



The Effect of Ethnopedagogically-Based Diorama Media on the Science Literacy Skills of Elementary School Students

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Abstract: This study aims to analyze the effect of ethnopedagogic-based diorama media on the science literacy skills of fifth-grade students at SDN Padike III. The research employed a quantitative approach with a pre-experimental method and a one-group pretest-posttest design involving 30 students. Data were collected through tests, observation, questionnaires, and documentation, then analyzed using paired sample t-test and N-Gain analysis. The results showed a significant difference between pretest and posttest scores ($p < 0.05$), with an N-Gain value of 0.60, which falls into the moderate category. Students' responses to the use of the media were also in the good category. It can be concluded that ethnopedagogic-based diorama media is able to improve students' science literacy skills and can serve as an alternative IPAS instructional medium that is more contextual through the integration of local culture.

Keywords: Diorama media; Ethnopedagogy; IPAS learning; Science literacy

Introduction

Scientific literacy is one of the key competencies that students must possess from elementary school onwards. As explained by Limiansih et al., (2024), scientific literacy is an individual's ability to apply scientific knowledge and skills to understand and make decisions related to the natural environment.

Based on the results of the 2022 PISA (Programme for International Student Assessment) assessment, Indonesia ranked 67th out of 81 participating countries in science, with an average score of 383. This indicates that students' science literacy is categorized as low. Although PISA measures the abilities of 15-year-old students, these results reflect the need to strengthen science literacy starting from elementary school as the initial stage in developing students' scientific thinking skills. The low achievement in science literacy indicates that science education in schools still needs to be improved, particularly in developing critical thinking

skills and the application of scientific concepts in real life (OECD, 2023; Rustan et al., 2024; Zibar et al., 2025).

In efforts to develop students' science literacy skills, IPAS instruction in elementary schools plays a crucial role, as it is not only oriented toward mastery of basic concepts in natural and social sciences, but also trains students to understand natural phenomena, formulate scientific questions, conduct observations, and relate learned concepts to everyday life. Therefore, IPAS instruction should serve as the primary vehicle for fostering students' science literacy skills from an early age, and must be designed actively and meaningfully to comprehensively train students' scientific processes.

In the learning process, there are factors that can affect students' scientific literacy skills, including internal and external factors. Internal factors include students' motivation, interests, and study habits, while external factors include family, educators, learning models, and learning media. This is evidenced by facts in the field, as shown by the results of observations and

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initial interviews with a fifth-grade teacher at SDN Padike III, Talango Subdistrict, which obtained information that students' scientific literacy skills are still relatively low, with many students experiencing difficulties in understanding the scientific concepts being taught. Although instructional media have been used, the media and teaching materials employed are still limited to textbooks and two-dimensional images, thus affecting students' concrete learning experiences.

The limited availability of learning media is suspected to cause students to quickly feel bored and less interested in participating in lessons. This condition results in low learning motivation and active student engagement in the learning process, and creates the perception that science learning is very difficult to understand, which ultimately affects students' low science literacy skills.

The issue indicates that IPAS instruction at SDN Padike III still requires innovation, particularly in the use of learning media that are more concrete, engaging, and capable of comprehensively developing students' scientific literacy skills. Researchers offer a solution through the use of ethnopedagogically based diorama media as a three-dimensional representation of a display or scene intended to depict real-life events or situations.

Previous research indicates that the use of innovative instructional media such as dioramas plays an important role in improving the quality of IPAS learning in elementary schools. The findings of the study conducted by Murdani et al. (2024) identified that the use of diorama media assisted by the guided inquiry model can significantly improve the science literacy skills of fifth-grade elementary school students.

In line with this, Maulana et al. (2025) in their study concluded that the implementation of the Project Based Learning model assisted by diorama media was able to significantly improve students' science literacy, as indicated by the increase from pretest to posttest scores. These findings support the idea that diorama media can contribute positively to enhancing students' science literacy skills. In addition, other studies have also revealed that diorama media is effective in increasing students' interest and learning outcomes in IPAS instruction. This study strengthens the theoretical foundation that diorama media is relevant for use in IPAS instruction (Maulana et al., 2025).

Studies on culture-based learning approaches, such as ethnopedagogy or ethnoscience, have also shown positive results for science literacy. In their research, (Amilia Rohmah & Julianto, 2025) revealed that integrating local wisdom into learning media can enhance students' science literacy through contextual and meaningful learning. This is supported by Rahmawati et al. (2020), who state that the ethnopedagogical approach not only enhances science

literacy but also strengthens students' cultural identity in science learning. Research conducted by Lestari & Zulirfan, (2024) reinforces the assertion that local culture-based learning can have a positive impact on learning outcomes and science literacy.

Nevertheless, based on the review of several studies above, there are still some research gaps. Most studies related to diorama media continue to focus on improving learning outcomes, motivation, or conceptual understanding, and have not yet extensively examined its effect on scientific literacy as a 21st-century competency. In addition, although some studies have explored scientific literacy, the use of diorama media is generally still combined with certain instructional models (such as inquiry, PBL, or PjBL, Discovery Learning), so there has not been much research that specifically develops diorama media as a primary innovation based on local context.

Research related to ethnopedagogy has primarily focused on the development of models or media based on culture in general, such as digital media or ethnoscience, and there are still few studies that directly integrate it with concrete media such as dioramas in IPAS learning in elementary schools. In addition, there has not been much research that specifically examines the integration of ethnopedagogical-based diorama media within the context of students' distinctive environments, such as coastal or archipelagic regions. This gap represents an important opportunity for research.

Thus, this study offers novelty in integrating diorama media based on ethnopedagogy as an effort to improve students' scientific literacy skills. This integration is expected to contribute to providing learning that is more concrete, contextual, and relevant to students' everyday lives, as well as optimally enhance students' scientific literacy skills.

Theoretically, the use of ethnopedagogy-based diorama media can be linked to constructivism theory, which emphasizes the importance of direct experience in building students' understanding. In addition, this study is expected to serve as an alternative solution for teachers in developing instructional media and approaches that are suited to the characteristics of students and their environment.

Based on these conditions, it can be concluded that there is still a need for research specifically examining the effect of ethnopedagogically-based diorama use on the science literacy skills of elementary school students. Therefore, the researcher is interested in conducting a study entitled "The Effect of Ethnopedagogically-Based Diorama Media on the Science Literacy Skills of Elementary School Students."

Method

This study is a quantitative research using an experimental method, employing a pre-experimental design in the form of a one-group pretest-posttest design. The study was conducted at SDN Padike III, located on Raya Padike street, Talango Subdistrict, Sumenep Regency, with a research duration of 4 weeks.

Table 1. Research Design

Pretest	Treatment	Posttest
O ₁	X	O ₂

Source: (Sugiyono, 2018)

Description:

O₁ : Pretest of students' scientific literacy skills

X : Treatment in the form of using diorama media based on ethnopedagogy

O₂ : Posttest of students' scientific literacy skills

The design consists of three stages. First, students are given a pretest to assess their initial scientific literacy skills. Then, students receive an intervention in the form of learning using ethnopedagogy-based diorama media. Finally, students take a posttest to determine the improvement in scientific literacy after the intervention. The sample in this study includes all fifth grade students at SDN Padike III in the 2025/2026 academic year, totaling 30 individuals. This sample was selected using saturated sampling technique, or commonly referred to as a census sample, because the population size is relatively small, namely 30 students.

This study employed observation sheets, tests, and questionnaires that met criteria for validity and reliability. Data were obtained through observation, tests, questionnaires, and documentation, and subsequently analyzed using descriptive statistics, normality test, paired sample t-test, and N-Gain test with the assistance of SPSS version 20 software to determine the improvement in students' scientific literacy skills following the implementation of ethnopedagogically-based diorama media.

Result and Discussion

Result

The results of this study are presented in several stages, beginning with validity and reliability testing of

the instruments as the basis for determining the appropriateness of the measurement tools used. The validity test was conducted using product moment correlation with the assistance of SPSS version 20 at a 5% significance level.

Table 2. Instrument Validity

Criteria	Number of Items
Valid	14
Not Valid	1
Total	15

Based on table 2, the results of the item validity test show that of the 15 items tested, 14 items were declared valid and 1 item was not valid. Valid items have r_{hitung} values greater than r_{tabel}, making them suitable for use as research instruments.

Table 3. Instrument Reliability

Cronbach's Alpha	N of Items
0.738	14

Next, based on the table above, the results of the reliability test show a Cronbach's Alpha value of 0.738. This value is greater than 0.60, indicating that the instrument is reliable. After the instrument was declared valid and reliable, the analysis proceeded to the data from the students' pretest and posttest results to determine their scientific literacy skills. The next stage is descriptive statistical analysis, which is used to provide a general overview of student learning outcomes and scientific literacy skills before and after the intervention. The results of the descriptive statistical analysis are presented in Table 4.

Based on Table 4, it is shown that the highest pretest score was 12 and the lowest was 3, with a mean score of 6.67 and a standard deviation of 2.76. After the intervention, the highest posttest score was 14 and the lowest was 6, with the mean score increasing to 10.83 and a standard deviation of 2.09. This indicates an improvement in students' scientific literacy skills.

The next stage is the normality test, which is conducted to determine whether the data are normally distributed, so that they can be further analyzed using parametric analysis with a paired sample t-test. The normality test is performed using the Shapiro-Wilk method because the sample size is <50 students.

Table 4. Descriptive Statistical Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Pretest	30	3	12	6.67	2.758
Posttest	30	6	14	10.83	2.086
Valid N (listwise)	30				

Based on the Table 5, the significance value for the pretest is 0.064 and for the posttest is 0.115. Both values are greater than 0.05, indicating that the pretest and

posttest data are normally distributed, thus fulfilling the requirements for analysis using parametric tests.

Table 5. Shapiro-Wilk Normality Test

Variable	Statistics	Sig.
Pretest	0.934	0.064
Posttest	0.944	0.115

Hypothesis testing was conducted using a paired sample t-test to determine the difference in students'

learning outcomes before and after the intervention. The test results are presented in the Table 6.

Table 6. Paired Sampel T-test

Variable	Mean Difference	T	df	Sig.(2-tailed)
Pretest-Posttest	-4.17	-12.53	29	0.000

In the table, a significance value of 0.000 was obtained, which means it is less than 0.05. This result indicates that there is a significant difference between the pretest and posttest scores. Thus, H0 is rejected and H1 is accepted, so it can be concluded that the treatment given affects students' scientific literacy skills.

To determine the increase in students' scientific literacy skills after the treatment, it is necessary to

conduct an N-Gain analysis with the following classification of score gain categories.

Table 7. Classification of Score Acquisition Categories

N-Gain Value	Category
$g > 0.7$	High
$0.3 \leq g \leq 0.7$	Medium
$g < 0.3$	Low

Source: (Oktavia et al., 2019)

Table 8. N-Gain Analysis

Variable	N	Minimum	Maximum	Mean	Category
N-Gain Score	30	0.25	1.00	0.60	Medium
N-Gain (%)	30	25.00	100.00	60.01	Fairly Effective

Based on the results of the N-Gain analysis, an average score of 0.60 or 60.01% was obtained. According to the N-Gain categories, this value falls into the medium category, indicating that the applied instructional method was able to improve student learning outcomes with a fairly good level of effectiveness. In addition to using tests, the researcher also used supporting data in the form of questionnaires to determine students' responses to the use of ethnopedagogically based dioramas in IPAS instruction.

Table 9. Classification of Questionnaire Result Categories

Percentage (%)	Category
81-100	Very Good
61-80	Good
41-60	Fair
21-40	Poor
0-20	Very Poor

Source: (Widayanti et al., 2024)

Table 10. Student Response Questionnaire Results

Indicators	N of Item	Mean Score	Maximum Score	Percentage %	Category
Interest	3	9.50	12	79.17	Good
Understanding (Science Literacy)	3	10.10	12	84.17	Excellent
Ethnopedagogy (Local Wisdom)	2	6.40	8	80.00	Good
Activeness	4	11.83	16	73.96	Good
Motivation	4	13.00	16	81.25	Excellent
Ease	4	12.63	16	78.96	Good
Total	20	63.47	80	79.33	Good

The results of the student response questionnaire analysis show that the average overall score was 63.47 out of a maximum score of 80, with a percentage of 79.33% categorized as good. Based on each indicator, the

understanding (scientific literacy) indicator achieved the highest percentage at 84.17% with a excellent category, followed by the motivation indicator at 81.25% with a excellent category. Meanwhile, the interest indicator

obtained a percentage of 79.17%, ethnopedagogy (local wisdom) at 80.00%, ease at 78.96%, and activeness at 73.96%, all of which are categorized as good.

In addition to using quantitative statistical data, this study also conducted direct observation to examine the learning process using diorama media and to record students' participation and responses during the implementation of the diorama media.

Based on the observation results, almost all aspects of learning were carried out well. The teacher made

optimal use of the diorama as a medium and related the material to local wisdom. Students appeared actively engaged in observing the medium, discussing, and were able to connect science concepts with phenomena in their surroundings through the diorama. In addition, several students were able to identify environmental problems and propose solutions based on evidence obtained from the diorama observation results.



Figure 1. Learning process: (a) Teacher using diorama media; (b) students observe the media; and (c)) students discuss

Discussion

This study indicates that the use of ethnopedagogically based diorama media has a positive effect on the science literacy skills of fifth-grade students at SDN Padike III. This finding is demonstrated not only by a significant difference between pretest and posttest results, but also reinforced by the improvement in students' abilities, which are classified under the moderate category based on the N-Gain analysis, as well as supported by student responses and observations during the learning process.

Overall, these findings indicate that ethnopedagogic-based diorama media is capable of creating more meaningful and contextual learning, and encourages students to construct knowledge through direct learning experiences.

The improvement in students' scientific literacy skills indicates that diorama media functions not only as a visual aid, but also as a means that facilitates students in connecting scientific concepts with real-world phenomena in their surrounding environment.

Before treatment, most students had difficulty understanding IPAS concepts because learning relied more on textbooks and two-dimensional images. This situation caused students to tend to memorize concepts without understanding their relevance to everyday life.

After using the media, students gain more concrete experiences through activities such as observing, discussing, and identifying events presented in the diorama. This process helps students gradually build conceptual understanding so that their abilities improve in explaining scientific phenomena, identifying

concepts, and using scientific evidence (Hadiprayitno et al., 2020; Saputra & Nurmilawati, 2023).

This finding is based on constructivist theory put forward by Lev Vygotsky, which emphasizes that knowledge is actively constructed through learning experiences, social interaction, and students' direct engagement in the learning process (Dewi & Fauziati, 2021). In this study, the diorama medium serves as scaffolding that helps students build their understanding through 3D visual representations resembling real-life conditions.

The integration of ethnopedagogy further strengthens the process of knowledge construction because learning materials are not presented abstractly, but are instead linked to local culture and environments familiar to students. Therefore, learning becomes more contextual, making it easier for students to connect their daily experiences with the scientific concepts being studied.

The success of the ethnopedagogy-based diorama media in improving science literacy is also supported by the results of classroom observations. During the learning process, nearly all stages were carried out successfully. The teacher was able to utilize the media optimally and relate the IPAS material to environmental conditions and local wisdom. In addition, students participated actively by observing objects in the diorama, discussing with groupmates, asking questions, and expressing opinions based on their observations.

Several students were even able to identify environmental problems and provide solutions based on evidence they found from the media used. These

findings indicate that ethnopedagogy-based diorama media not only enhances cognitive aspects but also develops scientific thinking skills and science process skills, which are essential components of scientific literacy.

These findings are supported by students' positive responses to the use of ethnopedagogy-based diorama media. The questionnaire results show that students gave favorable assessments of the media used, especially in the indicators of scientific literacy understanding and learning motivation, both of which received a "very good" category. This indicates that students felt the learning process became more engaging, easier to understand, and able to increase their enthusiasm for learning.

The high scores on the comprehension indicator demonstrate that the diorama media successfully helped students understand the relationship between scientific concepts and real-life situations. Meanwhile, the high learning motivation indicates that the use of engaging media can create a more enjoyable learning atmosphere, thus encouraging students to actively participate throughout the learning process (Jannah et al., 2023; Suhendra et al., 2025; Walewangko et al., 2024).

The results of this study show that integrating local culture into instructional media provides added value that not only enhances conceptual understanding of science, but also makes learning more relevant to students' real-life experiences. Thus, ethnopedagogy serves as a bridge connecting scientific knowledge with local culture without diminishing the substance of scientific concepts (Nursima et al., 2022).

These findings are consistent with the study by Murdani et al., (2024), which states that the use of diorama media can enhance elementary students' science literacy skills through more concrete learning. The similarity of these findings indicates that visualizing objects using three-dimensional media is effective in helping students understand scientific concepts that were previously abstract.

This study also reinforces the findings of Maulana et al., (2025) who found that diorama media can improve students' science literacy. However, this study has different characteristics because the increase in science literacy was achieved through the integration of diorama media with an ethnopedagogical approach, without being combined with any specific learning model. Therefore, the improvement of science literacy skills in this study further emphasizes the contribution of ethnopedagogy-based diorama media as an educational innovation, rather than as an effect of any particular learning model.

In addition, the results of this study also support the research of Amilia Rohmah & Julianto, (2025) which shows that the integration of local cultural elements in

learning media can enhance science literacy through contextual learning. The findings of this study also reinforce the results of Rahmawati et al., (2020) which state that the ethnopedagogical approach is capable of developing scientific literacy while simultaneously strengthening students' understanding of local culture. The difference is, the previous study focused more on the development of cultural identity, whereas this study emphasizes that local culture can be integrated into concrete media in the form of dioramas, thereby providing a more visual, interactive, and easily comprehensible learning experience for elementary school students.

Although the N-Gain analysis results indicate that the improvement in scientific literacy skills falls into the moderate category, this finding suggests that the use of ethnopedagogy-based diorama media has had a positive impact, but has not yet yielded a very high level of improvement.

This condition is suspected to be influenced by several factors, including the relatively short duration of the intervention, the students' limited prior experience with science literacy-based learning, and the research design, which used only a single group without a control group. Therefore, future research could develop ethnopedagogy-based diorama media with a longer implementation period or combine it with active learning models such as project based learning or inquiry to achieve a more optimal increase in science literacy.

Academically, this research contributes to the development of IPAS instruction in elementary schools through the integration of concrete media with an ethnopedagogical approach. The research findings demonstrate that science learning linked to local culture can enhance scientific literacy skills while also making the learning process more meaningful for students. Thus, ethnopedagogically-based diorama media can serve as an alternative instructional innovation that not only supports the achievement of scientific literacy competencies, but also contributes to the preservation of local cultural values in primary education.

Conclusion

It can be concluded that the ethnopedagogy-based diorama medium has a positive effect on improving the science literacy skills of fifth-grade students at SDN Padike III. This is evidenced by a significant difference between the pretest and posttest results ($p < 0.05$), an N-Gain score of 0.60, which falls into the moderate category, as well as student responses that are categorized as good. These results indicate that ethnopedagogy-based diorama media can serve as an

alternative for learning IPAS that is more contextual and meaningful. This study is still limited to a single school with a one-group pretest-posttest design. Therefore, further research needs to involve a broader sample and use a control group to obtain stronger empirical evidence.

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Author Contributions

Conceptualization, methodology, S.T.N.L.Q.; validation, S., and Y.P.A.; formal analysis, investigation, S.T.N.L.Q.; resources, SDN Padike III and PGRI Sumenep University; data curation, I.K and M.M.AR; writing—original draft preparation, S.T.N.L.Q.; writing—review and editing, I.K and M.M.AR; visualization, I.K and M.M.AR.; authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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