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Development of Diorama Media in Science Subject for 5th Grade Elementary Student

Sulaiman[1], **Meirza Nanda Faradita**[2], **Ishmatun Naila**[3], **Qaulan Sadida**[4]
[123] Universitas Muhammadiyah Surabaya, Indonesia
[4] Universitas Gajah Mada Yogyakarta, Indonesia
e-mail: ishmatunnaila@um-surabaya.ac.id

Abstract: Observations carried out by researchers in class V SDIT Ar Rayyan Surabaya found that the media used in the science and science subjects in class V SDIT Ar Rayyan did not use diorama media. This research aimed to determine the level of validity, effectiveness, and practicality of Terrarium Ecosystem Diorama media using the R&D method with the ADDIE model because the work stages are systematic, each phase is evaluated and revised, so the resulting product becomes a valid product. The data collection techniques used are validity, effectiveness, and practicality tests, use the following data collection techniques: Validation Sheet, Test Sheet, Student Response Sheet. Then the data analysis technique used is a descriptive analysis technique that calculates the percentage value of the results, the results is Terrarium Ecosystem Diorama Media gets a media validity value of 95.5% and a material validity value of 92.69%, which is the percentage included in the very valid category. Testing the effectiveness of this medium resulted in 85% of students achieving the KKTP score. This media practicality test received a percentage score of 84% and was included in the very practical criteria. Therefore, this Terrarium Ecosystem Diorama media can be stated as valid, effective, and practical.
Keywords: Media, Diorama, Science and Technology, Independent Curriculum.

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A. Introduction

The integration of instructional media in primary education has become an increasingly urgent priority in supporting effective teaching and learning processes. In the context of science education, where learners are often required to grasp abstract and complex concepts at an early age, visual and tactile media are instrumental in enhancing comprehension, engagement, and retention (Gopalan et al., 2017; Yildirim, 2020). Research has shown that multimodal teaching strategies, especially those that incorporate physical representations, enable students to better connect theoretical knowledge to real-world phenomena, thus enriching their conceptual frameworks (Mayer, 2009; OECD, 2019).

In 2023 the government through the Curriculum Standards and Educational Assessment Agency, Ministry of Education, Culture, Research and Technology, through the Decree of the head of BSKAP, Ministry of Education, Culture and Research and Technology Number 022/H/KR/2023 concerning educational units implementing the implementation of the independent curriculum in the 2023/2024 academic year, in the Fourth Dictum decided that the educational unit as referred to in the First Dictum letters b, c, and d is the educational unit implementing the implementation of the Independent Curriculum since the 2022/2023 academic year which changes the category of independent learning to independent change or independent sharing implementing the implementation of the Independent Curriculum with the following provisions: a) PAUD for students aged 4 to 6 years, b) SD/MI/equivalent in grades 1, 2, 4, and 5 (Kemendikbudristek, 2023). Referring to the decree, the author conducted research on class V science and science subjects, adapted from the Ministry of Education and Culture's website regarding essential matters of learning at elementary school level, that in the independent curriculum Natural Sciences (IPA) subjects and Social Sciences (IPS) subjects merged into one subject, namely Natural and Social Sciences or IPAS (Ihsani et al., 2023). In the pocket book published by the Ministry of Education and Culture entitled "Independent Curriculum Question and Answer Pocket Book", this merger was carried out with the hope that after these two subjects were combined students would be triggered to manage the social environment and the natural environment in one unit (Kemendikbud, 2022).

Despite its recognized importance, instructional practice in many Indonesian elementary schools remains predominantly teacher-centered. Preliminary observations at SDIT Ar Rayyan Surabaya revealed that science instruction is often limited to conventional lectures or simple digital presentations, which may not fully engage students or support deep understanding. In conditions where technological infrastructure is inadequate, reliance on passive learning strategies further exacerbates learning gaps. The lack of interactive, context-relevant, and low-cost media represents a critical shortcoming in current pedagogical practice, particularly in achieving the aims of the new integrated “IPAS” curriculum that combines natural and social sciences.

Curriculum, according to Mauritz Johnson, is defined as an important part of education which functions to direct and predict teaching outcomes. This curriculum is not just a list of teaching materials or topics but a comprehensive plan that covers various important elements of the educational process. The curriculum regulates what type of material must be taught to students, the range of topics that must be studied thoroughly, and the hierarchy or sequence of material that is arranged logically and systematically. In addition, the curriculum regulates the educational process which includes the approaches, teaching, learning strategies, and assessment procedures used to ensure that educational goals are achieved (Pattylima et al., 2023).

Piaget's cognitive learning theory suggests that a child develops and builds himself through the surrounding environment according to age or stages which have been divided by Jean Piaget, formulating a theory of cognitive development which classifies children's thinking processes into four stages. The sensorimotor stage lasts from birth to two years of age, where babies understand the world through sensory and motor skills. The preoperational stage, from ages two to seven, is characterized using symbols for the representation of objects without understanding logical operations. The concrete operational stage, ages seven to eleven, occurs when children begin to think logically about real events but struggle with abstract concepts. The formal operational stage, which begins around the age of eleven, allows children to start thinking logically about concrete things but has difficulty with abstract concepts (Agustyaningrum & Pradanti, 2022).

In the scheme described by Piaget, it is explained that a child's abilities and knowledge increase as he gets older, in this case books function as the main source of information, while the teacher acts as a facilitator who manages the learning process. Thus, teachers must have the skills to provide facilities to support children's learning, among the facilities that teachers must master skillfully are learning media (Amalia Rahmi & Febrina Dafit, 2022).

Currently, the world of education has entered the 4.0 era and is moving towards the 5.0 era, which means teachers must try to keep up with the times, carry out educational reforms that are sustainable, planned and on target. The strategy for improving the quality of education is an effort to improve the overall quality of education and it is necessary for teachers to adapt to these changes. Teachers can use various approaches to improve the quality of education as facilitators of the teaching and learning process. This includes innovation in learning, namely in the use of the latest technology and more interactive and participatory learning methods. Through these adaptation efforts, teachers can help students acquire skills that suit the needs of the times and encourage the creation of a fun and efficient learning environment (Faradita, 2018). Elementary school teachers have a big responsibility as educators of the nation's next generation, teachers are tasked with creating quality human resources in the future (Naila et al., 2021).

Researchers looked at the needs of the subject, namely learning media, this is an important aspect of the learning process, especially in the science and science learning subject which requires visualization so that students can understand the material well and correctly. One of the factors that causes the success of learning is the learning media itself (Mirnawati et al., 2023).

Gagne and Briggs stated explicitly that learning media clearly includes various physical tools and equipment that are used to convey material to students. This media is very important for the educational process because it supports teachers to provide efficient and interesting information. By using various learning media, material can be delivered with strategies that are simpler for students to understand and remember. Apart from that, the use of various learning media can also improve student learning outcomes. (Kaltsum, 2017).

The use of learning media in the educational process has great potential to improve student academic achievement. Teachers can make teaching and learning activities more interactive and attractive using appropriate educational media, such as making material into animations that attract students' interest. This can increase students' involvement and attention, encouraging their desire to learn. Because this high level of motivation contributes directly to improved academic performance, it is very important. Learning media not only helps in conveying information but also helps create a dynamic and enjoyable learning environment, thereby helping students achieve optimal educational results (Febrita & Ulfah, 2019).

The learning media that researchers use is manipulative media, researchers use manipulative media to make it easier for teachers to explain ecosystem material in the IPAS subject, teachers can manipulate the media according to the ecosystem material that will be explained, such as ecosystem material around rivers, rainforest ecosystems and others. so on, with the hope that it will be easier for students to understand the material that has been explained because they see directly the process of an event occurring in an ecosystem.

This is in line with the definition of manipulative media explained by Lorton, namely that manipulative media includes various types of objects that can be seen, touched, heard and manipulated directly by students. This includes everything that is concrete and can be used in learning activities to improve students' understanding of concepts (Arifah & Utami, 2023). Media functions as a tool or means to facilitate the delivery of messages from the sender to the recipient. Teachers as designers and implementers of learning activities must be able to create classroom situations and conditions that can stimulate students (F. Setiawan, 2017). The purpose of using media is to ensure that the message conveyed can be understood clearly and precisely by the recipient. Media can be in various formats, such as text, images, video, audio, or a combination of all these formats. With effective use of media, the communication process becomes smoother and more efficient, so that recipients can understand the message better.

Diorama media, as three-dimensional learning aids, offer significant potential to address this gap. Dioramas provide concrete, hands-on learning experiences that allow students to visually and physically explore complex topics such as ecological systems, biodiversity, and interdependence between living and non-living components. Studies indicate that when students interact directly with diorama models, they exhibit higher motivation, deeper cognitive engagement, and improved scientific reasoning (Aurélio et al., 2021; Boaventura et al., 2021). Moreover, by employing eco-themed terrarium-style dioramas, educators can effectively promote environmental literacy, one of the critical competencies of 21st-century learners, while encouraging students to develop empathy and responsibility toward nature (Ardoin et al., 2023; UNESCO, 2022).

There is relevant previous research, namely that published in the article entitled "Use of Diorama Media in Learning with the Sub-theme Let's Love the Environment in Elementary Schools." The results of this research show that students at SDN Cibeureum 1 stated that they were happy to learn using interesting and new learning media (Sa'bani et al., 2017). The second relevant research was research in class V of SDN Singapaducurug which produced data that the pre-test on cognitive learning outcomes carried out by the researcher showed results in the low category, and after implementing diorama media the researcher conducted a post-test and showed results in the medium category, the increase in the value of students' cognitive learning outcomes was very likely. Due to the high enthusiasm of students when learning is carried out using Diorama media, this causes students to understand more quickly and easily remember ecosystem learning material (Aris & Hanifah, 2021). There is one relevant previous research, conducted by (Luh Komang Widya Santhi et al., 2020), this research states that the Visualization, Auditory, Kinesthetic (VAK) learning model which is assisted using diorama media can increase students' knowledge competence.

While existing research has demonstrated the pedagogical benefits of dioramas, many of these studies emphasize aesthetic or engagement outcomes rather than curriculum alignment and conceptual mastery. Furthermore, few have developed dioramas specifically tailored to the IPAS learning objectives within the Indonesian elementary education context. This study seeks to fill that gap by designing and validating an ecosystem-based diorama model that integrates core science content with hands-on exploration and sustainability principles.

Therefore, the aim of this research is to develop a valid, practical, and effective diorama instructional media focused on the ecosystem theme for Grade 5 science learning. Based on the observations that the author has made at SDIT Ar Rayyan Surabaya, the result is that, in class V, the science and science subject has not implemented 3D learning media, especially dioramas. For a long time, the learning media used has been in the form of digital media in the form of videos or photos, and problems often arise if using digital media means that some of the teacher's digital devices do not support the school's facilities. It implies the need for a functional, adaptable, and effective diorama learning media. Thus, through a structured development and evaluation process, this study contributes both theoretically and practically to the advancement of context-based science education and the integration of environmental literacy in primary classrooms.

B. Method

In the research that the author is currently conducting, he applies the Research and Development (R&D) method, this method has the main goal of creating products that are tested through empirical procedures (Mulyatiningsih, 2016). This product development process involves stages that are documented and evaluated at each step. This research and development activity requires quite a long time. Researchers organize research activities into several stages, including observation and planning the design to be developed. The

subjects in this research are class V students at SDIT Ar Rayyan, and the object that will be studied is the use of learning media in class V science subjects.

The ADDIE model was employed for development, focusing on the analysis, design, development, implementation, and evaluation phases in various fields, such as education and professional development, are designed and implemented using this model (Xue et al., 2023). The author uses this model because he is able to find needs, create the right solution, create materials and products (Prananda & Wardana, 2020).

This research model is an effective one for developing learning media because the work stages are systematic, each phase is evaluated and improved on the previous stage, so that the product produced by this development research is a valid product (Azizah, 2016).

Data collection carried out is validation, questionnaires and tests. Below is a chart of the ADDIE development model.

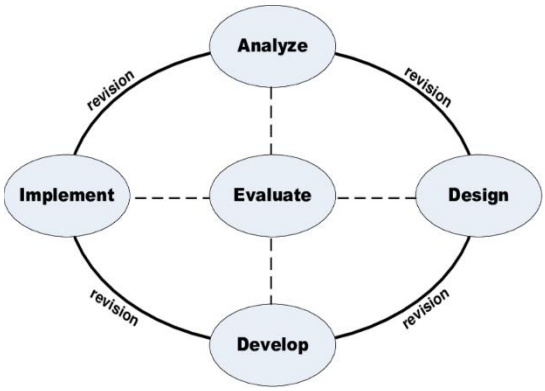

Figure 1. ADDIE development model chart.
Source: (Anggraeni et al., 2019)

Data Collection Techniques, the data collection technique instruments used in this research are: 1) Validation Sheet, 2) Test Sheet, 3) Student Response Questionnaire Sheet. The data analysis technique used in this research uses descriptive analytical techniques which calculate the percentage of result values.

Researchers analyzed validation data from media and material experts using a Likert scale to obtain validation data from experts. The Likert scale that researchers used had a score range of 1 to 5, with the following criteria: 1) very invalid, 2) invalid, 3) quite valid, 4) valid, 5) very valid. The Likert scores obtained are then processed using the following formula.

$$\text{p (\%)} = \frac{\text{total score obtained}}{\text{the highest score}} \text{ x } 100\%$$

Source: (Bintiningtiyas et al., 2016)

The feasibility of learning media is equated with the score percentage results. So the greater the resulting score, the greater the level of eligibility. The barometer for giving scores in the media validation test is as follows.

Table 1. Validation Scoring Barometer

No	Percentage	Information
1.	80%-100%	Very Valid
2.	60%-79.99%	Valid
3.	50%-59.99%	Less Valid
4.	0-49.99%	Invalid

Source: (H. R. Setiawan et al., 2021)

Data analysis of student evaluation test results, the level of effectiveness of this media is analyzed using the evaluation sheet given to students, the benchmark for effectiveness is seen from the final score of student evaluation results who have achieved classical completeness of 75% with a Learning Objective Completeness Criteria (KKTP) score of at least 75. The formula for determining the percentage of media effectiveness is as follows:

$$\frac{\text{the complete number of student}}{\text{total number of student}} \text{ x } 100\%$$

Source (Aprianti, 2019)

Analysis of data from student response questionnaires, the level of practicality of this media was analyzed using a questionnaire sheet on student responses to the media, with the following criteria: 1) strongly disagree, 2) disagree, 3) quite agree, 4) agree, 5) strongly agree. After the Likert score is obtained, it is processed using the following formula:

$$p = \frac{f}{N}\ x\ 100\%$$

Information:

p : percentage
f : score obtained
N : maximum score
Source (Anissa et al., 2020)

The practicality of the media is equated with the score percentage results. So the greater the resulting score, the greater the level of eligibility. The barometer for scoring the level of practicality is as follows.

Table 2. Practical Test Score Barometer

No	Percentage	Information
1.	80%-100%	Very practil
2.	60%-79.99%	Practical
3.	50%-59.99%	Not practical
4.	0-49.99%	Not practical

Source: modification from (H. R. Setiawan et al., 2021)

After the percentage results for each student are obtained, then the results are processed to find the average value using the following formula:

$$x = \frac{\Sigma \text{ x}}{\Sigma \text{ N}}$$

Information:

x : average percentage
Σ x : the number of percentages obtained
Σ N : many students

C. Results and Discussion

Results

The results obtained from the research that has been carried out are terrarium diorama learning media, where this media has gone through 5 stages of the ADDIE development model, namely:

Analysis

In this first stage, the researcher carried out an analysis of the experimental class, namely class V SDIT Ar Rayyan Surabaya, the author looked at the constraints and barriers that existed in the class, from the observations the author carried out, the results were that science learning in class V SDIT Ar Rayyan had not used diorama learning media, and 50% or 10 out of 20 class V students have science evaluation results below the ~~KKM~~ learning objective achievement criteria which is called *Kriteria Ketercapaian Tujuan Pembelajaran* (KKTP). After getting the problem formulation, the researchers carried out an evaluation by planning to make more interesting media in the hope of increasing the results of student evaluation scores. The results of this evaluation led to the procurement of diorama media. Diorama media was chosen because the science subject needed something that made it easier for students to visualize things. The presence of visual media has a big impact on students in the teaching and learning process, especially in gaining an understanding of the material being studied (Supardi, 2017)

Design

The second stage that the researchers carried out was designing terrarium ecosystem diorama media. This media was designed by looking at class needs, including adapting this media to learning objectives, planning the content contained in the media and adapting it to the learning material. The media design process is divided into 3 stages, namely: a) Sketch, the initial design is made in the form of a sketch on HVS paper. b) Layout, the sketch results that have been made are then converted into vectors to get a visual estimate that is close to precise. c) Application, when the design is felt to be interesting enough, the researcher begins to build this terrarium diorama media guided by the material and learning objectives.

After the prototype was ready, the researchers evaluated the results of the initial design. From the evaluation carried out, they found that in the first design, the biotic and abiotic components in the terrarium media were less varied.

Figure 2. Results of Media Protoype stage 1

Development

In the third stage, researchers carried out development of the first prototype, referring to the results of the second stage evaluation, namely the lack of variety in biotic and abiotic components. Therefore, researchers developed this media by adding several variations to the biotic and abiotic components, namely: buche palandra plants, micro green plants, red plants, compost soil, and red stones.

Figure 3. Media Prototype Results Stage 2 After Development

Media validation was carried out by two FKIP UM Surabaya lecturers and one class V teacher at SDIT Ar Rayyan Surabaya, using a validation questionnaire sheet. And get the following results.

Table 3. Media Validation Test Results

Media Validation Test Results	
Validator	Percentage
Media expert I	88.3%
Media expert II	100%
Media expert III	98.3%
Total	286.6%
Average	95.5 %

From the results of the validation questionnaire above, it can be concluded that the media developed received an average score of 95%. So this media is included in the very

valid category. Material validation, material validation was carried out by 2 FKIP UM Surabaya lecturers and 1 class V teacher at SDIT Ar Rayyan using a validation questionnaire sheet. And get the following results.

Table 4. Material Validation Test Results

Material Validation Test Results	
Validator	Percentage
Material expert I	87.27%
Material expert II	96.3%
Material expert III	94.5%
Total	278.07%
Average	92.69 %

From the results of the validation questionnaire above, it can be concluded that the media developed received an average score of 92.69% and is included in the very valid category. At the end of stage 3, researchers carried out an evaluation, namely adding small animals.

Implementation

In this fourth stage, the researcher implemented terrarium diorama media in the fifth grade science subject at SDIT Ar Rayyan Surabaya. When the researcher showed this media, the students' responses were very enthusiastic and eager to carry out the learning, they asked questions about what the researcher had brought.

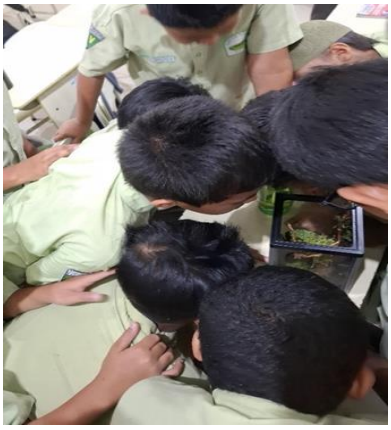

Figure 4. Students Who are Interested in Terrarium Learning Media

When the learning activities took place and the researcher explained the learning material with the help of terrarium media, students showed great interest in learning, this could be seen from their attitude who actively participated in questions and answers and discussions. This happens because there is an attractive media display, so that students become enthusiastic, in accordance with research conducted by (Muchtar et al., 2023). At the end of the lesson, the researcher tested the effectiveness of the learning media. This effectiveness test can be measured by looking at the increase in students' final test results. If 75% of the total students have achieved a score above KKTP, namely 75, then this media is considered effective. To get the effectiveness results above, the researcher gave evaluation test sheets to all students, and got the following results.

Table 5. Student Final Test Results

No	Student's Name	Initial Value	Final Score
1.	AF	38	87.5
2.	AFA	60	87.5
3.	AA	38	62.5
4.	AHB	80	72.5
5.	AFZ	68	100
6.	DAA	78	85
7.	EI	85	100
8.	GGA	83	87.5
9.	HCB	78	80
10.	IAZ	78	100
11.	ISS	45	87.5
12.	MDA	60	100
13.	MAM	78	100
14.	MAO	73	100
15.	MAA	80	100
16.	MAI	45	67.5
17.	MIH	75	100
18.	SA	68	100
19.	SHA	40	75
20.	UDB	50	100

From the results above, it can be concluded that 85% of the total number of students have achieved the KKTP score, this is an increase from the previous test results, namely 55% of students who achieved the KKTP score. Judging from the results of student test scores which show a significant increase, this media can be concluded as an effective medium for learning ecosystem material.

After carrying out the effectiveness test, the researcher carried out a media practicality test by giving response questionnaire sheets to students and obtained the following results.

Table 6. Results of Student Questionnaire Responses

No	Student's Name	Questionnaire Scores	Percentage
1.	AF	23	92%
2.	AFA	22	88%
3.	AHB	22	88%
4.	AFZ	21	84%
5.	EI	22	88%
6.	HCB	22	88%
7.	IAZ	23	92%
8.	ISS	21	84%
9.	MDA	23	92%
10.	MAM	21	84%
11.	MAO	20	80%
12.	MAA	25	100%
13.	MAI	20	80%
14.	MIH	23	92%
15.	SHA	20	80%
16.	UDB	25	100%
17.	AA	18	72%
18.	DAA	19	76%
19.	GGA	14	56%
20.	SA	16	64%

From the student response questionnaire sheet above, the results obtained were that 16 out of 20 or 80% of students stated that this media was very practical and 20% stated that this media was practical.

Evaluation

The 5th stage in the ADDIE development model is to carry out a comprehensive evaluation, based on the results that have been obtained. In this study, the evaluation carried out by the researcher was to evaluate and revise the components of the media content, where previously the media was only filled with flora, so the researchers added fauna components, namely worms and insects. Then the researchers also added lights as lighting to replace the role of sunlight, so that photosynthesis continues to occur in plants. Apart from that, the researchers also added media information, so that students know what content is in the media.

Discussion

The validation results of the terrarium diorama media show an average score of 95.5%, placing it in the “very valid” category. This high validity can be theoretically explained by the alignment of the media’s design with the principles of constructivist learning, which emphasizes student engagement through tangible, contextual materials

(Mayer, 2009). Practically, this outcome is consistent with previous research that found diorama-based learning media supports meaningful learning by visualizing abstract science content into concrete experiences (Sa'bani et al., 2017; Supardi, 2017). The involvement of multiple expert validators, including both university lecturers and classroom teachers, also ensures triangulated perspectives in the assessment process, thereby enhancing its credibility.

The effectiveness of the diorama media is evident from student test results, where 85% of the students achieved the minimum criteria (KKTP). From a theoretical standpoint, this result supports Piaget's concrete operational stage theory, which emphasizes the importance of hands-on experiences in children's cognitive development (Agustyaningrum & Pradanti, 2022). Dioramas provide a visual-spatial context that facilitates schema construction, especially in science topics such as ecosystems that involve complex relationships between biotic and abiotic elements. In comparison, Aris and Hanifah (2021) similarly observed significant cognitive gains after using diorama media in science classes, indicating that this method has consistent benefits across contexts.

The practicality test revealed that 80% of students rated the media as "very practical" and 20% as "practical," showing overall favorable responses. This is important because practical media not only save instructional time but also maintain students' enthusiasm and engagement throughout the learning process. According to Aris and Hanifah (2021), manipulative media that engage multiple senses tend to be more effective in sustaining attention and improving comprehension. The positive student feedback also supports the notion that tactile and immersive learning environments enhance affective outcomes, such as motivation and enjoyment, which are often overlooked in traditional evaluation methods.

Comparatively, the study's innovation lies in the integration of terrarium elements into a diorama format, adding ecological realism. This hybrid media expands upon the traditional diorama approach used in studies like (Sa'bani et al., 2017), by incorporating live components such as microgreens and decomposers to simulate real ecological processes. Such realism enhances ecological literacy by enabling students to observe real-time interactions within ecosystems. This adds a unique contribution to the field of science education, particularly in the context of the Merdeka Curriculum's emphasis on independent, inquiry-based learning.

In conclusion, the development and implementation of the terrarium diorama media demonstrate robust validity, effectiveness, and practicality, validated both empirically and theoretically. When aligned with constructivist learning principles and contextualized within the current curricular framework, this media shows promise in improving not only cognitive learning outcomes but also student engagement and environmental awareness. For future research, further trials across varied schools and integration with digital tools could expand the scope and adaptability of this media, supporting its scalability and sustainability in broader educational settings.

D. Conclusion

The development of Terrarium diorama media carried out by researchers resulted in a Rainforest Ecosystem Terrarium media product. To produce this media, it has gone through 5 stages of the ADDIE development model and validation tests, effectiveness tests and practical tests have been carried out. Validation tests of the media and materials on this product showed that the level of validity of the Rainforest Ecosystem Terrarium media was 95.5% and the level of validity of the material from this media was 92.69% and was included in the very valid category. The results of the media effectiveness test showed that 85% of students had completed the KKTP after carrying out learning using Terrarium media. And the practical test of this media showed that 80% of students considered this media to be very practical, and 20% of students considered this media to be quite practical. So it can be concluded that the development of Terrarium Ecosystem diorama media is valid, effective and practical media development. And this research can be used as a reference for further research related to the ADDIE development model or Diorama media development.

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