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Creating An Educational Science Website Leveraging Beach Edutourism to Enhance Scientific Literacy

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Abstract: Connecting lessons to students' surroundings makes it easier for them to understand and use science skills. This research aimed to create a practical science website about Talang Siring Beach edutourism to help students practice these skills. The science website media was developed using the ADDIE model. A post-test-only control group design was used for the implementation stage of the research design. The research subjects were 59 students who were split into two classes (31 students in the experimental class and 28 students in the control class). The instruments used included a validation questionnaire for the feasibility of media and material aspects, a response and readability questionnaire, and also a science literacy test. The Mann-Whitney U test was used to compare the experimental and control classes' scientific literacy levels. The results of this study show the developed media is valid (0.89 for the feasibility aspect and 0.9 for material feasibility). The response to and readability of the website media are in a good category. The results of the Mann-Whitney U test show a difference in scientific literacy skills between the two classes (sig. 0.000 < 0.05). The experimental class has a higher level of scientific literacy than the control class. The study found that the Talang Siring Beach science website works well and boosts students' scientific literacy. This means teachers should link learning to the local environment so students can better solve problems around them. Future work should pair these websites with effective teaching strategies.

Keywords: *science website, scientific literacy, Talang Siring Beach edutourism.*

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INTRODUCTION

Nowadays, classroom learning activities should not only focus on students' mastery of concepts but should also be expanded to skills that can prepare students as citizens who are ready to live in the 5.0 era. Various skills, such as problem-solving (Funke et al., 2018; Graesser et al., 2018; Wulandari et al., 2019; Nakakoji & Wilson, 2020) scientific reasoning skills (Kambeyo & Csapo, 2018; Yediarani et al., 2019; Sutarja et al., 2022; Yasir et al., 2022) scientific process skills (Serevina et al., 2018; Darmaji et al., 2019; Safaruddin et al., 2020; Wola et al., 2023) and scientific literacy (Ristanto et al., 2018; Shaffer et al., 2019) are the focus of research in science education. Experts strive to help students master these skills so that they can become citizens of science who make positive contributions to their environment.

Scientific literacy is defined as the ability to solve everyday problems using scientific methods, not without evidence, let alone in an illogical way (Kembara et al., 2020). This ability is one of the abilities that is the focus of attention of science education experts. Students are trained to have the competence to explain a problem with a scientific explanation; evaluate investigation activities; and interpret information from one form to another to improve their scientific literacy skills (Fauziyah et al., 2021; Ashari et al., 2023; Ramli et al., 2024). Through this ability, students can become citizens of

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science who do not easily believe in hoax news that circulates very quickly in the 5.0 era (National Research Council, 2012; Yacoubian, 2018; Scheufele & Krause, 2019). Training students to have good scientific literacy skills means building a good environmental system.

The facts show that students lack scientific literacy skills (OECD, 2023; Nuryanti et al., 2023). Several previous research results show that all aspects of scientific literacy competency, namely making scientific explanations, evaluating research designs, and interpreting data are in the low category (Nur'Aini et al., 2018; Fauziyah et al., 2021; Ashari et al., 2023; Siswanto et al., 2023). Kembara et al., (2020) on the object of prospective teacher students, also show the fact that scientific literacy skills are one of the abilities that have not been mastered by prospective teacher students. Similar results were found in the research of Nazilah et al., (2019) at a junior high school in Pamekasan which is located close to Talang Siring Beach, where students' science literacy ability scores were still in the low category with an average of 15.73 before the application of socio-scientific issues-based teaching materials. The facts described show how important it is for science education experts to focus on improving students' scientific literacy skills, and to equip students as citizens of science in the 5.0 era.

Several efforts have been made by science education experts to develop students' scientific literacy skills. In terms of learning models, the Science, Technology, Society (STS) Learning Model outperforms the Problem-Based Learning (PBL) Model in terms of improving students' scientific literacy skills, but does not apply to students who have high dependence/low independence (Ratini et al., 2018). This fact is supported by the literature review of Oliver et al., (2021) which shows that teachers still need to emphasize concepts in students' inquiry activities at the junior high school level, even though it is not the classes that more frequently implement inquiry-based learning that can improve students' scientific literacy skills. This study shows that there needs to be a match between students' abilities and the learning models applied in students' classes. Learning media can be used to improve students' scientific literacy skills in addition to creating an inquiry-based learning environment, as shown by many studies (Niswatuzzahro et al., 2018; Wen et al., 2020; Wahyu et al., 2020).

Existing studies demonstrate the need to create a learning environment that focuses not only on science as a product but also on the aspect of science as a process. The scientific literacy abilities of students can be enhanced by conditioning a learning environment that is close to their everyday lives. Dewi et al., (2019) in their research, showed that using learning resources that bring students closer to everyday life should be the primary focus for enhancing students' scientific literacy. Whether through a learning model or learning resources, an important component to emphasize is the closeness of what is taught to students' daily lives, or what is commonly called the contextuality of the learning environment.

Talang Siring Beach is one of the tourist attractions in Pamekasan. Students can utilize the playground, swimming pool, mangrove forest, and other natural objects at this beach as learning resources. In a study conducted on Google Scholar, Talang Siring Beach is not a popular object in its use as a learning resource. As an effort to foster students' scientific literacy skills and create contextual learning resources, Talang Siring Beach is an object that is worthy of being used as inspiration for creating learning media. Talang Siring Beach can be used as a learning resource to train students' scientific literacy because the facilities available there (such as mangrove forests, playgrounds, swimming pools, floating charts, etc.) are closely related to science concepts so that they can be used as a context in science learning. These science concepts include the concepts of pressure, vibration, waves, simple machines, work and energy, force, coastal ecosystems, mangrove forests, corrosion, and mixtures. This will make science learning more contextual. Contextual phenomenon-based learning can improve students' scientific literacy (Santoso et al., 2023).

Because of the contextual elements of Talang Siring Beach, it is necessary to develop learning media to foster students' scientific literacy skills. One form of popular media is in the form of a website because learning through a website allows students to learn anywhere, as is the nature of the existence of learning media (Cahyadi, 2019). According to previous research (Mahmud et al., 2023), the use of website media improves students' scientific literacy, which is why the website was chosen. The integration of Talang Siring Beach into the website being developed will make the material presented more contextual. The contextuality of learning media can assist students in comprehending the material and cultivating scientific literacy (Muhlis et al., 2024). This study aims to develop a

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science website to teach students how to be scientifically literate. The science website integrated with the science context at Talang Siring Beach needs to be tested for its effectiveness in training students' science literacy skills through the use of this media in science learning in the classroom. It is expected that this study's findings will produce learning media intended to improve students' scientific literacy skills as well as expand our understanding of the connection between media and students' scientific literacy. In addition, this study is expected to provide an overview that the integration of the surrounding environment is very important as a source of contextualization of science learning and as a way to improve students' scientific literacy.

METHOD

This study develops a website for science learning whose contents are integrated with the science concept found in Talang Siring Beach Edutourism. This study is a type of research and development in which a website-based product is developed and its effectiveness is tested. The ADDIE model stages (analysis, design, development, implementation, and evaluation) were used to develop the Talang Siring Beach Edutourism website. **Figure 1** depicts the ADDIE phases of this website's development.

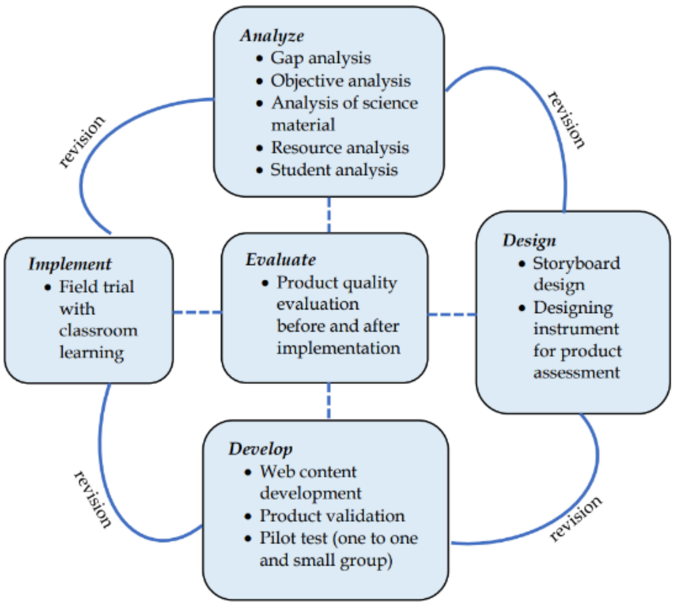

Figure 1. ADDIE Stages in Developing a Science Website

The analysis stage was carried out through gap validation analysis, user analysis (students), objective analysis, resource analysis, and analysis of science components in Talang Siring Beach Edutourism (material analysis). During this analysis stage, activities like observation, interviewing, and literature study were done. The findings of this analysis stage clarified the core problems to be solved and the need for developing the learning media.

The second stage is design. The purpose of this stage is to verify the desired performance and the correct testing method. At the design stage, the storyboard of the developed website was designed. The website design that was prepared could answer the problems at the analysis stage. In addition, the product assessment instrument was also designed at this stage of activity.

At the development stage, the website content was created based on the storyboard created at the design stage. The content was created from the results of material analysis, observation results, and interviews using the Wix website application and considering the aspects of scientific literacy competencies to be trained. After the website was created, the next step was validation. The validation process used a website validation questionnaire instrument on the media feasibility aspect and the material feasibility aspect. Website validation was carried out on six validators. The Aiken formula, similar to **Formula 1**, was used to calculate the expert validity results (Hendryadi, 2017).

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$$V = \frac{\sum s}{[n(c-1)]}$$

Notes:
V = Aiken's validity
s = r – lo
lo = the lowest validator's score
c = the highest validator's score
r = the validator's score
n = the number of validators

The science website media is considered valid if the obtained validity score is more than 0.78. This limit value is obtained from Aiken's V table for six validators with a rating category of 4 (Aiken, 1985; Kurniawati & Aini, 2022).

At the development stage, after the validation process was completed, a pilot test was administered with one-to-one and small-group testing. Three students were tested one-to-one and eight students were tested in small groups. During the pilot test, students were given a response and readability questionnaire from the developed website media.

The implementation stage was carried out at State Junior High School (SMPN) 1 Pamekasan, Madura, Indonesia. The implementation stage used a posttest-only control group design. This stage involved two classes, one of which served as the control and the other one as the experimental classes. The research sample was established using the random sampling technique. There were 31 students in the experimental class (class B) and 28 in the control class (class F). Learning in the experimental class was through the use of media from the website. Students were divided into seven groups. Each group was given a map and barcode of the Talang Siring Beach edutourism website. The teaching at the experimental class was carried out following the syntax of the cooperative model and the students learned using science website media via their respective mobile phones. Furthermore, a science literacy test was administered to both the experimental and control classes to measure students' science literacy abilities. The scientific literacy test, response questionnaire, and readability questionnaire had been validated before they were used with the average validity score of the scientific literacy test being 0.89 (valid). The average reliability score being 88% (reliable), the average validity score of the readability questionnaire being 0.93 (valid) and the average reliability score being 93% (reliable), and the average validity score of the student response questionnaire instrument being 1.00 (valid) and the average reliability score being 100% (reliable).

The Mann-Whitney U test was then used to examine the test results from the experimental and control classes to identify differences in science literacy abilities between the two groups. In addition, the level of student science literacy was determined from the scores obtained by students. The criteria for the level of science literacy were measured by giving a score to each question with a different level adjusted to the PISA score. The calculation of the achievement score and the level is presented in **Table 1** (Pravitasari et al., 2015).

Table 1. Level of Scientific Literacy

Score	Level of Scientific Literacy
86-100	Level 6
72-85	Level 5
61-71	Level 4
40-60	Level 3
15-39	Level 2
8-14	Level 1
0-7	Below Level 1

At the evaluation stage, the product quality evaluation was carried out either before or after implementation. At each stage of ADDIE, this evaluation was carried out. The evaluation results were used to provide feedback for future product improvements.

FINDINGS AND DISCUSSION

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The ADDIE model was used to develop the integrated science website based on Talang Siring Beach edu-tourism. The ADDIE model was chosen because its stages are structured and systematic, including the analysis, design, development, implementation, and evaluation stages (Cahyadi, 2019). The findings of each ADDIE stage are described below.

The findings at the analysis stage were obtained from observation, interviews, and literature reviews. The result of the gap analysis shows that the media used in learning are less varied and tend to use textbooks (Sejati et al., 2021), students' science literacy is less facilitated (Arief & Utari, 2015; Ma'ruf & Rafianti, 2023), and the integration of content around students in learning is less than optimal. The findings of the user analysis (students) include students operating gadgets more to play games and social media (Prizki & Sari, 2020), when visiting tourist attractions the purpose is simply recreation and taking photos, and students' low scientific literacy (Nur'Aini et al., 2018; Kembara et al., 2020; Widiyana et al., 2021). The findings of the objective analysis are to foster students' scientific literacy through website media whose content is integrated with the student's environment. The findings of the resource analysis are the availability of the Wix platform for website creation and also the students' ownership of gadgets. The findings of the material analysis include many science concepts found at Talang Siring Beach, including the concepts of pressure, vibration, waves, simple machines, work and energy, force, coastal ecosystems, mangrove forests, food chains, corrosion, mixtures, and chemical properties of materials.

The result of the design stage is a storyboard of the menus on the science website. The storyboard is presented in **Figure 2**.

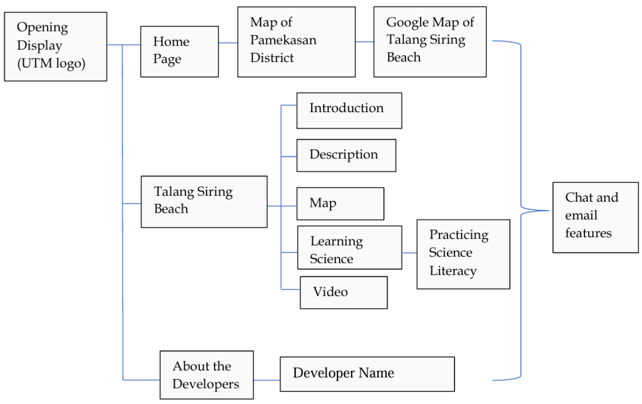

Figure 2. Science Website Storyboard

The findings of the development stage are in the form of a science website whose link can be accessed using the barcode on the Talang Siring Beach map. The map and barcode link to the website are presented in **Figure 3**.

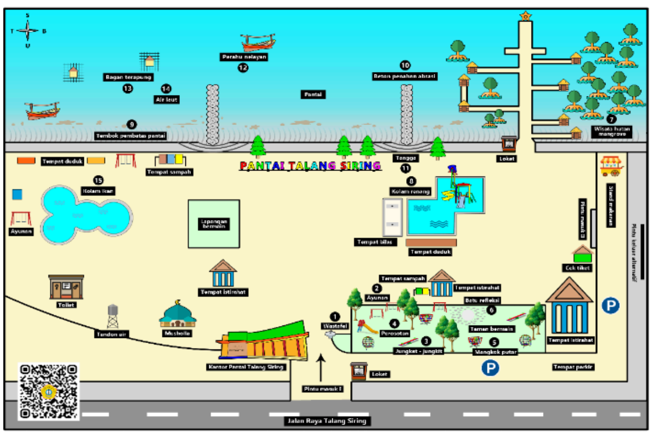

Figure 3. Talang Siring Beach Map with Science Website Barcode

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Examples of science website displays for training science literacy in the competency aspect are shown in **Figure 4a, Figure 4b,** and **Figure 4c.**

Figure 4a. An Example of a Science Website Display to Train Indicators of Explain Phenomena Scientifically

Figure 4b. An Example of a Science Website Display to Train Indicators of Interpret Data and Evidence Scientifically

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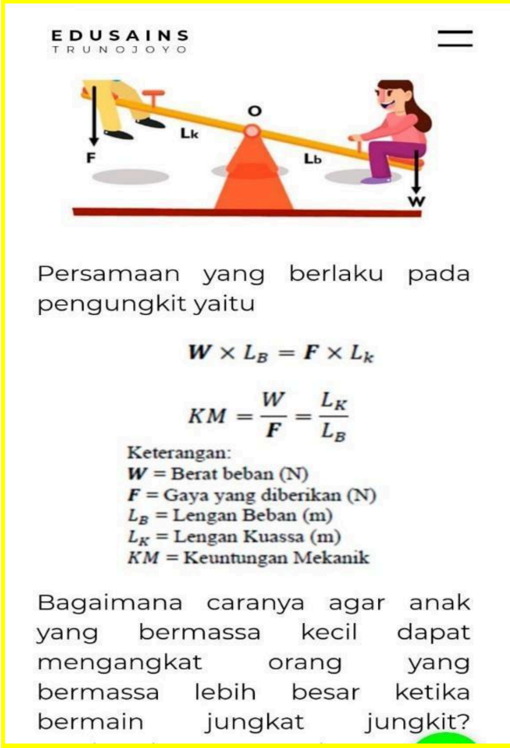

Figure 4c. An Example of a Science Website Display to Train Indicators of Evaluate and Design Scientific Enquiry

After the science website was successfully developed, validation was carried out on six validators. It was aimed at determining the website's media and material validity. **Table 2** and **Table 3** provide an overview of the science website validation results.

Table 2. Validity of Media Aspect

Aspect	V	Category
Software Engineering	0.89	Valid
Visual Communication	0.88	Valid
Average	0.89	Valid

Table 3. Validity of Material Aspect

Aspect	V	Category
Content Suitability	0.89	Valid
Presentation Suitability	0.91	Valid
Language	0.90	Valid
Average	0.90	Valid

Table 2 and **Table 3** show that the developed science website media is said to be valid based on the validity score in the aspects of material feasibility and material readability. The developed website is easy to operate, can be run on a cellphone or PC, and does not crash easily when operated, it can be used as a means of independent learning for students because it can be used repeatedly by students. This is in line with the principles of usability, compatibility, reliability, and reusability in the software engineering aspects of the developed website media. In addition, the website content also uses real examples of students. This is relevant to Ausubel's learning theory that learning can be meaningful if it links the knowledge that students already have with the material being studied, for example by linking things that are around students (Ardiani & Agung, 2022). The developed science website also displays images to support the science material presented. The use of images helps students understand concepts and attracts their attention to learning (Sun & Looi, 2013; Saidah, 2023). The findings regarding the science website's validity are relevant to the research by Sejati et al., (2021) which

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asserts that the interactive learning media based on the developed website has very high validity. Website media can be an alternative source of independent learning that can be used anywhere and anytime.

After the media was declared valid, a pilot test was conducted through one-to-one and small-group trials before its implementation in large-scale classroom learning. Students were given a response questionnaire and a science website readability questionnaire for this one-to-one and small-group trial. **Figure 5** and **Figure 6** show the responses and readability scores from the one-to-one and small-group trials.

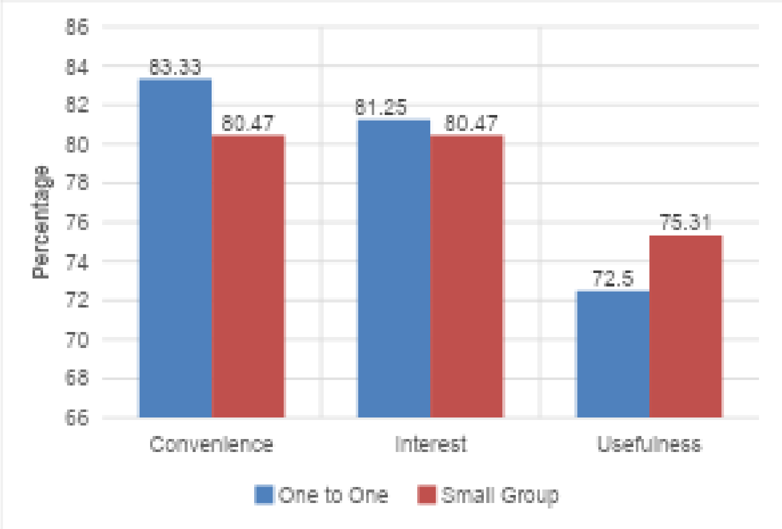

Figure 5. Results of Student Responses in One-to-One and Small-Group Tests

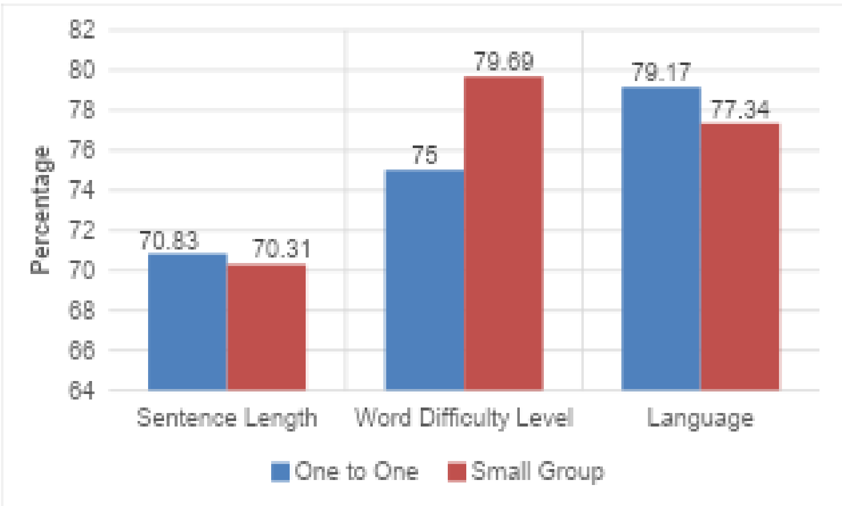

Figure 6. Results of Media Readability in One-to-One and Small-Group Tests

Based on the findings of the pilot test through one-to-one and small-group trials, it is known that the student average response to the website media is positive. Students find it easy to operate the website media. In addition, students are also interested in learning using the website media. This is following the behaviorism theory regarding stimulus and response (Abidin, 2022). It is possible to pique students' interest in learning by providing stimulus in the form of media found on websites, such as images and videos.

The student's scores on the website media's readability in the one-to-one and small-group tests are also in a good category. The language used in the website media is adjusted to the level of thinking of students. This applies to Piaget's theory that junior high school students are still in the formal operational stage (Anas, 2018). Therefore, the choice of language used in presenting science material

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is adjusted to students' cognitive development (Landina & Agustiana, 2022; Saidah, 2023). This aims to make the material easily understood by students. To make it easier for students to learn, the foreign terms used in the presentation of the material are also accompanied by explanations.

After a pilot test was conducted through one-to-one and small group testing with the findings of the response and readability of the web in the favorable category, the next step was to implement the web in classroom learning. Experimental class learning followed the syntax of the cooperative model. Students were divided into seven groups, each of which was given a map and barcode of the Talang Siring Beach edutourism website. Experimental class students learned using science website media via their respective mobile phones. They were asked to watch a video of Talang Siring Beach and then work in groups to find the relationship between science concepts and several facilities at Talang Siring Beach. The students could learn while exploring the facilities available at Talang Siring Beach using the Talang Siring Beach map and looking for information on the relationship between these facilities and science concepts on the science website used. The students took a science literacy test following the implementation of learning through the use of media from the science website. The science literacy test was also given to the control class as a comparison. Science literacy data were obtained by giving a science literacy essay test on the competency aspect. The indicators of the competency aspect used were explaining a problem with a scientific explanation, evaluating investigation activities, and interpreting information from one to another (Arief & Utari, 2015; Fauziyah et al., 2021; Ashari et al., 2023; Ramli et al., 2024).

The Shapiro-Wilk test was used to determine whether the collected data from the science literacy test results were normal before the hypothesis testing. Because the significance level was less than 0.05, the Shapiro-Wilk test revealed that the data did not have a normal distribution. The Mann-Whitney U test was used for non-parametric testing because the science literacy test data from the experimental and control classes were not normally distributed. **Table 4** displays the Mann-Whitney U test's findings.

Table 4. Mann-Whitney U Test Findings

Test Statistics	Scientific Literacy Score
Mann-Whitney U	76.500
Wilcoxon W	482.500
Z	-5.459
Asymp. Sig. (2-tailed)	0.000

The hypothesis test results have a significance level of 0.000, as shown in **Table 4.** The null hypothesis is rejected because this value is less than 0.05. Therefore, it is possible to conclude that the experimental class and the control class have different levels of scientific literacy. The science website media integrated with Talang Siring beach edu-tourism can be used to practice science literacy skills. Students are accustomed to reading the content and solving problems on the science website media while examining images, equations, or videos, thereby practicing their scientific literacy. Additionally, aspects of Talang Siring Beach edu-tourism are integrated into the website content. The science components in Talang Siring Beach edu-tourism are close to students' daily lives. These findings are relevant to the research of Rubini et al., (2018) which states that the use of literacy-based multimedia can enhance students' scientific literacy skills. This is because scientific literacy is related to the ability to understand science, communicate science, and apply scientific knowledge to solve problems based on scientific considerations (Hastuti et al., 2020; Nurhasanah et al., 2020). Scientific literacy is crucial for the provision of skills that must be possessed in the 21st century, which include critical, creative, collaborative, and communication thinking (Banila et al., 2021). Scientific literacy can be improved through the use of media in the learning process (Niswatuzzahro et al., 2018; Wahyu et al., 2020; Wen et al., 2020).

The average scientific literacy score of the two classes was calculated to compare and contrast the experimental and control groups' levels of scientific literacy. **Figure 7** depicts the experimental and control classes' average scientific literacy scores.

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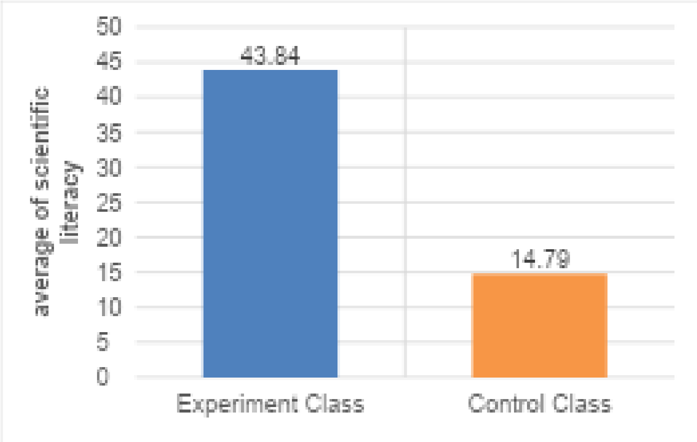

Figure 7. The Experimental and Control Classes' Average Scientific Literacy

The criteria listed in **Table 1** above were used to conclude the level of science literacy based on the average science literacy score between the experimental and control classes. **Figure 8** and **Table 5** show the results of the science literacy levels of the experimental and control classes.

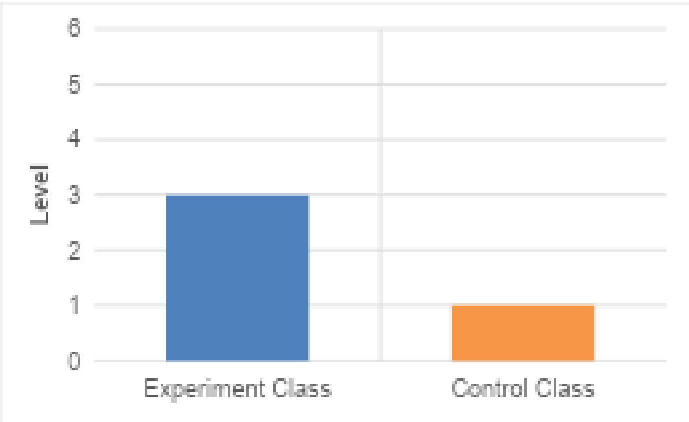

Figure 8. The Experimental and Control Classes' Scientific Literacy Level

Table 5. Distribution of Scientific Literacy Levels in Experimental and Control Classes

Level of Scientific Literacy	Experimental Class		Control Class	
	Number of Students	Percentage	Number of Students	Percentage
Below level 1	0	0.00	11	39.29
Level 1	2	6.45	6	21.43
Level 2	10	32.26	10	35.71
Level 3	14	45.16	1	3.57
Level 4	0	0.00	0	0.00
Level 5	5	16.13	0	0.00
Level 6	0	0.00	0	0.00

The findings presented in **Figure 7** indicate that the experimental class's average scientific literacy level is higher than the control class's. These results support the conclusion of the Mann-Whitney U test. The experimental class's use of science website media affects the development of students' scientific literacy skills. These findings are also consistent with Gu et al., (2019) finding that students who learn with website media have better scientific literacy skills than students who do not.

Figure 8 reveals that the experimental class has a higher level of scientific literacy than the control class. The average student in the experimental class is level 3. While the control class has a

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level 1 scientific literacy. The students in the experimental class can show evidence of related scientific reasoning and develop arguments for questions of analysis, modeling, and data interpretation. Meanwhile, the control class students can provide only simple explanations of several causal relationships (Pravitasari et al., 2015). The data on the distribution of science literacy levels in the experimental and control classes (**Table 5**) support this conclusion. Five students in the experimental class can achieve science literacy at level 5, while the number of the control class students who can reach level 3 is only one. In the experimental classes, using media from contextual science websites can help students become more scientifically literate. The contextuality of learning resources is effective in training students' scientific literacy (Muhlis et al., 2024).

The science website integrated with Talang Siring Beach edu-tourism is effective in training students' scientific literacy in the experimental class because the developed website has trained three indicators of scientific literacy in the competency aspect. This can be seen from several examples of website displays in Figure 4a, Figure 4b, and Figure 4c. In the indicator explaining the phenomenon scientifically, the website presents trigger questions related to the phenomena encountered at Talang Siring Beach and encourages students to answer using the knowledge they have to explain the phenomenon. After the question is followed by an explanation of the scientific concept on the developed website. As in Figure 4a, the website presents a picture of a floating bagan followed by the question of why a floating bagan can float in seawater. Then below it is given a scientific explanation of why a floating bagan can float in seawater. In the indicator interpreting data and evidence scientifically, the website displays several types of modeling or representations ranging from image modeling to mathematical modeling. As can be seen in Figure 4b, the website presents a picture of a rotating bowl, and then mathematical modeling and images are given to make it easier for students to understand. In the indicator of evaluating and designing scientific inquiry, for example in Figure 4c, on the website students are trained to find ways to solve the problems given. Students can be trained to design where and at what distance a small child should sit on the seesaw.

Learning using the science website integrated with Talang Siring Beach edu-tourism makes learning more contextual because it is linked to phenomena in the students' environment. This makes the edu-tourism-based approach more effective in training students' scientific literacy. Students can learn while exploring the facilities available at Talang Siring Beach through videos on the science website and can relate these facilities to the science concepts learned in the science learning section of the website. In addition, all students who were samples in the experimental class had visited Talang Siring beach, so this made it easier for students to learn using the science website because they could relate new information obtained when learning using the science website with information that they already had before. This is following the concept of Ausubel's meaningful learning theory which states that meaningful learning occurs when students can relate concepts that they already have with concepts that have just been learned (Ardiani & Agung, 2022). According to Yanto et al., (2023), the application of meaningful learning can help improve students' scientific literacy.

In the experimental class, after learning to use the science website, a questionnaire of responses and readability of the science website was also given. **Table 6** displays the findings of the students' responses to the website media in the experimental class. In the meantime, **Table 7** displays the experimental class students' assessments of the website media's readability.

Table 6. Responses from the Experimental Class's Students

Indicator	Score (%)
Convenience	82.42
Interest	79.13
Usefulness	72.75
Average	78.1

Table 7. Results of Media Readability in the Experimental Class

Indicator	Skor (%)
Sentence Length	70.13
Word Difficulty Level	70.76
Language	76.69
Average	72.53

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Table 6 and **Table 7** show that students' responses to website media and the readability of website media by students are included in the good category. Students can easily use website media, which also helps them understand the concepts. Because the content is supported by images, students are interested in what the website media looks like and what it contains. The presence of images fosters students' interest in learning. The sentences used in the website media are also easy for students to understand because they are presented sequentially and the content is contextual and close to students' daily lives. Learning materials that are presented contextually tend to facilitate student learning and enhance scientific literacy (Dewi et al., 2019). This study finding is relevant to the research of Sun & Looi, (2013) which reports that students liked the developed web media. Students find it easy and interested in learning using website media. The website media helps students to learn independently (Sejati et al., 2021). Website media has a positive effect on students' understanding of concepts and practicing scientific literacy.

The results of this study can provide an overview that the integration of the surrounding environment is very important as a source of contextualization of science learning and as one way to improve students' science literacy. The results of this study imply that to train science literacy, teachers need to link things around students in the learning process so that students find it easier to solve problems around them. Website media can be developed through the integration of other local potentials around students. Further research is expected on the right learning model that can collaborate with contextual website media to improve students' science literacy so that the results are more optimal.

CONCLUSION

This study concludes that the integrated science website media for Talang Siring Beach edu-tourism is feasible to use with a media aspect validity score of 0.89 and a material aspect validity score of 0.9. Student responses and the readability of the website media by students are both rated as satisfactory. The developed website media can help train students' scientific literacy skills with level 3 achievements in the experimental class. The integration of the surrounding environment makes it easier for students to understand the material and foster students' scientific literacy.

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REFERENCES

Abidin, A. M. (2022). Penerapan Teori Belajar Behaviorisme Dalam Pembelajaran (Studi Pada Anak). *An-Nisa*, *15*(1), 1–8. https://doi.org/10.30863/an.v15i1.3315

Aiken, L. R. (1985). Three coefficients for analyzing the reliability and validity of ratings, educational and psychological measurument. *Educational and Psychological Measurement*, *45*(1), 131–142.

Anas, N. (2018). Pembelajaran Ipa: Dari Fakta Menuju Teori. *Nizhamiyah*, *8*(1), 1–10. https://doi.org/10.30821/niz.v8i1.251

Ardiani, N. K. E., & Agung, A. A. G. (2022). Multimedia Pembelajaran Interaktif Berorientasi Teori Belajar Ausubel pada Muatan IPA Materi Sumber Energi. *Jurnal Penelitian Dan Pengembangan Pendidikan*, *6*(1), 26–35. https://doi.org/10.23887/jppp.v6i1.45159

Arief, M. K., & Utari, S. (2015). Implementation of Levels of Inquiry on Science Learning To Improve Junior High School Student'S Scientific Literacy Penerapan Levels of Inquiry Pada Pembelajaran Ipa Untuk Meningkatkan Literasi Sains Siswa Smp. *Jurnal Pendidikan Fisika Indonesia*, *11*(2), 117–125.

Ashari, S. E., Rachmadiarti, F., & Herdyastuti, N. (2023). Analysis of the Science Literacy Profile of Students at State Junior High School. *IJORER : International Journal of Recent Educational Research*, *4*(6), 889–898. https://doi.org/10.46245/ijorer.v4i6.340

Banila, L., Lestari, H., & Siskandar, R. (2021). Apllication of Blended Learning with a STEM Approach to Improve Students' Science Literacy Ability during the Covid 19 Pandemic. *Journal*

ISSN 2406-9205 (print), ISSN 2477-4820 (online)

of Biology Learning, *3*(1), 25.

Cahyadi, A. (2019). *Pengembangan Media dan Sumber Belajar: Teori dan Prosedur*. Laksita Indonesia.

Darmaji, D., Kurniawan, D. A., & Irdianti, I. (2019). Physics education students' science process skills. *International Journal of Evaluation and Research in Education* , *8*(2), 293–298. https://doi.org/10.11591/ijere.v8i2.16401

Dewi, C. A., Khery, Y., & Erna, M. (2019). An ethnoscience study in chemistry learning to develop scientific literacy. *Jurnal Pendidikan IPA Indonesia*, *8*(2), 279–287. https://doi.org/10.15294/jpii.v8i2.19261

Fauziyah, A., Prasetyaningsih, & Biru, L. T. (2021). Analysis of Scientific Literacy Skills in Solving Question Science on Food Security Themes in Serang City. *Jurnal Penelitian Pendidikan IPA*, *6*(2), 56–63. https://doi.org/10.26740/jppipa.v6n2.p56-63

Funke, J., Fischer, A., & Holt, D. V. (2018). Competencies for Complexity: Problem Solving in the Twenty-First Century. In *Assessment and teaching of 21st century skills* (Issue January, pp. 41–53). Springer. https://doi.org/10.1007/978-3-319-65368-6_3

Graesser, A. C., Fiore, S. M., Greiff, S., Andrews-Todd, J., Foltz, P. W., & Hesse, F. W. (2018). Advancing the Science of Collaborative Problem Solving. *Psychological Science in the Public Interest*, *19*(2), 59–92. https://doi.org/10.1177/1529100618808244

Gu, X., Wang, C., & Lin, L. (2019). Examining scientific literacy through new media. *Eurasia Journal of Mathematics, Science and Technology Education*, *15*(12), 1–14. https://doi.org/10.29333/ejmste/109948

Hastuti, P. W., Setianingsih, W., & Anjarsari, P. (2020). How to develop students' scientific literacy through integration of local wisdom in Yogyakarta on science learning? *Journal of Physics: Conference Series*, *1440*(1), 0–8. https://doi.org/10.1088/1742-6596/1440/1/012108

Hendryadi, H. (2017). Validitas Isi: Tahap Awal Pengembangan Kuesioner. *Jurnal Riset Manajemen Dan Bisnis (JRMB) Fakultas Ekonomi UNIAT*, *2*(2), 169–178. https://doi.org/10.36226/jrmb.v2i2.47

Kambeyo, L., & Csapo, B. (2018). Scientific Reasoning Skills: A Theoretical Background on Science Education. *Reform Forum: Journal for Educational Research in Namibia*, *26*(1), 27–36.

Kembara, M. D., Hanny, R., Gantina, N., Kusumawati, I., Budimansyah, D., Sunarsi, D., & Khoiri, A. (2020). Scientific Literacy Profile Of Student Teachers On Science For All Context. *Solid State Technology*, *63*(6), 5844–5856.

Kurniawati, E., & Aini, S. (2022). Validity and Practicality of Guided Inquiry-Based Interactive Multimedia on Topic of Acid-Base for Senior High School Learning. *Jurnal Penelitian Pendidikan IPA*, *8*(4), 2279–2285. https://doi.org/10.29303/jppipa.v8i4.1941

Landina, I. A. P. L., & Agustiana, I. G. A. T. (2022). Meningkatkan Berpikir Kritis Siswa melalui Media Pembelajaran Flipbook berbasis Kasus pada Muatan IPA Kelas V SD. *Mimbar Ilmu*, *27*(3), 443–452. https://doi.org/10.23887/mi.v27i3.52555

Ma'ruf, A., & Rafianti, W. R. (2023). Meningkatkan Aktivitas, Kemampuan Literasi Sains dan Hasil Belajar Muatan IPA Menggunakan Model Plant and Teach. *Scholastica Journal: Jurnal Pendidikan Sekolah Dasar Dan Pendidikan Dasar*, *6*(2), 22–33. https://doi.org/10.31851/scholastica.v6i2.12998

Mahmud, D. R., Hidayat, A., Munzil, M., & Fadhli, M. (2023). Pengembangan Web Interaktif "Hai Si IPA" Untuk Meningkatkan Literasi Sains Di Sekolah Dasar. *Cetta: Jurnal Ilmu Pendidikan*, *6*(4), 829–842. https://doi.org/10.37329/cetta.v6i4.2818

Muhlis, Raksun, A., Artayasa, I. P., Hadiprayitno, G., & Sukri, A. (2024). Developing Context-Based Teaching Materials and their Effects on Students' Scientific Literacy Skills. *Pegem Journal of Education and Instruction*, *14*(1), 226–233. https://doi.org/10.47 750/pegegog.14.01.25

Nakakoji, Y., & Wilson, R. (2020). Interdisciplinary learning in mathematics and science: transfer of learning for 21st century problem solving at university. *Journal of Intelligence*, *8*(32), 1–22. https://doi.org/10.3390/jintelligence8030032

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. The National Academies Press. https://doi.org/10.17226/13165

Nazilah, N., Muharrami, L. K., Rosidi, I., & Wulandari, A. Y. R. (2019). Pengaruh Bahan Ajar Berbasis Socio-Scientific Issues Pada Materi Pemanasan Global Untuk Melatih Kemampuan

ISSN 2406-9205 (print), ISSN 2477-4820 (online)

Literasi Sains Siswa. *Natural Science Education Research*, *2*(1), 8–16. https://doi.org/10.21107/nser.v2i1.4162

Niswatuzzahro, V., Fakhriyah, F., & Rahayu, R. (2018). Penerapan Model Discovery Learning Berbantuan Media Audio Visual untuk Meningkatkan Literasi Sains Siswa Kelas 5 SD. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *8*(3), 273–284. https://doi.org/10.24246/j.js.2018.v8.i3.p273-284

Nur'Aini, D., Rahardjo, S. B., & Susanti, V. H. (2018). Student's profile about science literacy in Surakarta. *Journal of Physics: Conference Series*, *1022*(1), 1–6. https://doi.org/10.1088/1742-6596/1022/1/012016

Nurhasanah, N., Jumadi, J., Herliandry, L. D., Zahra, M., & Suban, M. E. (2020). Perkembangan Penelitian Literasi Sains Dalam Pembelajaran Fisika Di Indonesia. *Edusains*, *12*(1), 38–46. https://doi.org/10.15408/es.v12i1.14148

Nuryanti, T., Pursitasari, I. D., & Rubini, B. (2023). Science Literacy Profile of Junior High School Students on Climate Change Material. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8390–8395. https://doi.org/10.29303/jppipa.v9i10.5218

OECD. (2023). PISA 2022 Results (Volume I): The State of Learning and Equity in Education. In *OECD: Vol. I*. OECD Publishing. https://doi.org/10.1787/53f23881-en

Oliver, M., McConney, A., & Woods-McConney, A. (2021). The Efficacy of Inquiry-Based Instruction in Science: a Comparative Analysis of Six Countries Using PISA 2015. *Research in Science Education*, *51*(2), 595–616. https://doi.org/10.1007/s11165-019-09901-0

Pravitasari, O. tri, Widodo, W., & Pornomo, T. (2015). Pengembangan Media Pembelajaran Blog Berorientasi Literasi Sains Pada. *Pensa: Jurnal Pendidikan Sains*, *3*(3), 1–6.

Prizki, T. B. D., & Sari, S. P. (2020). Kecanduan Gadget pada Siswa Kelas XI di SMK Negeri 1 Lahat. *JUANG: Jurnal Wahana Konseling*, *3*(1), 11–20. https://doi.org/10.31851/juang.v3i1.4938

Ramli, M., Novalya, A. D., Indriyanti, N. Y., Wichaidit, S., & Wichaidit, P. R. (2024). The Validity and Practical Test of STEM@Home Learning Design to Empower Student's Science Literacy. *Jurnal Inovasi Pendidikan IPA*, *10*(1), 86–97. https://doi.org/10.21831/jipi.v10i1.70941

Ratini, Muchtar, H., Suparman, M. A., Tamuri, A. H., & Susanto, E. (2018). The influence of learning models and learning reliance on students' scientific literacy. *Jurnal Pendidikan IPA Indonesia*, *7*(4), 458–466. https://doi.org/10.15294/jpii.v7i4.12489

Ristanto, R. H., Zubaidah, S., Amin, M., & Rohman, F. (2018). From a reader to a scientist: developing cirgi learning to empower scientific literacy and mastery of biology concept. *Biosfer: Jurnal Prndidikan Biologi*, *11*(2), 90–100. https://doi.org/10.21009/biosferjpb.v11n2.90-100

Rubini, B., Permanasari, A., & Yuningsih, W. (2018). Learning Multimedia Based on Science Literacy on the Lightning Theme. *Jurnal Penelitian Dan Pembelajaran IPA*, *4*(2), 89. https://doi.org/10.30870/jppi.v4i2.3926

Safaruddin, S., Ibrahim, N., Juhaeni, J., Harmilawati, H., & Qadrianti, L. (2020). The Effect of Project-Based Learning Assisted by Electronic Media on Learning Motivation and Science Process Skills. *Journal of Innovation in Educational and Cultural Research*, *1*(1), 22–29. https://doi.org/10.46843/jiecr.v1i1.5

Saidah, L. (2023). Pengembangan Media Berbasis Website Untuk Menigkatkan Hasil Belajar Siswa Pada Materi Sumber dan Bentuk Energi. *Experiment: Journal of Science Education*, *3*(2), 40–48.

Santoso, A. N., Sunarti, T., & Wasis. (2023). Effectiveness of Contextual Phenomena-Based Learning to Improve Science Literacy. *International Journal of Current Educational Research*, *2*(1), 17–26. https://doi.org/10.53621/ijocer.v2i1.205

Scheufele, D. A., & Krause, N. M. (2019). Science audiences, misinformation, and fake news. *Proceedings of the National Academy of Sciences of the United States of America*, *116*(16), 7662–7669. https://doi.org/10.1073/pnas.1805871115

Sejati, W. S., Purba, H. S., & Mahardika, A. I. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Web Pada Pembelajaran Klasifikasi Materi Dan Perubahannya Kelas VII SMP Dengan Metode Demonstrasi. *Computer Science Education Journal (CSEJ)*, *1*(2), 37–48.

Serevina, V., Sunaryo, S., Raihanati, R., Astra, I. M., & Sari, I. J. (2018). Development of E-Module Based on Problem Based Learning (PBL) on Heat and Temperature to Improve Student's Science Process Skill. *TOJET: The Turkish Online Journal of Educational Technology*, *17*(3), 26–36.

Shaffer, J. F., Ferguson, J., & Denaro, K. (2019). Use of the test of scientific literacy skills reveals that fundamental literacy is an important contributor to scientific literacy. *CBE Life Sciences Education*, *18*(31), 1–10. https://doi.org/10.1187/cbe.18-12-0238

Siswanto, J., Suyidno, Mahtari, S., Fitriyani, Febriani, W., & Sari, E. (2023). The Barriers to Developing Students' Scientific Literacy in Learning Physics of Quantities and Measurements. *Jurnal Pendidikan Sains Indonesia*, *11*(2), 206–220. https://doi.org/10.24815/jpsi.v11i2.27767

Sun, D., & Looi, C. K. (2013). Designing a Web-Based Science Learning Environment for Model-Based Collaborative Inquiry. *Journal of Science Education and Technology*, *22*(1), 73–89. https://doi.org/10.1007/s10956-012-9377-9

Sutarja, M. C., Tamam, B., Andryani, E. N., & Iswanto, I. H. (2022). Profile of Pesantren Students' Character, Scientific Reasoning Skills and Its' Relationship. *Scientiae Educatia: Jurnal Pendidikan Sains*, *11*(1), 65–74. https://doi.org/10.24235/sc.educatia.v11i1.9570

Wahyu, Y., Suastra, I. W., Sadia, I. W., & Suarni, N. K. (2020). The effectiveness of mobile augmented reality assisted STEM-based learning on scientific literacy and students' achievement. *International Journal of Instruction*, *13*(3), 343–356. https://doi.org/10.29333/iji.2020.13324a

Wen, C. T., Liu, C. C., Chang, H. Y., Chang, C. J., Chang, M. H., Fan Chiang, S. H., Yang, C. W., & Hwang, F. K. (2020). Students' guided inquiry with simulation and its relation to school science achievement and scientific literacy. *Computers and Education*, *149*, 103830. https://doi.org/10.1016/j.compedu.2020.103830

Widiyana, A., Situmorang, R. P., & Tapilouw, M. C. (2021). Development of Animated Media-based Discovery Learning to Improve Scientific Literacy Content for Senior High School Students in Human Circulatory System Material. *Jurnal Pendidikan Sains (Jps)*, *9*(1), 69–80. https://doi.org/10.26714/jps.9.1.2021.69-80

Wola, B. R., Rungkat, J. A., & Harindah, G. M. D. (2023). Science process skills of prospective science teachers' in practicum activity at the laboratory. *Jurnal Inovasi Pendidikan IPA*, *9*(1), 50–61. https://doi.org/10.21831/jipi.v9i1.52974

Wulandari, A. Y. R., Agustina, N., Hidayati, Y., & Tsulutsya, F. B. (2019). Increasing students' problem-solving ability on the pressure concept through model-eliciting activities (MEAs). *AIP Conference Proceedings*, *2202*, 1–8. https://doi.org/10.1063/1.5141671

Yacoubian, H. A. (2018). Scientific literacy for democratic decision-making. *International Journal of Science Education*, *40*(3), 308–327. https://doi.org/10.1080/09500693.2017.1420266

Yanto, A. R., Pantiwati, Y., Saputri, A. R., Andani, T. S., & Sari, T. N. I. (2023). Applying Meaningful Learning (NGL and Game) to Improve Students' Scientific Concept Understanding and Scientific Literacy in Reproductive System Material. *Jurnal Eksakta Pendidikan (Jep)*, *7*(1), 74–83. https://doi.org/10.24036/jep/vol7-iss1/728

Yasir, M., Wulandari, A. Y. R., Qomaria, N., Prahani, B. K., & Dwikoranto, D. (2022). Developing Madura local content and augmented reality-based digital textbook to improve scientific reasoning ability. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, *8*(1), 22–31. https://doi.org/10.22219/jpbi.v8i1.16917

Yediarani, R. D., Maison, M., & Syarkowi, A. (2019). Scientific Reasoning Abilities Profil of Junior High School Students in Jambi. *Indonesian Journal of Science and Education*, *3*(1), 21–25. https://doi.org/10.31002/ijose.v3i1.627

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