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DEVELOPMENT OF WATER CYCLE DIORAMA MEDIA TO IMPROVE STUDENTS' CRITICAL THINKING ABILITY

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Abstract

Research purposes this is to produce a product in the form of a water cycle diorama media that is feasible, practical, and effective for increasing the ability to think critically. Methods applied in research This is Research and Development (R&D) with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The population in this research was class V Mis Madinatussalam students, consisting of 30 students. Meanwhile, sampling in this study used a total sampling technique or used the entire population as the research sample. The data collection techniques used by researchers in this research were interviews, tests, and questionnaires. This research uses qualitative data through observation, interviews, and LKPD, while quantitative data is used through pre-test and post-test**.** In this research, the data obtained was analyzed qualitatively and quantitatively. Qualitative analysis is used to describe the product development process. Quantitative analysis is used to describe product quality assessments, response questionnaires, and test learning outcomes through effectiveness tests. The results of data analysis are used for product improvement. The use of diorama media at the time is feasible, practical, and effective for students in fifth-grade elementary school. The effectiveness of diorama media was measured using the N-gain test. The average pre-test and post-test was 0.41, with a percentage of 41% in the medium category. Future researchers can develop diorama media on different subjects to improve other 4C skills, such as creative thinking, collaboration, and communication.

Keywords Critical Thinking, Development, Diorama Media, Skills.

INTRODUCTION

Critical thinking is a term given to someone who has active skills in identifying, analyzing, evaluating (Bassham, 2019), arguments, and truth to overcome problems so that conclusions can be drawn about what can be trusted and what should be. Critical thinking is a careful thinking process to analyze and evaluate information (Fahruddin, 2012). Critical thinking is the ability to reflect on thoughts and solve a problem. (Robert Ennis, 1991) He says that Critical thinking is a person's reflective and reasonable thinking process that focuses on deciding what to believe or do, which means critical thinking is a person's reflective and reasonable thinking process that focuses on deciding what to believe or do. Critical thinking is a person's attitude when they encounter a problem that must be resolved and make a decision (Susanti & Saleh, 2022). So, critical thinking is an individual's ability to think systematically and rationally to analyze and evaluate an existing problem or fact so that conclusions can be drawn according to the knowledge they have.

Critical thinking is important for students to analyze and map out an answer or solution to every problem they face in the future (Yolanza & Mardianto, 2022). In modern times and with sophisticated technology that makes all information easier, critical thinking is very important for everyone to be able to identify false or illogical reasoning. Critical thinking will also help to make strong arguments based on evaluated evidence (Zakiyah & Lestari, 2019). Rapid technological developments and a lot of information are spread in the digital world, so it is necessary to have students' critical thinking skills at the elementary school level (Hasibuan, 2021). Through critical thinking skills, students are expected to be able to make decisions based on data and use logic that is believed to be correct (Purba, 2023). In the 21st century, the concept of critical thinking is starting to be frequently used in education along with the development of science and technology (Hamdani, 2019).

Partnership for 21st Century Learning states that in education, 21st-century participants must have Skills in *Critical thinking, Communication, Collaboration, and Creativity* or call with 4C skills (Hoir, 2019). Skills This, Of course, is just really needed in an effort to prepare participants so that they are later ready to face the global challenges (Prasasti & Anas, 2023). Ability to think critically This aimed at skills base participants educated and trained in analyzing, solving problems, and evaluating evidence found (Lailiyah & Widiyono, 2023). Skills think critically required in learning, especially in science lessons, of which there are many learning materials. This participant educated sued For can think in a way critical in solving a problem (Jannah & Atmojo, 2022).

Think critically is one of the Skills the 21st century is a must owned by participants to educate (Hoir, 2019). But in reality. Still, Lots of Indonesian children don't have the ability to do that; this can seen from the results of The recent Program For the *International Student Assessment* (PISA). This was announced on December 5, 2023. Indonesia is ranked 68th out of 81 countries with scores in mathematics (379), Science (398), and Reading (371). Survey results *The Trends in International Mathematics and Science Study (*TIIMS) in 2015 Indonesia is ranked 44th with an average score of 397. With TIMSS dividing criteria achievement participant survey into four: low (400), medium (475), high (550), and advanced (625); from the data, it can said Indonesia's position is at the level of low (Nizam, 2016). Conclusions obtained from this data show that participants' science scores students in Indonesia are classified as low. This signifies that participants' Indonesian education yet their own ability to think highly critically.

Research conducted by (Susanti, 2019) mentioned that the ability to think is critical for a student with a school base. No development with OK can be proven by the value results. Study students are still below KKM 75 and only get an average score of 66.67. Likewise, research conducted by (Karimah, 2023) Students at SDN Jatitengah 01 Regency Blitar own ability to think with low criticality. This can proven with low results evaluation mid-semester (PTS) in science lessons, where of 15 students in class V, 7 of them own PTS value below criteria minimum completeness of 70 given by the teacher. The problem happens Because students have difficulty understanding material and work questions if there is no learning media that supports it.

Through tests, early researchers conducted in class V of MIS Madinatussalam found that 60% of participants educated those who haven't yet reached the level of ability to think critically. This fact can be proven because out of 30 students, 18 students were not able to answer the test given. This is thought to be because the learning process carried out by teachers is still one-way, and there is a lack of use of learning media that can support students in thinking critically.

Based on the facts above, teachers can apply critical thinking through the use of learning media. Using learning media will develop students' 4C abilities, one of which is critical thinking (Jannah & Atmojo., 2022). A learning media that contains information and knowledge will be used to make the teaching and learning process more effective and efficient (Rambe, 2022). In the teaching and learning process, the existence of learning media has quite an important meaning. Because the material presented is clearer with the media (Khadijah, 2019), the use of media in the classroom can optimize the learning process (Karo-karo & Rohani, 2018). One of the subjects that can improve

students' critical thinking skills is science lessons. Science learning emphasizes providing direct experience to develop students' competencies so they can understand learning critically and scientifically (Wandini et al., 2022). To improve critical thinking skills, the media is needed to guide students in the learning process in order to increase their critical thinking skills (Sinaga & Anas, 2022).

One of the appropriate media to encourage students' critical thinking skills in science learning is Diorama Media. This diorama was first discovered by Louis Daguerre and Charles Marie Boutton and was first exhibited in Paris in July 1822. Diorama media is a three-dimensional medium for depicting actual phenomena but on a smaller scale (Pagarra et al., 2022). (Kristanto, 2016) Put forward, diorama media is a medium that has a real visual display on a small scale from the original. It can be concluded that a diorama is a replica of a scene or phenomenon in a smaller form.

This diorama media is suitable for elementary school children, whose cognitive capacities are still concrete operational (Aufa, Khairiah, et al., 2023). Because not all science material can be presented in a real way to students As the age development of elementary school students enters the concrete operational stage, supporting media is needed (Evitasari & Aulia, 2022). Concrete learning media will help students think critically to solve problems in learning. (Jannah & Atmojo, 2022). Natural Science (IPA) (Aufa, Luthfi, et al., 2023), so they require appropriate media to support students' critical thinking abilities. The development of diorama media in learning Natural Sciences (IPA) has become a strong impetus for this research. The development of diorama media is aimed at finding out whether the media can improve students' critical thinking skills in science learning. With this diorama media, students will be able to think critically.

Research on the development of diorama media has been carried out before, but only a few have carried out the development of diorama media to improve students' critical thinking skills. Recent studies have explored the development of water cycle diorama media to enhance students' critical thinking and learning outcomes in elementary science education. Research indicates that these dioramas can significantly improve students' understanding of the water cycle process and critical thinking skills (Laili et al., 2023). The development of these media typically follows established research and development (R&D) models, such as the 4D model or Borg and Gall model, involving stages like design, validation, and implementation (Humaira & Ninawati, 2023). Validation by experts and user trials consistently show high levels of validity and feasibility for these diorama media (Banegas, 2023; Pardy, 2020). Additionally, interactive multimedia learning tools

have been developed to complement diorama media, further enhancing students' analytical thinking abilities in water cycle education (Nur'Azizah et al., 2018). The difference between this research and previous research is that this research wanted to develop air cycle aroma media to improve students' critical thinking in fifth-grade science learning for elementary school students, whereas, in previous research, no one had researched it to improve critical thinking in elementary school students, either by air cycle aroma media or other media.

METHOD

This study uses type study development or R&D (*research and development).* R&D research methods acc (Sugiyono, 2019) Is method research used to produce a product specifically and test the product effectively used? This uses ADDIE (*Analysis, Design, Development, Implementation, Evaluation).* Research This aim is to create products in the form of Water Cycle diorama media for Science Subjects and testing eligibility.

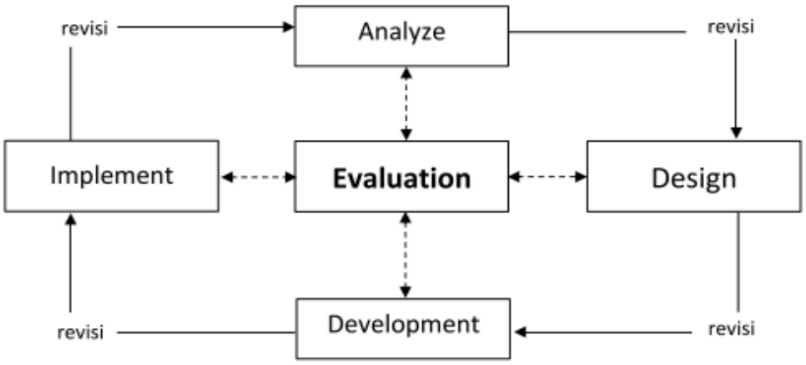

Figure 1. ADDIE Model Flow

Stage *analysis* aims to enable researchers to know What objective from learning media made, what desired goal was achieved, and who will how do you use this media. Method delivery, and planning like What will made. At stage *Design*, the researcher will begin the process of designing the media that will be created, identifying materials and sources of Power just needed, and developing the research instruments used. Activities at stage *development* cover the creation of appropriate media with existing plans created at the design stage, then validated by expert validators so that the media is created worthy of use in learning. At stage *implementation*, the researcher starts carrying out media trials in class and ensures that at that stage, this media can walk as planned. Trials were conducted in class V of MIS Madinatussalam. Last stage evaluation: This is done to determine the success rate of the development of the created media stage. This is also done in order to be able to revise what has been done, starting from stage analysis, planning, and

development.

This research was carried out at Mis Madinatussalam. The population in this research was class V students at Mis Madinatussalam, consisting of 30 students. Meanwhile, sampling in this study used a total sampling technique or used the entire population as the research sample. The data collection techniques used by researchers in this research were interviews, tests, and questionnaires. (1) Interviews are conducted before research with subject teachers to obtain the information needed to develop an LKPD. The information needed is in the form of materials and curriculum used in the learning process at Mis Madinatussalam. (2) Validation sheets are intended for material experts, media experts, and education experts to test the validity of the product being developed. This validation sheet is the result of comments and suggestions on the LKPD, which have been created to make it suitable for implementation in field trials. (3) Test the learning outcomes to determine the effectiveness of the multiplication LKPD in overcoming the difficulties of the multiplication calculation operation of the stacked roads that have been developed. (4) The student response questionnaire is used to determine the practicality of the LKPD multiplication of multiple paths from the responses/comments given by students on the questionnaire sheet.

In this research, the data obtained was analyzed qualitatively and quantitatively. Qualitative analysis is used to describe the product development process. Quantitative analysis is used to describe product quality assessments, response questionnaires, and learning outcomes tests. The results of data analysis are used for product improvement.

The instruments used in this research include observation, questionnaire sheets, pretest and posttest interviews, and documentation. The quality of the development product meets the following quality aspects, including a) validity, b) practicality, and c) effectiveness. Based on these criteria, the level of validity, practicality, and effectiveness is determined. In giving meaning where it is taken. The decision to revise the media used for qualifications has the following criteria:

Table 1. Percentage of Validity Criteria

Criteria	Information
75% < SV ≤ 100%	Suitable for use without repairs
50% < SV ≤ 75 %	Good to use but needs minor improvements
25 % < SV ≤ 50%	Not suitable for use but needs major repairs
0 % < SV ≤ 25%	Not suitable for use

Media expert validation questionnaire, material expert validation questionnaire, instrument validation questionnaire, and response questionnaire. Educator and student response questionnaires use a Likert scale (four scales). Because of that, the material expert validation

questionnaire assessment or score is four for very good answers, three for very good answers, three for very good answers, three for very good answers, and three for very good answers. Good answer, two bad answers, and one bad answer. Assessment is carried out through questionnaires by media experts by putting a checklist mark (√) in the column that has determined appropriate responses to statements that have been presented in the questionnaire. Calculation of average scores for each aspect. In this study, a questionnaire analysis used a Likert scale in the form of a checklist (√), which was processed by making a presentation with analytical formulas.

FINDINGS AND DISCUSSION

Findings

Analysis Stage (*Analysis*)

The analysis stage is the earliest stage researchers carry out in designing diorama media. This diorama media was developed to improve students' critical thinking skills. Through this analysis stage, the researcher can determine the purpose of the learning media created, how it will be delivered, and what kind of plans will be made through the information that the researcher obtains, such as what the conditions of the students are when studying in class, what curriculum is used. The information used was obtained from the results of physical observations carried out by researchers in class V of MIS Madinatussalam.

Next, the researcher created a critical thinking assessment instrument in the form of a critical thinking skills rubric based on critical thinking indicators, namely: (1) Providing a simple explanation (*Elementary Clarification),* (2) Building basic skills (*Basic Support*), (3) Providing a conclusion (*Inference),* (4) Providing further explanation (*Advance Clarification),* (5) Arranging Strategy and Tactics (*Strategies and Tactic).*

Design Stage (*Design)*

At this stage, researchers begin to design learning media that is as interesting as possible. Designing learning media includes (1) making a design, (2) adapting it to KI, KD, and learning objectives based on learning at the MIS class V level, (3) making LKPD according to the stages of students' cognitive development so that later the media developed can improve thinking abilities critical of students.

Development Stage (*Development)*

In this third stage, after the media has been designed, it will then be validated by two expert validators to find out whether the media is suitable for use in learning. The aspects assessed by expert validators are media suitability and material suitability. The assessment results obtained from expert validators can be seen in Table 2 below:

Table 2. Validation Test Results

No	Validator Type	Validation Score	Criteria
1.	Media Expert	85.5%	Very Valid
2.	Materials Expert	100%	Very Valid
	Average	92.7%	Very Valid

Value of validation Media experts get a percentage score of 85.5%, and marks from validation expert material get a score of 100%. This signifies that the media developed falls into the very valid category with an interval of 81% - 100%.

Stage Implementation

Next, in step four, this media trial is carried out, developed, and validated. Media tested: Try learning science material about the water cycle in class V. The practical value of Diorama Media is measured by using instrument evaluation from and response to participants' education. Value results in the practicality of diorama media can be seen in the formula under This:

$$\text{Practicality Value} = \frac{\text{Total jumlah keseluruhan}}{\text{nilai maksimum x banyak siswa}} \text{x } 100\%$$

$$= \frac{804}{960} \text{ x } 100\% = 83.75\%$$

Based on the results of the assessment of the student response questionnaire above, an average percentage score of 83.75% was obtained. This score is in the very practical category. The effectiveness of diorama media can be seen from the *pre-test* and *post-test scores. The results of the recapitulation of pre-test* and *post-test* scores can be seen in Table 3 below.

Table 3. Results of *pre-test* and *post-test* scores

No	Subject	Earned Average Value	
		Pre-test	***Post-test***
1.	30 Students Class V	56.6	74.5
	Average N-Gain		**0.41**
	Percentage		**41%**

The N-Gain obtained from the average *pre-test* and *post-test score* is 0.41. It can be said that the level of students' critical thinking increased by 0.41 or 41%. The N-gain value obtained was 0.41, including in the medium category with a range of $0.3 \leq g \geq 0.7$, and effective media was used.

Evaluation Stage (*Evaluation*)

The final stage of this research is evaluation. The media created has been validated and tested in class. Validation and trials are carried out to see the level of effectiveness of the media created. There are no critical comments or suggestions from students regarding the product during the trial, which can be used as a reference for revising the product. The assessment made by the validator of the diorama media is in the valid category, which indicates that the media is suitable for use.

Discussion

This research produces a product in the form of water cycle diorama media. Diorama media is three-dimensional media that depicts a real event or event on a small scale (Kristanto, 2016). Diorama media is suitable for students' cognitive development, namely concrete operations, where at this stage, children will think logically but only about physical objects. The results of increasing students' critical thinking skills from the tests in this research show significant improvements across various indicators. First, in providing a simple explanation (Elementary Clarification), there was a 23% increase, with 55% of students not achieving this indicator in the pre-test, compared to 78% achieving it in the post-test. This indicates that the diorama media is very effective in helping students understand basic concepts more clearly. Second, in building basic skills (Basic Support), the pre-test percentage was 60%, which increased to 65% in the post-test, showing a 5% improvement in students' abilities. Although this increase is relatively small, it still demonstrates that the use of diorama media can help reinforce the foundational skills of critical thinking.

The third indicator, providing a conclusion (Inference), saw a 10% increase in students' abilities, from 52% in the pre-test to 62% in the post-test. This improvement suggests that students became better at drawing conclusions based on the information they obtained. Fourth, in providing further explanation (Advance Clarification), there was a significant increase of 38%, from 56% in the pre-test to 94% in the post-test. This indicates that students became more proficient in offering deeper explanations of concepts or phenomena. Lastly, in regulating strategies and tactics (Strategies and Tactics), the percentage of students who could plan strategies or tactics in solving problems increased by 26%, from 57% in the pre-test to 83% in the post-test. This substantial increase signifies that diorama media is effective in helping students develop better strategic thinking skills. Overall,

these results demonstrate that the use of diorama media in learning can substantially enhance students' critical thinking skills (Chen et al., 2024; Lajthia et al., 2024; Yassin, 2024). The existence of diorama media will make it easier to understand the process of the water cycle because it is presented in a real way. This matter is in accordance with an opinion (Pentianasari & Firmannandya, 2022), who said that material presented in a way that is real or concrete would make it easier for participants to educate, understand, and remember the material lesson.

Diorama media can increase the ability of participants to educate. This is for thinking critically about science learning in the material water cycle. In line with research conducted by (Anggraini & Misnar, 2023; Cools et al., 2018; Karimah et al., 2023) Explained that diorama media can increase the ability to think critically about participant education and get it to help participants educate and understand the material. Through this diorama learning media, participants will be more active in learning and will find the concept Alone in understanding the material provided (Amanda & Istianah, 2022).

Achievement ability to think critically participants be measured using created tests based on indicators think critical, which include Giving an explanation simply (*Elementary Clarification),* building skills (*Basic Support*), Providing a conclusion (*Inference),* Giving an Explanation more continued (*advanced clarification),* Setting Strategies and Tactics (*Strategies and Tactics)* (Hölscher et al., 2024; Miličević et al., 2024; Oono et al., 2022). The critical thinking test is then analyzed based on the aspects to be achieved in the indicators. This test was created to determine the increase in students' critical thinking skills before and after using diorama media in learning. In line with the research (M. L. . Saputri et al., 2021)Which states that thinking ability tests can improve students' critical thinking abilities.

The results of increasing students' critical thinking skills from the tests in this research show significant improvements across various indicators. First, in providing a simple explanation (Elementary Clarification), there was a 23% increase, with 55% of students not achieving this indicator in the pre-test, compared to 78% achieving it in the post-test. This indicates that the diorama media is very effective in helping students understand basic concepts more clearly (Chu et al., 2018). Second, in building basic skills (Basic Support), the pre-test percentage was 60%, which increased to 65% in the post-test, showing a 5% improvement in students' abilities. Although this increase is relatively small, it still demonstrates that the use of diorama media can help reinforce the foundational skills of critical thinking (Vasseghipanah & Haghir, 2024).

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The development of this diorama media has been validated by expert validators and received a score percentage of 85.5% from media experts and 100% from material experts who placed diorama media in the category suitable for use in learning. Validation is carried out by the validator using a validation sheet in the form of a (Du et al., 2024; Mohammed et al., 2024). This validation sheet is designed to ensure that the diorama media created is suitable for use in learning. This validation sheet is a reference for the success of the research itself (Saputri, 2023) .

CONCLUSION

Based on the data from the development research above, it can be concluded that the use of diorama media is effective and suitable for use in the learning process. This diorama media meets the assessment criteria, which can be proven by the assessment scores of expert validators. The media validator gave a score of 33 with a percentage of 85.5%, and the material validator gave a score of 40 with a percentage of 100%. The recapitulation result of the scores of the two experts was 92.7%; this shows that it is in the very valid category. This shows that this diorama media is suitable for use in the learning process. The effectiveness of this Diorama Media is in the very practical category to use, with a percentage of 83.75% obtained from the analysis of questionnaire scores given to students. The N- *Gain* obtained from the average *pre-test* and *post-test* was 0.41, including the interval category $0.3 \leq g \geq 0.7$ in the medium category. This shows that diorama media is effectively used in the learning process.

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