Diorama

The creation of a water cycle diorama learning media using existing materials, such as sun illustrations made from yellow ping pong balls, formed in a semicircle with bulbs/LEDs. The white cloud is made of delineated Dakron, and LED lights are placed in the center to enhance the visual clarity of the cloud. The black cloud is made of Dakron, the water vapor USB machine, which is described and then colored with black ink. There is a hose to drip water so it rains, while the black cloud that can walk in is given a front and rear magnet. The arrow marks and names are provided to explain their functions and uses. This design aims to visualize ideas for developing water-cycle diorama media.

Figure 5: Installation of Land and Sea Illustrations

The image above shows the installation stage of the illustration of the land and ocean on the Water Cycle diorama media. On the front of the media, the researcher added a visual element, such as a black aquarium filter, to depict the soil layer. The dark color of the filter creates a deep impression and enhances the illustration of Earth's surface contours. This element serves as a key basis for distinguishing land and ocean areas in dioramas.

On the surface of the filter, synthetic grass is installed to represent a green, fertile area of the soil. The researcher also attached mini ornamental plants to the artificial grass to create a natural impression and beautify the visual appearance. The arrangement of the plants is done proportionally to make it look realistic and aesthetically appealing. All these components are structured to create illustrations that are not only informative but also capable of capturing students' attention and improving their understanding of the water cycle.

Figure 6: Water Cycle Diorama Learning Outcomes

The image above results from a water cycle diorama media developed by the researcher. The illustrations in the water cycle diorama media are based on reality, including the media's

appearance, colors, and emphasized elements (Guedes, L. S., Zanardi, I., Span, S., & Landoni, 2023), (Scheersoi, A., & Tunnicliffe, 2019). The color in the diorama media is appropriate as the illustrations of the ocean, river, infiltration, and land (highlands, mountains, and lowlands). Based on the production results of the Water Cycle Diorama learning media development above, it is a learning material instead of a book. The press is presented concretely in line with water cycle diorama learning media were also developed, along with a media validity test and a material validity test with a material validator. Furthermore, after the media are tested, the validity of the media experts and the material is declared very high. The media can be used in learning, especially in the teaching of science class V material on the occurrence of the water cycle. In line with previous research, it is stated that when natural science learning media, such as weather materials, are deemed valid, they can be applied in the learning process. The water cycle diorama that has been developed is seen from the function of use, namely: (1) The water cycle diorama media has an attention function, namely attractiveness, (2) The water cycle diorama media has an affective function, namely improvement, (3) The water cycle diorama media has a cognitive function, namely achievement (Harrington, 2020,Cools et al., 2018) (4) Water cycle diorama media has a compensatory function, which means that the presence of images or elements of materials used in learning media can help students in organizing information in the media (Trowbridge, 2019, Hoekstra, 2019).

Water cycle dioramas have been successfully developed and proven suitable for classroom use as a learning medium. This medium is very appropriate for science learning in class V of MI, As Salam, especially for the material on the water cycle. A diorama, as a visual medium, provides an alternative to textbooks (Poli et al., 2018). So that it can clarify concepts and help students understand the material more easily.

Using this media is expected to provide tangible benefits for students, adding insight and increasing interest in learning. With engaging and interactive presentations, learning becomes more effective and fun. This certainly supports achieving optimal learning goals in the classroom.

CONCLUSION

Based on the results of research and development that have been carried out by researchers on the development of water cycle diorama learning media in science class V, MI As Salam, it can be concluded that water cycle diorama learning media was developed by looking at the results of questionnaire data on the needs of educators and students. Educators and students want acrylic as the primary material, measuring 40 x 20 cm, using colors to clarify the material, and icons/plants as illustrations in the media. The water cycle diorama media is designed with a 3-dimensional model and uses the replicas or icons needed for each material, so that students not only see and read, but can also apply the media directly and according to the material presented.

This research produced a water cycle diorama learning media product that achieved the following validity: the validation results from media experts yielded a total score of 98, with an average

score of 4.9. After applying the media feasibility criteria in Table 4.3, a total of 98% was obtained, with very valid criteria. The validation results from the assessment by material experts yielded a total score of 72, with an average score of 4.8. After being converted using the media eligibility criteria, it receives a total of 96% with very valid criteria. The limitation of the research lies in the study's limited location, which is a single school. Recommendations for further research include developing learning media in a broader scope of locations.

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