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SCIENCE E-MODULE BASED ON LOCAL WISDOM TO IMPROVE SCIENTIFIC LITERACY AND CRITICAL THINKING SKILLS OF JUNIOR HIGH SCHOOL STUDENTS

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ABSTRAK

Skills that must be provided to students in the 21st century are scientific literacy and critical thinking skills. Scientific literacy and critical thinking skills in students can be built through local wisdom. In addition, many students today do not know their own regional culture. Integration of local wisdom in science learning requires teaching materials that attract students' attention. Teaching materials can be in the form of e-modules that can encourage students to be more active in learning. The purpose of this study is to produce a science e-module based on local wisdom to improve valid scientific literacy and critical thinking skills of junior high school students. The method used is a type of research and development (Research and Development) by adapting the 4D model developed by Thiagarajan. In the 4D model there are 4, namely define, design, development, and dissemination. The define stage contains an initial needs analysis to create a media, including an analysis of student needs and teacher analysis, the design stage includes media selection, preparation of learning materials, and initial design of a media, the development stage to create a learning media product, in this case the prototype of the media is validated to several validators to create a valid local wisdom-based science e-module the information that has been obtained, this can help train students' critical thinking skills. The validation results covering aspects of content feasibility, presentation aspects, language aspects, graphic aspects by three validators obtained an average percentage of 93% with a very valid category. This shows that the e-module that has been developed has the qualifications to be used. The implications of the validation results are potential for students to be more familiar with local wisdom in their area and its relationship to the material they are studying and are able to improve scientific literacy and critical thinking skills. This is because this e-module is equipped with scientific literacy questions on students' critical thinking skills based on local wisdom Lumajang trains students' scientific literacy and trains students to analyze, evaluate, express their arguments and conclude the information that has been obtained, this can help train students' critical thinking skills.

A. INTRODUCTION

Natural Sciences is a subject that studies natural phenomena and their applications in everyday life. In essence, science is built on the basis of scientific products and scientific processes. Scientific products and scientific processes can be carried out through practical activities or direct practice (Syafilin & Ayurachmawati, 2022).

Science learning should provide opportunities for students to learn and use the knowledge they have and apply it in life so that it is directly useful in everyday life. Science learning must emphasize providing students with direct experience to develop competencies to explore and understand the natural surroundings, which ultimately results in them discovering the concepts of the subject matter they are studying for themselves. Science learning is directed towards discovery so that it can help students to gain experience and a deeper understanding of the natural surroundings (Andriana et al., 2020).

Science learning is very important to support the progress of the development of Science and Technology (IPTEK) because science is related to ways to find out natural phenomena that occur and their systematics (Istiqomah et al., 2021). In the development of Science and Technology (IPTEK) in the current era is very rapid so that students need to be equipped with skills that are in accordance with the criteria of the 21st century to prepare a quality

generation (Ariana et al., 2020). One of the skills that need to be equipped to students is science literacy skills and higher order thinking skills, including critical thinking skills. These skills are very relevant to be developed through junior high school science learning (Jamaluddin et al., 2019).

Science literacy is about how learners use their knowledge to create a new idea, a new concept for a scientific problem (Irmawati et al., 2021). A person who has science literacy is able to use science concepts, has science process skills to assess in making daily decisions when dealing with other people, society and the environment (Ariana et al., 2020). In reality, science literacy is not as expected. One of the assessments conducted in 78 countries around the world organized by the Organization for Economic Cooperation and Development (OECD) using tests in 2022. Indonesia's science literacy score is lower than the international score. International science literacy scores reached 543 while Indonesian students' science literacy was only 383. There was a decrease in science literacy from the previous year. This can be seen from the science literacy score in 2018, which was 396 (OECD, 2023). This statement is reinforced by the results of several studies that show the science literacy of secondary school students in Indonesia is still low (Afina et al., 2021 ; Maulina et al., 2022 ; Rohmah & Hidayati, 2021 ;Agustin & Sartika, 2022 ; Sholahuddin et al., 2021).

Critical thinking needs to be developed in science learning so that students can understand science well, especially so that science is not understood only by rote (Rositawati, 2019). In addition, critical thinking is also important in building knowledge with an active role in the learning process. In fact, based on the needs analysis that has been conducted in junior high schools in Lumajang through interviews with 4 science educators and student needs analysis, the learning process is only a transfer of knowledge, learning is only teacher-centered, and participants become passive so that they do not develop the ability to ask questions and reason.

Science literacy skills and critical thinking skills in students can be built through local wisdom used as a learning resource. Local wisdom is a legacy of ancestors, which becomes a habit of society that is continuously passed down from ancestors to children and grandchildren in various regions in Indonesia. There are various kinds of local wisdom including folklore, folk songs, languages, performing arts, customs, celebrations, skills and traditions. One of the local wisdom in Lumajang is gamelan music that is used to accompany Lumajang's typical arts such as jaran kencak, jaran slining. Both dances are one of the cultures that combine elements of art such as musical instruments because the dance uses gamelan music. Traditional arts such as gamelan are included in local wisdom with the category of performing arts. Therefore, until now gamelan music is still preserved by the people of Lumajang (Fajar et al., 2023).

Local wisdom must continue to be explored, studied, and studied to maintain the values of culture that have been practiced since ancient times or customs in an area, one of which is by linking local wisdom to learning materials (Irmayanti et al., 2024). The learning process needs to start from things that are close to students or often encountered by students. Therefore, local wisdom is very important in learning. This can help students to more easily learn the concepts in the material so that students not only gain knowledge but can also implement it in everyday life (Yuliatin et al., 2022).

One of the science materials that can highlight the scientific treasures of Lumajang's local wisdom is vibration, waves and sound. The material is closely related to musical instruments, one of which is gamelan. Vibration, wave and sound materials are materials that are related to everyday life (Khumairok et al., 2021). In reality, the problem that students often face today is that they find it difficult when learning vibration and wave material because the material is difficult to understand due to the abstract form of vibrations and waves (Haliza & Hadi, 2022).

In local wisdom-based science learning, a learning media is needed to guide learning activities so that students can easily accept and understand the learning. This is supported by the analysis of the needs of students that students are more interested if there is media equipped with pictures and videos because it can foster students' interest in learning so that it makes it easier for them to understand the material. The learning media can be in the form of e-modules. E-modules are teaching materials or learning media that are presented electronically to support learning activities, and have components in the form of competencies and learning outcomes, instructions for use, tools / materials needed,

summary of material, exercises and tasks. E-module is one type of module that can include images, text, animation, graphics, videos that can be accessed anytime (Dewi & Lestari, 2020).

There are several previous studies on local wisdom-based science learning. However, in the context of local wisdom, not all regions introduce their local wisdom during learning, especially to improve science literacy and critical thinking skills. Some previous studies have revealed that local wisdom-based science is suitable for improving science literacy skills, because it can encourage students to form knowledge with the reality found in their environment (Herwandi et al., 2021). In addition, research (Rini, 2023) on thematic material states that local wisdom-based science learning can stimulate students' critical thinking skills. In research (Fitriya et al., 2025) explained that ethnoscience-based learning, which integrates local wisdom into science materials can improve science literacy, critical thinking skills, concept understanding, and skills to connect science with everyday life.

Previous studies used local wisdom only in certain regions. The novelty of this research is to develop an e-module of local wisdom in the Lumajang area that is rarely recognized by young people. The focus of this research is to develop e-modules while introducing Lumajang local wisdom and its relation to science learning. With this, students also know more about science concepts on local wisdom in the area where students live.

The urgency of this research lies in the skills that must be equipped to learners in the 21st century, namely science literacy and critical thinking skills. Science literacy and critical thinking skills of students are low and teachers in Lumajang area have never measured and trained students' science literacy and critical thinking skills. In addition, the current culture in Indonesia is increasingly eroded by the impact of globalization which results in many young people who do not know their own regional culture (Safutri, Qurrotul Anfa, 2024). Local wisdom-based learning will encourage students to make direct observations so that students can identify scientific questions, explain scientific phenomena and draw conclusions related to local wisdom (Pertiwi & Firdausi, 2019). By linking local wisdom in science learning, it improves students' critical thinking skills, this is because learning presents a real environment (Safutri, Qurrotul Anfa, 2024). Integrating local wisdom in science learning requires teaching materials that attract students' attention. Students will be more interested if a teaching material is equipped with pictures and videos because it can foster students' interest in learning so that it makes it easier for them to understand the material (Tambunan & Tambunan, 2023). E-modules can be used for independent learning and can be used by students either to repeat learning at home, library, laboratory, or other learning environments (Lastri, 2023). E-modules can encourage students to be more active in learning.

E-modules can be used by students to assist learners in repeating subject matter both at home and anywhere. In addition, local wisdom-based learning aims to shape individuals to have science literacy and critical thinking skills. Local wisdom-based learning more actively involves students in learning science materials related to regional culture in the area around their environment.

Based on the description above, the purpose of this study is to produce a valid science e-module based on local wisdom to improve scientific literacy and critical thinking skills of junior high school students.

B. RESEARCH METHOD

The research to be used is of the type Research and Development which aims to produce products in learning. One of the models in R&D research is the 4D model. The development model used in this research is the 4D model developed by Thiagarajan (1974). In the 4D model there are 4, namely defin, design, development, and dissemination. However, this research only reached the development stage. The flow of each development stage is depicted in Figure 1.

The research that has been done only reaches the development stage, namely the expert validation stage. The subjects of this study were VIII grade students in SMP Al-Ikhlash Lumajang with a total of 32 people. Data collection instruments in the form of questionnaires distributed to students and teachers and validation sheets with data analysis techniques using validity tests.

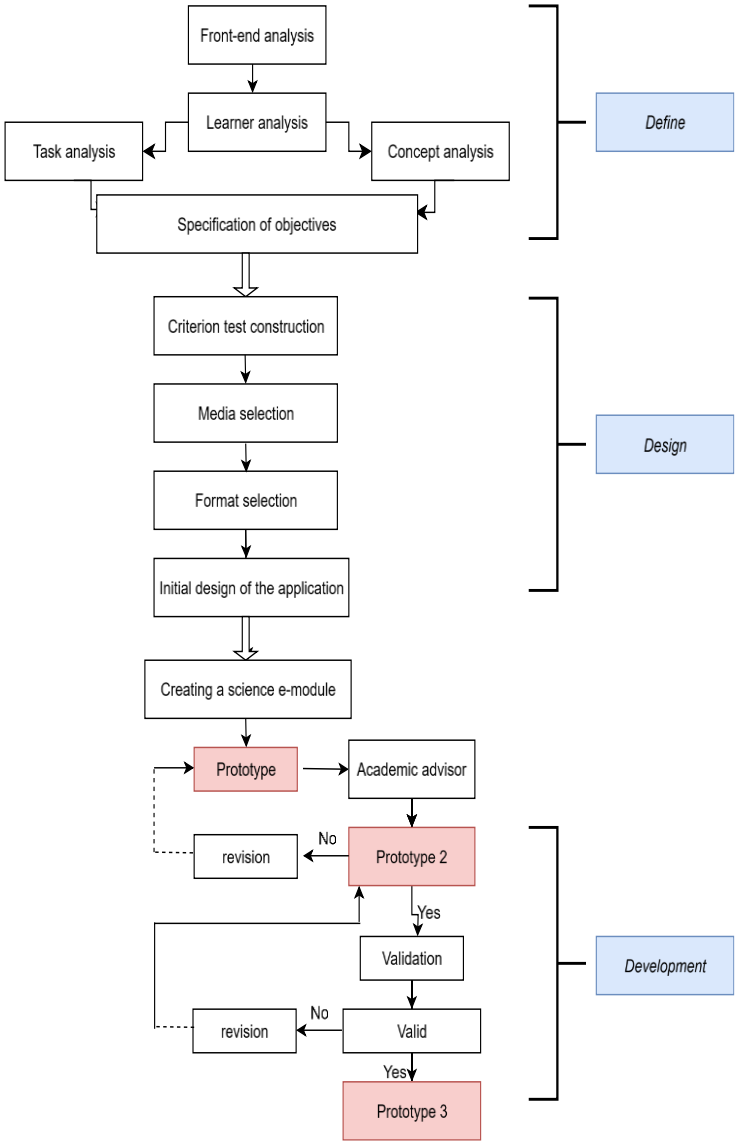


Figure 1. Flow of Thiagarajan's 4D Model

Data collection techniques are strategies or methods used to collect the required data. The data collection techniques used in the development of this local wisdom-based science e-module are as follows.

1. Questionnaires are data collection techniques carried out by providing written questions to respondents to be answered. The questionnaires used in this study were a needs analysis questionnaire, a questionnaire on the practicality of the local wisdom-based science e-module, and a student response questionnaire after using the local wisdom-based science e-module in learning.
2. Validation sheet. Data from the results of this validation are in the form of scores as well as criticisms and suggestions in order to improve the local wisdom-based science e-module that was developed. The form of validation assessment by the validator is carried out by means of a checklist (✓) in the appropriate assessment column and writing criticisms and suggestions.

E-modules are said to be valid if the teaching material can show a condition that is in accordance with the content and construct. Content validity aims to determine the relevance of learning media to learning materials while construct validation is a description of how far the impact of measurement results is able to show results that are in accordance with the theory (Asri & Dwiningsih, 2022).

Data collection techniques for assessing the quality of expert validators are using the Likert scale. The results of each point of the Likert scale instrument are in order from very good or positive to very bad or negative. The scores and descriptions of each assessment scale are shown in the table.

Table 1. Likert Scale Scores and Determination Criteria

Assessment score	Criteria
4	very good
3	quite good
2	not good
1	very bad

(Akbar, 2017)

The data obtained is then analyzed and interpreted into percentage form. The data processing is done by applying the following formula:

$$Vah = \frac{Tse}{Tsh} \times 100$$

Description:
Vah: Expert Validation (Percentage Value)
Tse: Total empirical score (maximum expected value)
Tsh: Total expected score

The validation criteria of the developed e-module are shown in Table 2 below:

Table 2. Validation Criteria

Score	Validity category	Description
86,00-100,0	Very valid	Very good to use
71,00-85,00	Valid	Can be used with minor revisions
56,00-70,00	Valid enough	Can be used after major revision
41,00-55,00	Less valid	Not to be used
25,00-40,00	Not valid	Not to be used

(Akbar, 2017)

C. RESULT AND DISCUSSION

This study uses data from the validation assessment of the development of local wisdom-based science e-modules after going through several

stages of the 4D model. Starting from the first stage, namely defin, design, development, which is limited only to getting valid results from two expert validators and one practitioner validator due to time and cost constraints. The following is a detailed explanation of each stage.

1. Define Phase

In the define phase, development needs analysis activities were carried out. At the front end of the analysis, the researcher gave a questionnaire filled out by the teacher. The results obtained, the teacher has never linked local wisdom with science learning. In the process of delivering the material, the teacher uses the lecture method, application, media teachers such as powerpoint, blackboard. Teachers have also never measured students' critical thinking skills and science literacy.

Learner analysis is carried out by analyzing student needs in learning. In this analysis, the researcher gave a questionnaire that was filled in by students. The results of the questionnaire analysis are shown in Table 2 below.

Table 2. Student Questionnaire Results

No.	Statement	Description	
		S	TS
1.	The science learning resources I use at school are difficult to understand	88%	12%
2.	The learning resources I currently use do not require me to hone my science literacy	76%	24%
3.	I have studied using e-modules	0%	100%
4.	I enjoy using electronic media to learn	89%	11%
5.	I prefer using digital books over printed books	86%	14%
6.	I find Vibration, Waves, and Sound material difficult to understand.	87%	13%
7.	I am more motivated or excited to learn science if it is related to everyday life, especially with Lumajang's local wisdom.	89%	11%
8.	I am often invited to discuss in class to find a solution to a problem when learning IPA	80%	20%
9.	I use critical reasoning skills in science learning	25%	75%
10.	I will find it easier to learn vibration, wave, and sound materials using digital books that are associated with local wisdom and will hone my critical thinking skills.	100 %	0%

The results of distributing questionnaires to students show that learning science based on books provided by the school, students have never used e-modules. Students prefer to utilize electronic media such as digital books for learning because according to students it is more practical and the material can be studied anywhere. Digital media is one option to provide meaningful and enjoyable understanding for students (Abdul & Elfin, 2024). Local wisdom plays an important role in increasing the enthusiasm for learning because it allows them to connect science knowledge with the context of the surrounding environment so that students can find meaning in learning (Imaduddin & Sundi, 2024). Students will find it easier to learn vibration, wave, and sound materials by using digital books that are associated with local wisdom. This can be seen from the questionnaire filled out by students who obtained a high percentage.

The results of the teacher analysis questionnaire and the analysis of the needs of students, researchers plan to develop additional teaching materials to support the learning process of students.

In the next definition stage, concept analysis and formulation of learning objectives are carried out. This stage aims to detail the content of the material to be delivered in a learning media. The results of the analysis obtained in the form of an outline of the content of the material in accordance with the CP (Learning Outcomes) and Learning Objectives (TP). The description of CP and TP is used by researchers as a reference for compiling and designing e-modules focused on vibration, wave, and sound material based on local wisdom. The results of the CP and TP analysis are shown in Table 3.

Table 3. Analysis of CP and TP

CP (Capaian Pembelajaran)	Tujuan Pembelajaran (TP)
Learners understand vibration, waves, sound and their uses in everyday life.	• Through videos and pictures, learners are able to identify vibrations in daily life well • Through videos and pictures, learners are able to explain the relationship between amplitude, frequency, and period of vibration appropriately. • Through a simple experiment, learners are able to investigate the vibration event of a pendulum well. • Through a simple experiment, learners are able to calculate the period and frequency of a vibration correctly.

	• Through videos and pictures, learners are able to identify waves in daily life correctly. • Through a rope wave experiment, learners are able to compare the characteristics of transverse waves and longitudinal waves correctly • Through teacher explanation using e-modules, learners are able to explain the relationship between wavelength, frequency, propagation speed, and wave period correctly.
	• Through videos and pictures, learners are able to identify sounds in daily life well. • Through teacher explanation using e-modules, learners are able to categorize infrasonic, audiosonic, and ultrasonic sounds correctly. • Through videos and pictures, learners are able to identify the characteristics of sound in daily life well. • Through a simple experiment, learners are able to analyze the relationship between the length of a string and the frequency of sound well. • Through videos and pictures, learners are able to relate the phenomenon of resonance in daily life well.

2. Design Phase

This stage aims to produce a learning media design that will be developed. The material to be presented in this study is vibration, waves, and sound which consists of several subjects, namely the definition of vibration, the characteristics of vibration, the definition of frequency and period, the definition of waves, types of waves based on the direction of propagation and the direction of vibration, the definition of sound, sound intermediaries, sound characteristics. The e-module was developed using the Canva application.

Local wisdom-based learning can maintain the nation's culture and improve students' abilities, especially in critical thinking skills (Safutri, Qurrotul Anfa, 2024) and science literacy (Fatmawati, Handhika, et al., 2021).

The next stage realizes the data analysis results into a learning e-module. The product design is shown in Figure 2.

Figure 2. Contents of the developed E-module

The design stage that aims to produce a learning media design that will be developed. First, the preparation of learning materials is carried out. The content of the material in this learning media is arranged based on the Learning Outcomes (CP), and Learning Objectives (TP) that have been determined to support the achievement of learning objectives optimally. Each material is presented with local wisdom-based explanations.

Second, media selection. The media developed by researchers is the development of science e-modules based on local wisdom. The media selection process is based on initial analysis, learner analysis, task analysis, concept analysis and learning objectives. Selection of learning media to help and facilitate students in understanding vibration, wave, and sound material and improve science literacy and critical thinking skills. Learning based on local wisdom can maintain the nation's culture and improve students' abilities, especially in critical thinking skills (Safutri, Qurrotul Anfa, 2024) and students' science literacy (Fatmawati, Sholahuddin, et al., 2021). The next stage realizes the data from the analysis into a learning e-module.

Third, format selection. The format selection stage is an activity step to design the components contained in the learning media developed using the Canva application to design e-modules. In addition, researchers also used the help of other applications, namely Wondeshare Filmora to design animations, audio and adobe after effects CC applications to remove the background video of people playing drums. Fourth, the initial design. At this stage, researchers designed products in the form of local wisdom-based e-modules. The initial product design is shown in Figure 2.

3. Development Phase

Validation stage

Before being implemented into learning, the product that has been developed must go through the validation stage by the validator. This stage is carried

out to assess the feasibility of the product. Validation data is obtained from validators through validation sheets. The following is the acquisition of validation scores according to 3 validators (2 lecturers and 1 science teacher) shown in Figure 3.

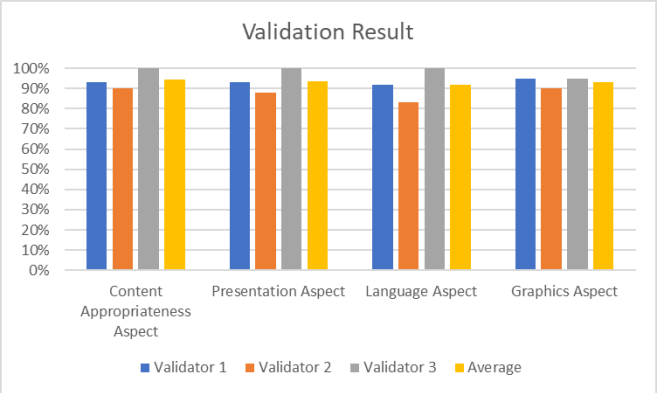


Figure 3. Product Validation Results

At this stage, the product feasibility was validated by 2 expert lecturers and 1 science teacher as a practical validator. Based on the analysis of the validation results, there are four aspects of the assessment, including the feasibility aspect obtaining a percentage of 94%. This is in line with research (Syahiddah et al., 2021), a high content feasibility aspect score indicates that the suitability of the E-Module content with core competencies and basic competencies, the suitability of the material content with learning objectives, the suitability of the integration of the material with Lumajang local wisdom and the suitability of the question content with the material. This is reinforced by research (Ardhani et al., 2021) that the module developed must be in accordance with the material and learning objectives in order to be applied. Integrating local wisdom into learning materials can develop students' knowledge and understanding of local wisdom. Local wisdom associated with science material encourages students to connect scientific knowledge with their culture and environment. This not only creates a more meaningful learning experience but also stimulates students' critical thinking skills in facing various scientific challenges (Zahro & Maulida, 2023).

In terms of presentation aspects, the percentage obtained was 94%. The assessment of presentation aspects includes systematic presentation, supporting material presentation such as glossary, references, critical thinking skills and science literacy practice questions and the use of local wisdom such as presenting local wisdom in the form of images and videos. The presentation of e-modules equipped with images and videos according to the interests and needs of students because according to students, the media is interesting, it can increase students' curiosity (Farida et al., 2022). E-modules are said to be interesting if they meet the criteria for presenting images, tables, writing and concept maps according to and attracting the interest of students (Aprilia & Wulandari, 2022). The validation results show that the presentation of the e-module meets the valid criteria, so that the e-module is in accordance with the criteria.

Validation of the linguistic aspect is the validation of the suitability of words with PUEBI, the use of correct punctuation and easy-to-understand sentences. In this case, the percentage obtained was 92%. The results of the validation of this linguistic aspect state that the words used in the e-module are in accordance with PUEBI, the punctuation in the e-module is also correct, and the sentences are easy to understand by readers, both teachers and students. This is in line with research (Zakiyah, W. I., & Dwiningsih, 2021) which has criteria for the validity of linguistic aspects including sentence effectiveness, clarity of information and use of sentences in accordance with PUEBI rules. The last validation aspect is the graphic aspect. This aspect contains layout, illustrations, and appropriateness of size in the use of writing. This aspect obtained a percentage of 93%. Teaching materials that meet the criteria for the graphic aspect are able to attract students' attention, thereby increasing their motivation to learn (Abdi et al., 2023).

Total average assessment of three validators from four aspects of 93% is classified as very valid. This is in line with research (Damayanti & Perdana, 2023) E-modules are said to be valid if they meet the criteria including the media display has an attractive color combination, the language used is in accordance with the understanding of students, the material is complete, covers several subjects into one whole, in accordance with basic competencies, relevant to the curriculum.

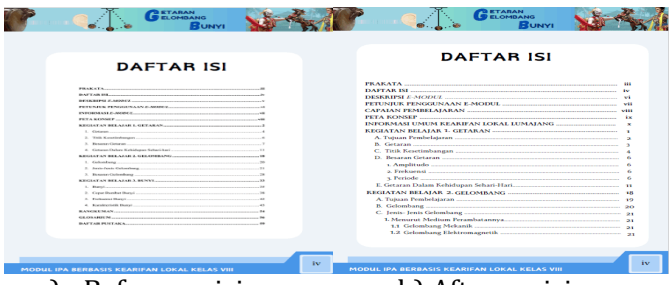
This e-module is equipped with scientific literacy questions, critical thinking skills of students, training students' scientific literacy and training students to analyze, evaluate, express their arguments and conclude the information that has been obtained, this can help train students' critical thinking skills. Each

learning activity contains 10 questions to improve scientific literacy and critical thinking skills based on Lumajang local wisdom. This is in line with research (Yunita, 2025) which uses e-modules in which there are practice questions to train scientific literacy and when implemented, it gets very good results in improving students' scientific literacy and has a positive impact on the learning process. This is reinforced by research conducted by (Kelana et al., 2025) showing that the integration of local wisdom in e-modules has been shown to increase the relevance of the material, appeal, and encourage deeper and more critical thinking in students. Students in the learning process are rarely trained with critical thinking questions. This results in students only receiving and memorizing.

Local wisdom-based e-modules must be equipped with wisdom-based questions but must use language that is easy for students to understand and trigger students' critical thinking skills and scientific literacy. Questions that are integrated with local wisdom are expected to introduce local culture and wisdom while increasing students' scientific literacy and critical thinking skills (Maulida & Sunarti, 2022). The questions in this e-module also have several improvements or revisions from the validators.

Revision stage

In addition, some suggestions were given by the validators for product improvement. Product revision aims to get a product that suits the needs of the field. Revisions made include the table of contents, less local wisdom-based material examples, less local wisdom-based questions, and adding an answer key before the summary. The validator's suggestion on the table of contents is more complete and the writing of the table of contents is more enlarged. The table of contents in this e-module serves to make it easier for readers to find the parts of the e-module that will be addressed (Mustika, 2022).



a) Before revision b) After revision

Figure 4. Table of Contents View

Revisions to the example material section are shown in Figure 5. Learning materials are supported by concrete examples with local wisdom that help students understand the concepts being taught (Akhyar et al., 2024).

The validator suggested that the examples be based on local wisdom related to gamelan

a) Before revision b) After revision

Figure 5. Display of Sample Materials Based on Local Wisdom

Revisions to the critical thinking skills and science literacy questions are shown in Figure 6. The questions contained in the e-module to train students' critical thinking skills and literacy. The validator suggested that the critical thinking skills and science literacy questions be based on local wisdom or related to gamelan musical instruments.

a) Before revision b) After revision

Figure 6. Display of Sample Questions on Critical Thinking Skills and Science Literacy

Revisions to the answer key section are shown in Figure 7. Additional answer keys at the very end of the material and questions are suggested by validators to make it easier for students to learn

independently. answer keys that function so that students are able to correct their own work and find out the extent to which students understand the material contained in the e-module (Chandra et al., 2021).

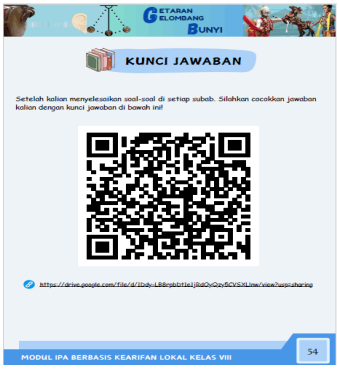


Figure 7. Additional Answer Key

In the product validation process that has been carried out, the results are very good. From the three validation results, the average percentage value was obtained. Some suggestions from validators aim to improve the product so that the product can meet the needs of students. Based on this validation, the product that has been produced in the form of local wisdom-based science e-modules to improve science literacy and critical thinking skills of junior high school students is suitable for use.

Implications of validation results, e-science modules based on local wisdom can be continued with development trials to test the practicality and effectiveness and this e-science module based on local wisdom has the potential for students to be more familiar with local wisdom in their area, in addition to understanding its relationship to the material they are studying. Learning based on local wisdom will encourage students to make direct observations so that students can identify scientific questions, explain scientific phenomena and draw conclusions related to local wisdom. Therefore, this e-module based on local wisdom is able to improve scientific literacy and critical thinking skills.

D. CONCLUSION AND RECOMMENDATION

Based on the results of the teacher analysis questionnaire and the needs analysis of students, researchers developed additional teaching materials to support the learning process of students. Researchers developed local wisdom-based science e-modules to improve science literacy and critical thinking skills of junior high school students on vibration, wave and sound materials. The validity of science e-modules based on local wisdom is reviewed from the assessment of three validators with a percentage of 93% with very valid criteria but there are minor revisions. Science e-modules based on local wisdom can be continued at the field trial stage by adapting the 4D model developed by Thiagarajan.

This e-module has the potential to improve scientific literacy and critical thinking skills because this e-module is equipped with scientific literacy questions, critical thinking skills of students, training students' scientific literacy and training students to analyze, evaluate, express their arguments and conclude the information that has been obtained, this can help train students' critical thinking skills. Each learning activity contains 10 questions to improve scientific literacy and critical thinking skills based on Lumajang local wisdom.

The theoretical contribution of the research is that this research is expected to increase insight and knowledge as well as information to researchers and readers about improving science literacy and critical thinking skills that can be improved through local wisdom-based science e-modules. The practical contribution of the research is that this research is expected to provide information and input as consideration in developing media by considering student characteristics.

This development research only reaches the develop stage, namely validation. Therefore, researchers hope that further research can be continued until the fourth stage, namely disseminate. but by paying attention to the difficulties, obstacles experienced by students in the science learning process. In addition, this local wisdom-based Science E-module only contains vibration, wave, and sound materials, therefore it needs to be developed in other science materials.

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