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# OLGA: Innovative Local Wisdom-Based Marine Ecology Learning Media for Fifth-Grade Students

**Yulia Nisfiatul Laily[1]✉, Amalia Ulfa Ramadhani[1], Maftuh Fauji Dimyati[2], Arfilia Wijayanti[1]**

[1]Program Studi Pendidikan Guru Sekolah Dasar, Universitas PGRI Semarang
[2]Program Studi Pendidikan Biologi, Universitas PGRI Semarang

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**Abstract**

This study introduces OLGA (Ocean Lomban Game), an innovative learning media integrating local wisdom to enhance marine ecology education for fifth-grade elementary students. Given the serious threats to global marine resources from human activities and climate change, early aquatic ecology and conservation education is crucial. OLGA incorporates the traditional Lomban Kupatan ritual from Tayu, Pati, emphasizing ecological balance and cultural heritage. Using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), the research involved evaluating current curriculum needs, designing a storyboard, developing the game with MIT App Inventor and animation videos, and implementing it in a classroom setting. Pre-tests and post-tests were conducted to measure effectiveness. The results indicated that OLGA significantly improved students' interest and performance in learning marine ecology. Validation by experts confirmed the media's suitability and effectiveness. Teacher and student feedback highlighted its practicality and ease of use, making OLGA a promising educational tool. The study concludes that OLGA effectively combines science education with local cultural elements to foster ecological awareness among students.

✉ correspondence:
Jl. Sidodadi Timur Jalan Dokter Cipto No.24, Karangtempel,
Kec. Semarang Tim., Kota Semarang, Jawa Tengah 50232, Indonesia
E-mail: yulianisfia287@gmail.com

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## INTRODUCTION

According to the news portal of the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia in 2015, global marine resources face serious threats due to human activities and climate change. The impact of marine ecosystem damage includes coral reef destruction, a habitat and food source for various marine creatures, including consumable and ornamental fish. One of the causes of coral reef destruction is destructive fishing methods, such as the use of explosives and toxic substances (Wongsorejo et al., 2020).

To address this issue, it is necessary to introduce marine ecology and its conservation to children from an early age. Early introduction is an important step in educating children about environmental awareness. The West Java Provincial Marine and Fisheries Department portal mentions the importance of involving the community, including children, in efforts to conserve coral reefs and marine life.

Early introduction to marine ecology can be effectively done through education based on local wisdom. Science education based on local wisdom refers to the Legal Foundation of Education Based on Local Excellence, which strives to restore local knowledge as a valuable asset in learning, making the teaching and learning of science more meaningful (Sainset al., 2013). Local wisdom includes values, norms, customs, culture, and local insights that are inherited and preserved as identity. The goal of education based on local wisdom is to form students who are always connected to the concrete situations they face and to produce a generation that is competent and reflects cultural values.

For example, the "lomban kupatan" is a Javanese traditional ritual in the Tayu area of Pati Regency, which is closely related to environmental conservation and the introduction of ecology to students. This ritual is often associated with the agricultural calendar and is a form of gratitude to ancestral spirits for the harvest. Previous research conducted by(Istiqomah, 2013) showed that lomban is a culture that has become the identity of Keboromo Village and has high cultural value. Recent research conducted by (Nuzulia, 2023) revealed that the "larung sesaji," which is part of lomban, is a form of acculturation between culture and religion. This reflects the harmonious relationship between the local community and nature and the community's understanding of ecological principles.

At the elementary school level, grade 5, students' developmental stages still require concrete objects to be seen in completing logical tasks because they are not yet able to think using only symbols (Prayogo, 2022). Therefore, learning media play a crucial role in increasing students' interest and achievement in learning. The use of interesting learning media can help students feel comfortable and easily receive the lesson material, especially at the elementary school level. Learning media can also help visualize abstract material, provide meaningful experiences, and enable learning to be done anywhere and anytime. For instance, the use of MIT App Inventor and animated videos in learning has various benefits. Based on observations at SDN Sambiroto 01 Tayu, it was found that no IT-based learning media had been used. The teaching process still relied on conventional methods without the support of digital technology, meaning students were not yet familiar with learning media that utilize information technology. This highlights the need for innovation in using IT-based learning media to enhance students' interest and understanding of the material, especially in creating a more interactive and engaging learning environment.

MIT App Inventor can help design innovative, engaging, and enjoyable Android-based learning applications for students, facilitating student learning activities (Supriyono, 2018). Moreover, research by (Istyasiwi et al., 2021) explains that the DORAMA digital card learning media, in the form of an Android-based application, can foster interest and motivation in learning, and students easily understand the material.

Based on the background, this research aims to develop OLGA (Ocean-Lomban-Game) as an innovative marine ecology learning media for fifth-grade elementary school students based on local wisdom. This learning will be designed using MIT App Inventor and animated video media. The purpose is to create effective and engaging learning media to improve students' understanding of marine ecology and its conservation importance, blending the theoretical and practical aspects of education.

The aim of this research is to explore the ecological values within the Lomban Kupatan culture and formulate them into a learning framework for students. This way, students can learn about the interconnections between human activities, the environment, and the importance of conserving natural resources

## METHODS

This research uses a Hypothetical Learning Trajectory (HLT) design on marine ecology materials with the ADDIE model (Analysis, Design, Development, Implementation, Evaluation), which was first developed by Robert Maribe Branch (Sugihartini & Yudiana, 2018). The following are the stages involved.

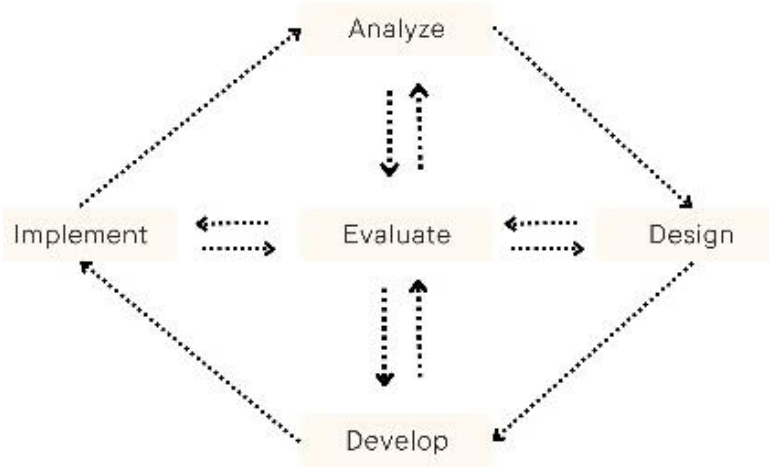



**Figure 1.** Stages of the ADDIE model
(Branch, 2009; Sugihartini & Yudiana, 2018)

a) The analysis stage is the first step in the development process of the ADDIE model. In this stage, an evaluation is conducted on the objectives of the product development being worked on. This evaluation covers various aspects such as the suitability of the material with the existing curriculum, the characteristics of the learners, the choice of learning media, and a review of previous research related to the media product being researched and developed.
b) In the design stage, the results include a plan for science learning. Designing the innovation of the media product developed in the form of a storyboard. This storyboard contains sketches of each game slide to be developed. The designed game is a collaboration between science and local wisdom. This game is named OLGA (Ocean Lomban Game). In addition, instruments required for the research are also designed, including material expert instruments, media expert instruments, pre-tests and post-tests, student questionnaires, lesson plans (RPP), and student worksheets (LKPD).
c) The result of this stage is the OLGA learning media. After obtaining these results, validation is given to material and media experts. Validation by material experts relates to the substance of the topics presented in the product. Meanwhile, validation by media experts aims to assess the suitability and feasibility of the developed product.
d) The fourth stage is implementing the developed product into a real product. This implementation aims to gather feedback. At this stage, researchers applied the OLGA media in the learning process according to the HLT design, with a sample of 26 fifth-grade students at SDN Sambiroto 01 Tayu. Several activities were carried out, including providing the product to students for trial and observing them while using the developed learning media. Additionally, students were given a pre-test before the media was implemented and a post-test afterward, as well as provided with LKPD (Student Worksheets) to assess their abilities on each topic in the OLGA media.

e) The final stage is to evaluate the value and percentage of the developed media. This stage aims to determine the feasibility and practicality of media development according to the objectives that have been set.

The data collection instruments used in this research include validation sheets from material experts and media experts to measure the validity of the product. There are response questionnaires from users, namely teachers and students, to measure the practicality of the product. In addition, pre-test and post-test instruments are also used to measure the effectiveness of the product on the subjects.

The data analysis techniques in this study are based on quantitative and qualitative data. Data collection is carried out using the prepared instruments. Quantitative data is obtained from expert validation results, user response questionnaires, and LKPD scores, pre-tests, and post-tests. Meanwhile, qualitative data is obtained from comments and suggestions from experts, teachers, and user responses, presented descriptively. Data analysis also uses IBM SPSS 220 with a paired t-test. The following are the data analysis techniques used in this research:

a. Validation of Media and Materials

The analysis of data calculated in the validation process by experts in the field of materials and media is conducted using the following Likert formula:

$$P\% = \frac{Frequency\ of\ respondents'\ answers}{Total\ number\ of\ respondents} \times 100\%$$

(Sugiyono, 2017)

Using the scores obtained, the category of validated media and its suitability can be determined. The media suitability categories can be seen in the following table.

Percentage of score totals according to (Arikunto, 2021):

**Table 1**. Percentage of Score Totals Category

| Assessment | Category |
|---|---|
| $75\% \leq P \leq 100\%$ | Valid without revision |
| $50\% \leq P \leq 75\%$ | Valid with minor revisions |
| $25\% \leq P \leq 50\%$ | Valid with significant revisions |
| $P \leq 25\%$ | Not valid |

b. Media Effectiveness

The effectiveness of OLGA media in learning is measured through T-Test and N-Gain. N-Gain test is a commonly used method to measure the effectiveness of a learning or intervention in improving students' learning outcomes (Sukarelawa et al., 2024).

**Table 2.** Pretest and Posttest Procedure

| | | |
|---|---|---|
| O1 | X | O2 |

O1: Pre-test scores of students
X: Treatment
O2: Post-test scores of students

To obtain the effectiveness of OLGA media, the difference between pre-test and post-test scores can be calculated using the N-Gain method. The equation used to calculate the N-Gain score.

$$\text{N-Gain} = \frac{Posttest\ score - Pretest\ score}{Ideal\ score - Pretest\ score}$$

(Sukarelawa et al., 2024)

To view the categories of N-Gain score improvement, you can refer to the Normalized Gain criteria in Table 2. Meanwhile, to determine the effectiveness level of the intervention application, you can refer to Table 3.

**Table 2.** Normalized Gain Criteria

| Nilai N-Gain | Interpretation |
|---|---|
| $0.70 < g < 1.00$ | High |
| $0.30 < g < 0.70$ | Moderate |
| $0.0 < g < 0.30$ | Low |
| $g = 0.00$ | No improvement |
| $-100 < g < 0.00$ | Decrease |

**Table 3.** The Effectiveness Level Interpretation

| Percentage (%) | Interpretation |
|---|---|
| < 40 | Ineffective |
| 40 – 55 | Less Effective |
| 56 – 75 | Moderately Effective |
| >76 | Effective |

c. Practicality of Media

The practicality of the media is determined through feedback or responses collected using a questionnaire given to students after they have tried the media. A questionnaire is an efficient data

collection technique if the researcher knows exactly which variables to measure and knows what to expect from the respondents (Sugiyono, 2017). The data obtained is then processed using a Likert scale with the following formula:

$$P\ \% = \frac{Total\ score\ obtained}{Maximum\ score} \times 100\%$$

(Sugiyono, 2017)

**Table 4.** Validation Rating Scale

| Response | Value |
|---|---|
| Very poor | 1 |
| Poor | 2 |
| Good | 3 |
| Very good | 4 |

Based on the scores obtained, the level of practicality or feasibility of the media is determined through the media success rate listed in the table below.

**Table 5.** Media Success Rate

| Percentage | Criteria |
|---|---|
| 81% - 100% | Very practical |
| 61% - 80% | Practical |
| 41% - 60% | Less practical |
| 21% - 40% | Not practical |
| 0% - 20% | Very impractical |

(Lucky Lusni Cahya, 2024)

The game scores are used to assess the understanding and abilities of students after reading and studying the material presented in the game before starting the game itself. Each topic's game is an implementation of the explained material. The scores of each game are stored in a database. The level of understanding and abilities of the students can be determined using the following table.

**Table 6.** Levels of Student Understanding and Abilities

| Type of game | Percentage | | | |
|---|---|---|---|---|
| | Very Good | Good | Fair | Poor |
| Food chain game | 271 – 360 | 181 – 270 | 91 – 180 | 0 – 90 |
| Food web game | 271 – 360 | 181 – 270 | 91 – 180 | 0 – 90 |
| Food pyramid game | 187 – 250 | 125 – 186 | 62 – 124 | 0 – 61 |
| Ecosystem balance game | 6292 – 8390 | 4195 – 6291 | 2098 – 4194 | 0 – 2097 |

Student's ability and understanding of learning through the OLGA media can also be seen in the results of the Student Worksheet (LKPD). The use of learning media such as the Student Worksheet (LKPD) book is one alternative to improve student learning outcomes (Nurliawaty et al., 2017). Based on the obtained scores, the level of student understanding is determined through the categories listed in the following table.

**Table 7.** Levels of Student Understanding and Abilities

| Scores | Category |
|---|---|
| 0 – 25 | Poor |
| 26 – 50 | Fair |
| 51 – 75 | Good |
| 76 – 100 | Excellent |

## RESULTS AND DISCUSSION

### Validity of OLGA

The validation of the media and materials from OLGA media needs to be conducted by experts before it is implemented in the field. This validation aims to ensure that the media is suitable for use as an appropriate solution to the existing problems. The validation of the materials aims to assess whether the content in the media is suitable and appropriate for learning. The media to be validated is developed using the ADDIE model, which includes:

1) Analyze

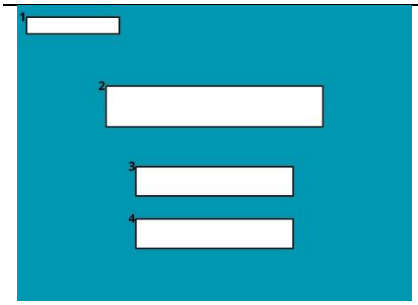
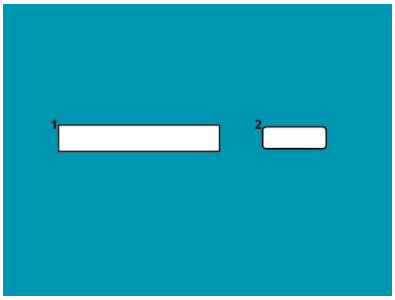
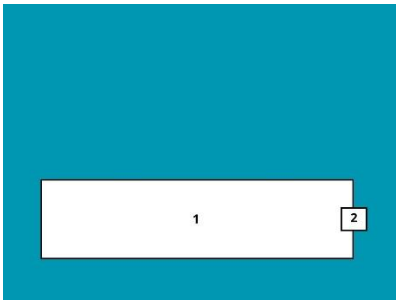
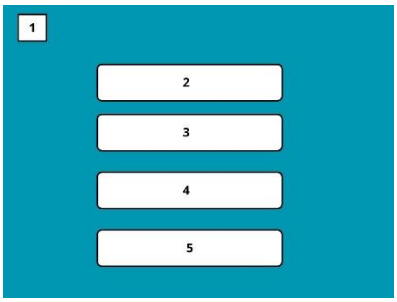
This stage is carried out to identify and analyze the problems being experienced. The issues include a lack of environmental awareness and a decrease in student interest in learning, as well as a lack of innovative and locally wisdom-based learning media development. This stage also determines the developed learning media in the form

of a game using a relevant curriculum, the independent curriculum.

2) Design

The second stage is the design. A simple design is created using the Canva application, and the game is created in the form of a storyboard, which will later be developed into a more complex form.

**Table 8.** Storyboard of OLGA media

| Figure | Description |
|---|---|
|  | **Initial Screen**<br>Welcome message<br>Game name: Ocean Lomban Game<br>Start button<br>Exit button |
|  | **Name Screen**<br>A place to enter the user's name. This serves as the identity for the score recorded in the database.<br>Start button |
|  | **Description Screen**<br>A description of the history of Lomban culture, criteria for buffalo used in Lomban, the Lomban kupatan procession in Tayu Regency, and the relationship between Lomban and the marine ecosystem.<br>Next button to read the presented material. |
|  | Menu Screen<br>Home button: to return to the initial screen.<br>Learning Topic 1 about food chains and food webs.<br>Learning Topic 2 about the food pyramid.<br>Learning Topic 3 about ecosystem balance.<br>Lomban culture topic at the beginning of the game.<br>Each learning topic contains material and games, as well as scores. |

3) Development

In the development stage, the storyboard design is developed into a complex form. After that, the OLGA product design will be assembled using MIT App Inventor to become a game. The realized OLGA game product will be validated by media and material experts to obtain suggestions.

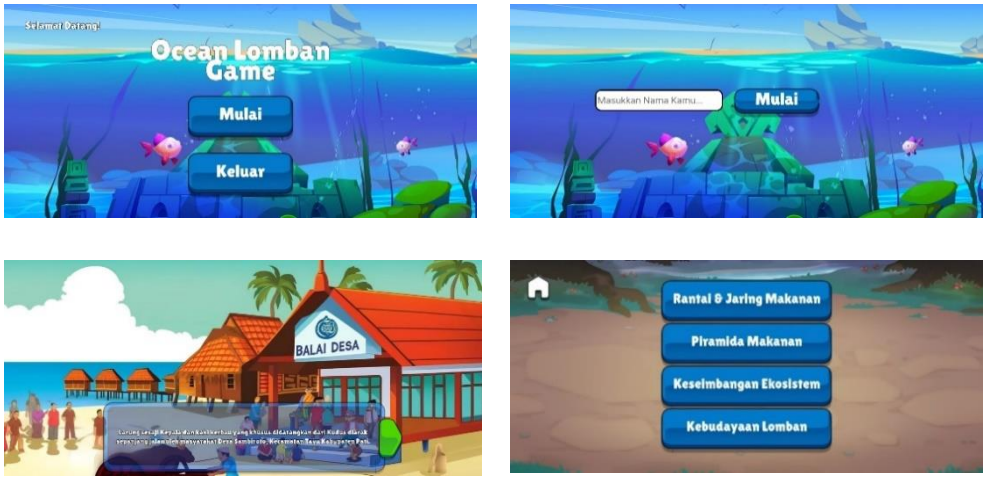



**Figure 2.** The developed OLGA media display includes backgrounds and sounds that match the media's theme, engaging games for each topic, and feedback received by students in each game

a. OLGA Validated by Media and Material Expert Lecturers

The validation result of OLGA Media by Media Expert Lecturer can be seen in the Table 9 and Table 10:

**Table 9.** Expert Validation 1

| No | Aspect | Maximum Score | Obtained Score |
|---|---|---|---|
| 1 | Effect of learning strategy | 28 | 21 |
| 2 | Software engineering | 20 | 15 |
| 3 | Visual appearance | 28 | 14 |
| Total | | 76 | 50 |
| Validation score percentage | | | 66% |

To obtain the validation results above, calculations were made using the Likert scale. Here are the calculations.

$$P\ \% = \frac{Total\ obtained\ score}{Maximum\ score} \times 100\%$$
$$= \frac{50}{76} \times 100\%$$
$$= 66\%$$

**Table 10.** Expert Validation 2

| No | Aspect | Maximum Score | Score Obtained |
|---|---|---|---|
| 1 | Effect of learning strategy | 28 | 21 |
| 2 | Software engineering | 20 | 16 |
| 3 | Visual appearance | 28 | 20 |
| Total | | 76 | 57 |
| Validation score percentage | | | 75% |

To obtain the validation results above, calculations were made using the Likert scale. Here are the calculations.

$$P\ \% = \frac{Total\ obtained\ score}{Maximum\ score} \times 100\%$$
$$= \frac{57}{76} \times 100\%$$
$$= 75\%$$

Based on these calculation results, media validation by experts obtained scores of 66% and 75%. This media is categorized as valid with minor revisions. Therefore, the media will be revised and then implemented in learning.

The validation result of OLGA Media by Material Expert Lecturer can be seen in the Table 11 and Table 12:

**Table 11.** Expert Validation Results 1

| No | Aspect | Maximum Score | Score Obtained |
|---|---|---|---|
| 1 | Material Suitability | 20 | 15 |
| 2 | Material Presentation | 45 | 36 |
| 3 | Material Relevance | 40 | 28 |
| 4 | Language | 20 | 16 |
| 5 | Evaluation | 25 | 16 |
| Total | | 150 | 111 |
| Validation score percentage | | | 74% |

To obtain the above material validation results, calculations were performed using the Likert scale. The calculation is as follows

:

$$P\ \% = \frac{Total\ obtained\ score}{Maximum\ score} \times 100\%$$
$$= \frac{111}{150} \times 100\%$$
$$= 74\%$$

**Table 12.** Expert Validation Results 2

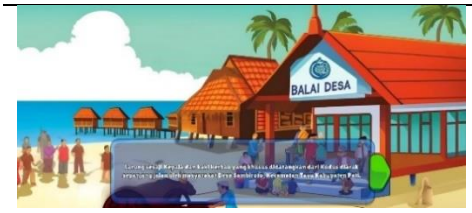
| No | Aspect | Maximum score | Score obtained |
|---|---|---|---|
| 1 | Material suitability | 20 | 19 |
| 2 | Material presentation | 45 | 44 |
| 3 | Material relevance | 40 | 39 |
| 4 | Language | 20 | 19 |
| 5 | Evaluation | 25 | 24 |
| Total | | 150 | 145 |
| Validation score percentage | | | 97% |

To obtain the above material validation results, calculations were performed using the Likert scale. The calculation is as follows:

$$P\ \% = \frac{Total\ obtained\ score}{Maximum\ score} \times 100\%$$
$$= \frac{145}{150} \times 100\%$$
$$= 97\%$$

Based on these calculation results, the material validation by experts obtained scores of 74% and 94%. This media is categorized as valid without revision and valid with slight revision. Therefore, the media will be revised further and then implemented in learning.

**Table 13.** Media OLGA Revisions

| Before revision | After revision |
|---|---|
|   |   |
| There is a change in the initial display after entering the identity or name. Initially, it led to the explanation of the material about "lomban" (a local cultural event). Now, it has been changed to a menu display. The menu display has two options: "lomban culture" and "marine ecology material." Additionally, there is a home button to return to the previous page and an "i" button containing information about the OLGA media, such as the creator's name, year of creation, learning achievements, and learning objectives. | |
|   |   |
| The font size of the material has been enlarged, and a better font has been chosen. | |

4) Implementation

At the implementation stage, the product is tested after going through the development and validation stages by validators. This trial involves 26 fifth-grade students from SD (Elementary School) Negeri Sambiroto 01. The purpose of this media trial is to gather data regarding students' opinions about the developed media and to determine whether the media is effective when used in the learning process to understand the local wisdom material of Kabupaten Tayu. Additionally, during the learning process, Student Worksheets are used to measure the student's level of understanding.

5) Evaluation

The final step in the ADDIE model is evaluation. At this stage, the media has undergone various tests for validity, feasibility, and effectiveness in the classroom learning process, involving expert lecturers, teachers, and students.

b. Effectiveness of OLGA Media

The effectiveness of OLGA Media can be seen in the Table 14:

**Table 14.** The Effectiveness of OLGA

| No | Responden Code | Score | | N-gain score | N-Gain Score Percentage | Improvement |
|---|---|---|---|---|---|---|
| | | Pretest | Posttest | | | |
| 1 | ABGA | 33 | 80 | 0.7014 | 70.14 | High |
| 2 | AR | 26 | 60 | 0.4594 | 45.94 | Medium |
| 3 | ARPR | 73 | 86 | 0.4814 | 48.14 | Medium |
| 4 | AN | 53 | 80 | 0.5744 | 57.44 | Medium |
| 5 | DS | 46 | 76 | 0.5555 | 55.55 | Medium |
| 6 | DNP | 66 | 93 | 0.7941 | 79.41 | High |
| 7 | FAAP | 73 | 73 | 0 | 0 | No improvement |
| 8 | GP | 66 | 80 | 0.4117 | 41.17 | Medium |
| 9 | HAM | 26 | 60 | 0.4594 | 45.94 | Medium |
| 10 | INW | 66 | 93 | 0.7941 | 79.41 | High |
| 11 | INF | 40 | 80 | 0.6666 | 66.66 | Medium |
| 12 | KPA | 40 | 76 | 0.6 | 60 | Medium |
| 13 | KSJ | 46 | 70 | 0.4444 | 44.44 | Medium |
| 14 | KU | 20 | 60 | 0.5 | 50 | Medium |
| 15 | LN | 33 | 80 | 0.7014 | 70.14 | High |
| 16 | MSM | 46 | 60 | 0.2592 | 25.92 | Low |
| 17 | MAA | 46 | 73 | 0.5 | 50 | Medium |
| 18 | MAR | 46 | 70 | 0.4444 | 44.44 | Medium |
| 19 | MADS | 40 | 66 | 0.4333 | 43.33 | Medium |
| 20 | MAA | 53 | 80 | 0.5744 | 57.44 | Medium |
| 21 | MRM | 46 | 73 | 0.5 | 50 | Medium |
| 22 | NAD | 53 | 93 | 0.8510 | 85.10 | High |
| 23 | OKN | 53 | 73 | 0.4255 | 42.55 | Medium |
| 24 | AL | 73 | 100 | 1 | 100 | High |
| 25 | SKA | 53 | 93 | 0.8510 | 85.10 | High |
| 26 | TM | 46 | 80 | 0.6296 | 62.96 | Medium |
| Average | | | | 0.5620 | 56.20 | fairly effective |

The effectiveness of the learning media is calculated using the t-test. The results of the t-test are shown in Table 15 below:

**Table 15.** The t-test Results

Paired Samples Statistic

| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Pretest | 48.5384 | 26 | 14.67850 | 2.87869 |
| | Posttest | 77.2308 | 26 | 11.20110 | 2.19672 |

Paired Samples Test

| | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| | Mean | Std. Deviation | Std. Error Mean | 95% Confedence Interval of the Difference Lower | Upper | | | |
| Paire 1 Pretest-Poast-est | -28.69231 | 10.89869 | 2.13741 | -33.09439 | -24.29023 | -13.424 | 25 | 0.000 |

Through the T-Test table, it can be analyzed from the sig. (2-tailed) value of 0.000 < 0.005 that there is a significant difference. It can be concluded that learning through the OLGA media has a significant impact or gives a significant effect on students' ability to understand the material about the marine ecosystem.

c. Practicality of OLGA

The practicality of the OLGA Media is obtained through a questionnaire given to students, consisting of 13 questions with the highest possible score of 116. Students filled out the questionnaire based on their feelings and opinions after using the media.

**Table 16.** The Questionnaire Results

| No | Aspect | Score |
|---|---|---|
| 1 | The game content aligns with the 5th-grade marine ecosystem lesson | 94 |
| 2 | The connection of local wisdom through lomban with the marine ecosystem material | 86 |
| 3 | Instructions in the game are easy to understand | 87 |
| 4 | The game makes you actively participate in learning | 97 |
| 5 | The images and graphics in the game are good | 89 |
| 6 | The sound and sound effects in the game are good | 73 |
| 7 | The game is related to school lessons | 85 |
| 8 | The language used in the game is easy to understand | 89 |
| 9 | The game helps students understand the marine ecosystem lesson | 95 |
| 10 | The game is interesting to play | 99 |
| 11 | The game is easy to play on PC devices | 92 |
| 12 | The game helps develop other skills such as critical thinking and problem-solving | 84 |
| 13 | Your understanding of the marine ecosystem increased after playing this game | 90 |
| Total Score | | 1160 |
| Maximum Score | | 1352 |

After obtaining the accumulated results of the questionnaire from students about the learning media, calculations are made using the Likert Scale to determine the practicality of the media.

$$P\ \% = \frac{Total\ obtained\ score}{Maximum\ score} \times 100\%$$
$$= \frac{1160}{1352} \times 100\%$$
$$= 86\%$$

Based on these calculation results, the practicality of the media as rated by the students scored 86%. This media is categorized as very practical. Therefore, the use of the OLGA media is recommended for implementation in learning.

The abilities and understanding of students based on the OLGA learning media are measured using game scores to assess students' comprehension and skills after reading and studying the material in the game before starting the game. Each game topic is an implementation of the explained material. The scores for each game are stored in a database.

**Table 17.** The Game Scores

| Category | Percentage | | | |
|---|---|---|---|---|
| | Food Chain | Food Web | Food Pyramid | Ecosystem Balance |
| Very good | 23% | 92% | 69% | 77% |
| Good | 50% | 8% | 31% | 23% |
| Sufficient | 23% | - | - | - |
| Poor | 4% | - | - | - |

Based on Table 17, the level of students' abilities and understanding based on the OLGA learning media shows a good category for the food chain (50%) and a very good category for the food web, food pyramid, and ecosystem balance.

**Table 18.** The Student Worksheet (LKPD)

| Category | Percentage | | | |
|---|---|---|---|---|
| | Food Chain | Food web | Food Pyramid | Ecosystem balance |
| Very good | - | 38% | 85% | 100% |
| Good | 100% | 62% | 15% | - |
| Sufficient | - | - | - | - |
| Poor | - | - | - | - |

Based on the LKPD table, the level of students' abilities and understanding based on the OLGA learning media shows a good category for the food chain and food web, as well as a very good category for the food pyramid and ecosystem balance.

Based on the research results, OLGA (Ocean Lomban Game) successfully enhanced students' interest and performance in marine ecology education, as reflected in the improved post-test results. These findings align with the study by (Hamari et al., 2016) which stated that game-based digital learning media can increase student engagement and motivation. OLGA also effectively integrated local wisdom into education, adding contextual value to learning. This supports the findings of (Yanou et al., 2023), who noted that combining local ecological knowledge with scientific data can strengthen conservation decisions and increase environmental awareness.

This study also shows similar results to research by (Clark et al., 2016), which found that the use of digital games in science education can significantly improve students' conceptual understanding. Expert validation of this media confirmed that OLGA is not only effective but also feasible for classroom use.

Moreover, the study by (Sun et al., 2018) revealed that interactive digital media could make students more active in the learning process. This aligns with the positive feedback from students and teachers in this study, where OLGA was rated as practical and easy to use, thus enhancing student engagement in learning.

However, (Mayer, 2020) warns that the use of digital media in education must consider proper

multimedia design to avoid cognitive overload. In this regard, OLGA managed to balance visual and interactive elements, reducing such risks.

These results are further supported by the study of (Wang & Zheng, 2021), which showed that effective educational media must undergo rigorous validation and testing. OLGA's validation by experts yielded excellent results, acknowledging it as an effective solution for improving students' understanding of marine ecosystems.

The use of technology in learning media like OLGA allows students to learn at their own pace and gain deeper understanding, as also highlighted by (Graf et al., 2013).

The novelty of this research lies in OLGA, the first marine ecology learning media that integrates information technology with the local wisdom of Lomban Kupatan Tayu. This innovative approach not only enhances the effectiveness of marine ecology education but also strengthens the deeper connection to local culture. By incorporating traditional practices, OLGA helps students better understand the importance of ecological balance in their daily lives. Additionally, the use of IT-based learning tools makes the material more accessible and engaging for students, thus increasing their motivation and retention. Overall, OLGA represents a unique blend of technology and cultural heritage in the field of education.

The conclusion drawn from this research is that the implementation of OLGA in marine ecology learning has a significant impact on improving students' understanding and interest in learning. Expert validation indicated that this media is considered valid and effective, while trial results showed a substantial improvement in students' ability to comprehend marine ecology concepts.

The potential for implementing OLGA on a broader scale is substantial, particularly in promoting technology-based learning that integrates local wisdom. OLGA can be applied in various schools, especially in coastal areas or regions with local traditions related to environmental conservation. With wider implementation, OLGA could significantly contribute to raising students' ecological awareness from an early age and supporting the sustainable conservation of natural resources through an innovative and contextual educational approach.

## CONCLUSION

The validation results for the OLGA media show 66% and 75%, which are categorized as valid with minor revisions. In comparison, the material validation percentages are 74% and 94%, also categorized as valid with minor revisions. The effectiveness of the media is assessed with an N-Gain value of 56.20, categorized as fairly effective, and a T-test with a sig. (2-tailed) value of 0.000 < 0.005, indicating a significant effect on students' abilities. The practicality of the OLGA media received a score of 86%, classifying it as very practical and suitable for use in learning. Therefore, the OLGA media can be implemented to teach marine ecology in science subjects.

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