



Feasibility of E-Module based on Local Culture “Makan Bajamba” in Science Learning to Improve Scientific Literacy

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Abstrak

Tujuan penelitian ini adalah untuk mengetahui validitas e-modul berbasis kebudayaan lokal “makan bajamba” dalam melatih literasi sains peserta didik pada materi makanan dan sistem pencernaan manusia. Penelitian dan Pengembangan dengan model pengembangan ADDIE digunakan sebagai metode dalam penelitian ini. Model penelitian tersebut terdiri atas lima langkah, yaitu Analysis (analisis), Design (perancangan), Development (pengembangan), Implementation (implementasi), dan Evaluation (evaluasi). Namun, penelitian ini hanya dibatasi sampai pada tahap pengembangan karena peneliti ingin melihat validitas e-modul berbasis kebudayaan lokal “makan bajamba”. Instrumen yang digunakan dalam uji validitas yaitu angket dengan skala likert. Kelayakan e-modul dinilai dari validitas isi dan konstruk yang mencakup beberapa aspek, diantaranya yaitu aspek materi, penyajian, media dan bahasa. Berdasarkan hasil validasi yang dilakukan yang dikaji oleh dua orang dosen program studi pendidikan IPA dan dua orang guru IPA, menunjukkan bahwa e-modul makan bajamba berbasis budaya lokal memperoleh persentase sebesar 93% untuk validitas isi termasuk kategori sangat valid dan validitas konstruk memperoleh persentase sebesar 96% termasuk kategori sangat valid, sehingga dapat digunakan sebagai bahan ajar untuk melatih literasi sains siswa.

Kata Kunci: e-modul, kebudayaan lokal, makan bajamba, literasi sains, validitas.

Abstract

The aim of this research is to determine the validity of e-module based on local culture "makan bajamba" to increase students' scientific literacy on food and the human digestive system. Research and Development with the ADDIE model is used as a research method. ADDIE consists of five steps, namely Analysis, Design, Development, Implementation and Evaluation. However, this research was only limited to the development stage because the researcher wanted to see the validity of the e-module based on local culture "makan bajamba". The instrument used in the validity test is a questionnaire with a Likert scale. The feasibility of the e-module is assessed from the validity of the content and construct which includes several aspects, there are content, presentation, media and language. Based on the results of validation carried out reviewed by two lecturers from the science education study program

and two science teachers, shows that the local culture-based e-module "makan bajamba" obtained a percentage of 93% for content validity, including the very valid category and construct validity obtained a percentage of 96% including The category is very valid, so it can be used as teaching material to train students scientific literacy.

Keywords: *e-module, local culture, makan bajamba, scientific literacy, validity.*

Introduction

Scientific literacy has an important role to encourage personal development, develop understanding of science, critical thinking skills and complex problem-solving abilities (Mutiaramses & Fitria, 2022). Scientific literacy is not only relevant in an academic context, but also important in everyday life, especially to encounter technological development and complex global challenges. Coppi et al (2023) explains that scientific literacy skills are important to understand the environment, health, modern society, economics and technology. Therefore, by having scientific literacy skills is able to make more rational decisions, based on evidence, and have a deeper understanding of natural and technological phenomena. Good science skills enable a person to sort information, evaluate scientific claims, and express ideas with strong arguments supported by scientific data (Rosenthal, 2020).

Even though scientific literacy is very important, in reality the scientific literacy abilities of students in Indonesian still have deficiency. Based on Program for International Student Assessment (PISA) data, the scientific literacy abilities of students in Indonesian are generally at the lowest when compared with the international average score. OECD (2019b) explain Indonesia was ranked 70 out of 78 countries participating in the PISA assessment in 2018. The average score scientific literacy for Indonesian students was 396 and the average OECD score for scientific literacy was 489. Meanwhile, the results of the scientific literacy assessment conducted by PISA in 2022, it also shows that the scientific literacy results of

Indonesian students are still low, namely with an average of 383 with the average OECD score for scientific literacy being 485 (OECD, 2023).

Based on the results of interviews with science teachers in Padang City, it is known that several factors cause the low scientific literacy abilities of students in Padang City, including (1) the material test presented by PISA questions is a content application from the material, while students master science as a product of rote memorization, (2) learning process that not support students to develop scientific literacy, more often use teacher-centered, discussions that have not been organized and assignments that are not followed by reflection, (3) students learn using teaching materials that do not involved scientific literacy. Therefore, the lack of curricular support for the development of scientific literacy and lack of teaching materials that can train students' scientific literacy is also one of the reasons for the low quality of science literacy in Indonesia.

Increasing students' scientific literacy is not only about theoretical understanding of scientific concepts, but also about students' ability to relate these concepts to the real world. Romance & Vitale (2017) explain that good mastery of scientific literacy can support determining steps in interpreting situations and conditions around students as the basis for key aspects of literacy development in science learning. In general, students struggle to connect their understanding of science with practical applications in everyday life (Risdianto et al., 2020). This demonstrates need for a more, interesting, contextual and relevant method for students.

The environment is a good source of knowledge because it broad questions that must be considered contextually (Herdiana et al., 2021). Contextual is a holistic learning process that aims to enable students to understand the personal, social and cultural context of their daily lives and acquire dynamic, flexible skills and knowledge (Dewi et al., 2021). Therefore, learning that connects real world situations by providing students with knowledge that can be applied in everyday life called contextual learning. (Prasetya Adi et al., 2019).

Attempt to explore the environment as a source of contextual learning, particularly through the integration of local culture into learning, known as ethnoscience. Wati et al (2021) explain ethnoscience is currently a recommended study in Indonesia because it can increase students' awareness in rediscovering local wisdom values and integrating them into the learning process. Through ethnoscience learning, students will be invited to learn local culture in the environment around students and relate it to the concepts of science.

Several studies on learning about local wisdom show that synergy between the learning process and local culture can improve several aspects, including student learning achievement (Ananda & Nawir, 2024; Kartini et al., 2019), and problem-solving abilities (Sinurat et al., 2023). Ethnoscience is also able to help students develop 21st century skills (Nurhasnah et al., 2022; Zakiyah & Sudarmin, 2022), critical thinking skills (Risdianto et al., 2020), environmental literacy abilities (Sriyati et al., 2022; Zaldy et al., 2022) and students' scientific literacy (Ambrosino & Rivera, 2022; Atmojo et al., 2021; Risdianto et al., 2020; Suryanti et al., 2020).

The intended science learning cannot be separated from the adaptation the latest technology. Technological advances provide benefits for teachers both of

teaching and learning process, for example through the preparation of digital teaching materials (Aurora & Rochintaniawati, 2022). Digital teaching materials can be accessed by students without space and time restrictions, meaning students can study outside of learning hours. The aim of preparing digital teaching materials is to make students independent learners so that they do not always need teacher assistance in the learning process (Maftuhah & Rochintaniawati, 2023).

The development of digital teaching materials can be form electronic modules or called e-module. According to Arsal et al (2019) e-module can be presenting as independent learning materials that are systematically arranged into learning units to achieve learning goals. Najuah et al (2020) explained that the advantage of electronic modules compared with printed modules lies in their interactive nature, because they contain representative methods that can display or upload images, sounds, videos and animations and have formative tests that provide automatic feedback to students. Therefore, researchers are interested in testing the validity of e-module based on local culture "makan bajamba" so that it can be used as a suitable teaching material for training literacy science.

Method

Research Design

Research and development using the ADDIE (Analysis, Design, Development, Implementation and Evaluation) model was used in this research. Branch (2009) explains that ADDIE is a suitable model for developing teaching materials because it has basic steps related to product development. The steps for using the ADDIE model can be seen in Figure 1. In this case, to obtain the results of the feasibility of the local culture-based "makan bajamba" e-

module in science learning in increasing scientific literacy, a research process was carried out to the development phase.

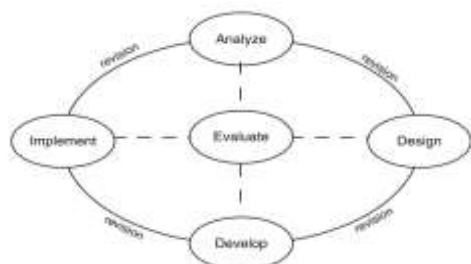


Figure 1. ADDIE Development Model
 (Branch, 2009)

Participants

Validation was carried out by two lecturers from the science education study program, faculty mathematics and science education, Universitas Pendidikan Indonesia as competent validators in the production of science learning media. Then, this validity test also involved two junior high school science teachers.

Instrument

The validity questionnaire was used as an instrument in this research. Validity includes content aspect, instructional presentation, language and media design to see the value of content validity and construct validity (BSNP, 2014). Content aspect consists of four aspects of assessment, namely suitability of content with learning outcomes, content accuracy, up-to-date, suitability of student needs, local wisdom and scientific literacy. The instructional presentation aspect includes suitability to characteristics or objectives, systematic presentation, interactivity (stimulus and response), having supporting components, and coherence or sequence of thought flow. Language aspect includes five aspects of assessment, namely straightforward, communicative, dialogic and interactive, adequacy of student development, and conformity to linguistic rules. Therefore, media design aspect consists of, the appearance of the e-module, the design of the e-module cover,

and the design of the e-module content. The validity questionnaire grid of the e-module based on local culture “*makan bajamba*” can be seen in Table 1 below.

Table 1. The validity questionnaire grid of the e-module “*makan bajamba*”

Aspect	Indicator of Assessment	Question Item
Content	Suitability of content with learning outcomes	1, 2, 3
	Content accuracy	4, 5, 6, 7, 8, 9
	Up-to-date	10, 11, 12
	Suitability of student needs	13, 14
	Ethnoscience or local wisdom	15, 16
	Scientific Literacy	17, 18, 19, 20, 21, 22
Instructional Presentation	Suitability to characteristics or objectives	23, 24, 25
	Systematic presentation	26, 27, 28
	Interactivity (stimulus and response)	29, 30, 31, 32
	Supporting components in presentation	33, 34, 35, 36, 37
	Coherence or sequence of thought flow	38, 39
Language	Straightforward	40, 41, 42
	Communicative	43
	Dialogic and interactive	44, 45
	Adequacy of student development	46, 47, 48
	Conformity to linguistic rules	49, 50, 51
Media design	E-module display	52, 53, 54
	E-module cover	55, 56, 57,

Aspect	Indicator of Assessment	Question Item
	design	58, 59, 60, 61, 62
	Design the content of e-module	63, 64, 65, 66, 67, 68, 69, 70, 71, 72

Procedure

The development procedure consists of five development stages, namely ADDIE (Analysis, Design, Development, Implementation and Evaluation) (Branch, 2009). This research is limited to the development stage because the researcher wants to see the feasibility of the teaching materials being developed. The validity of the teaching materials was tested through a distribution questionnaire. The results of the validity assessment by the validator will be used as a reference to improve the teaching materials being developed, namely the e-module based on local culture "makan bajamba". The development procedure is illustrated in Figure 2.

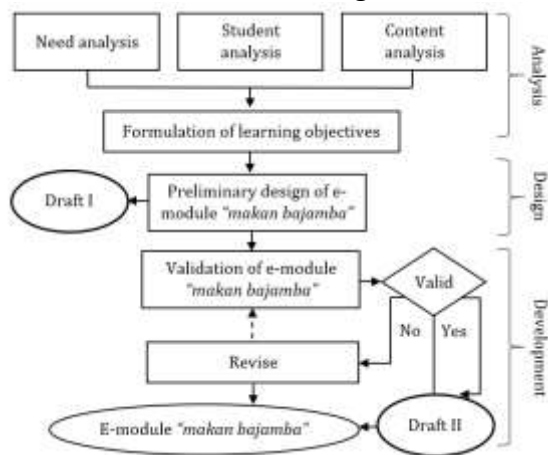


Figure 2. Adaptation of ADDIE Development Model Phases (Branch, 2009)

1. Analysis

The first procedure is to carry out an analysis stage which aims to collect various information in order to overcome existing problems. (Carles et al., 2024) explain data collected at analysis stage includes needs analysis, student analysis and content

analysis. The data carried out through open response questionnaire to find out the problems in the research area.

2. Design

The design stage is carried out based on the results of the analysis stage, in order to produce a product that is capable with students needs in understanding learning. In this case, an e-module based local culture "makan bajamba" in West Sumatra was developed which created into several indicators and capabilities to be achieved.

3. Development

The realization of the design prepared at the design phase is carried out at the development phase. E-module based local culture "makan bajamba" which has been developed, then reviewed by experts as validators. Assessment consists of several aspects that refer to (BSNP, 2014), including content, instructional presentation, media design and language to see the value of content validity and construct validity.

Data Analysis Techniques

Validity testing was carried out using questionnaire as an instrument with Likert scale. Sugiyono (2013) using a Likert scale, the variables to be measured are translated into variable indicators. The results of the data obtained of percentages and then analyzed using quantitative descriptive methods by comparing the scores of the data results from all validators with the criteria scores. Validation assessment using Likert scale calculations is shown in Table 2.

Table 2. Likert Scale (Riduwan, 2009)

Scoring Scale	Category
4	Very good
3	Good
2	Not really
1	Not at all

Data analysis techniques are calculated and interpreted on a percent scale for each aspect. The formula and interpretation of the feasibility of the e-

module based on local culture "makan bajamba" can be seen in Table 3 below.

$$P(\%) = \frac{\Sigma \text{ score from data collection}}{\text{maximum total score}} \times 100$$

Table 3. Validity Test Decision Criteria (Riduwan, 2009)

Percentage	Category	Note
0% – 20%	Very invalid	Cannot be used at all
21% – 40%	Invalid	Can be used with major revision
41% – 60%	Fairly Valid	Can be used with minor revision
61% – 80%	Valid	Can be used with small revision
81% – 100%	Very Valid	Can be used without revision

The teaching materials developed are said to be valid if the validators assessment meets the percentage results of $\geq 61\%$ with the valid to very valid category.

Result and Discussion

The development of e-module based on local culture "makan bajamba" was carried out using ADDIE model in science learning at junior high school level to improve students scientific literacy. This study was limited into development stage because the researchers only looked at the validity of e-module based on local culture "makan bajamba" in science learning.

1. Analysis

The result of needs analysis carried out on several science teachers in Tanah Datar Regency, West Sumatera found that: 1) teachers used teaching materials such as books, worksheets, handouts or PowerPoint in learning process. These teaching materials come from schools, the Ministry of education and culture or made

by teachers, generally form of printed media. 2) teachers understanding of scientific literacy is good, but in the learning process the implementation of learning involving scientific literacy is not optimal. It can be seen from the teachers assessment of students abilities in several scientific literacy indicators that have not been achieved, such as identifying variables that influence their investigations. The teacher stated that students still need full guidance from the teacher in determining variables in their research. Then, students have not been able to evaluate the investigative activities according to existing theories and concepts and have not been able to differentiate arguments based on scientific theory and arguments based on other considerations. Student responses also stated that the teaching materials currently used do not facilitate scientific literacy.

Students also expressed their opinions about learning based on local culture. The students mentioned that the connection of local culture in learning can increase understanding of science because they learn through things that are close to them. Teachers also support learning based on local culture, as this can improve students' understanding of science. In addition to promoting students' love for their own culture and region, it can help them increase their understanding of science and influence scientific literacy. However, several teachers stated that their difficulty in implementing learning based on local culture with the learning outcomes that students had to be master. Therefore, teachers also mentioned that to be successful in learning based on local culture in increasing students' scientific literacy, they need teaching materials that can help them carry out learning well.

Student analysis was carried out to determine student characteristics (Ananda & Nawir, 2024). Data was collected using a questionnaire consisting of aspects of

students interest in learning science, motivation in learning, learning styles and their scientific attitudes in the learning process. Based on the results of the analysis, it was found that 1) students like science subjects, but they difficult to be interested in this subject because the process and availability of teaching materials are less attractive. This is accordance with the findings from needs analysis, students indicated that their interest in reading learning materials had decreased because the books were less interesting because only showed text and static images. 2) the highest percentage of students learning styles was in the audio-visual and kinesthetic learning styles at 47% and 33% as can be seen in Figure 3.

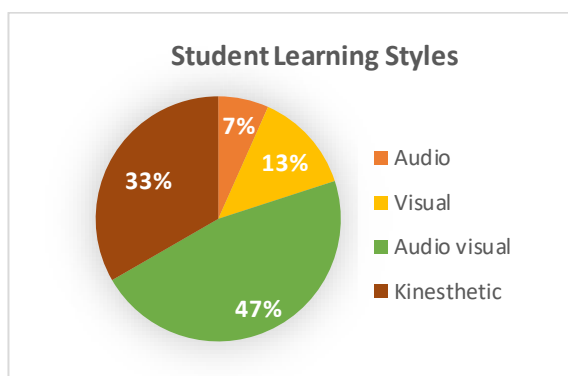


Figure 3. The results of analysis learner in students learning styles

Based on this information, researchers are trying to develop mobile learning teaching materials so that they can present the material not only as text and image representations, but can also represent the material dynamically such as animations and videos in order to increase students interest and make it easier to understand. Maftuhah & Rochintaniawati (2023) explain using teaching materials appropriately in the learning process can improve the quality of learning.

In the content analysis, researcher chose one of the specific traditions of the Minangkabau in West Sumatra, namely the "makan bajamba" This tradition has several

interesting things to teach, including nutrition in *bajamba* foods, additives in *bajamba* foods, rules and traditions of *bajamba* food related to maintaining health. This local wisdom can be connected into food and the digestive system in science learning outcomes for Class VIII Phase D.

2. Design

The design phase is carried out by creating a prototypes of teaching materials. This phase includes identifying materials appropriate to the learning outcomes and objectives, as well as the local wisdom will be used. In accordance with Suryanti et al (2020), the preparation of prototypes should be adjusted to what students need, the competencies to be achieved and the characteristics of the teaching materials to be created.

In this case, scientific literacy is one of characteristics of the e-module developed by the researchers. Therefore, the learning objectives presented in the e-module are created according to the scientific literacy competencies that need to be trained. The researchers selected several indicators that cover the three scientific literacy competencies developed by PISA (OECD, 2019a) namely, 1) Explaining phenomena scientifically, 2) Designing and evaluating investigations scientifically, and 3) Interpreting data and evidence scientifically. The learning outcomes and learning objectives prepared by the researchers in the e-module can be seen in Table 4.

Table 4. Learning outcomes and learning objectives in e-module based on "makan bajamba"

Learning outcomes	Learning objectives
Students will be able to carry out analyzes to determine the	1. Students can evaluate the methods used to identify nutritional content through food

<p>relationship between the digestive organ system and its function, as well as abnormalities or disorders that occur in certain organ systems.</p>	<p>testing experiments on "makan bajamba".</p>
<p>Students have the determination to make the right decisions to avoid additives that harm themselves and the environment.</p>	<ol style="list-style-type: none"> 2. Students can analyze, interpret data or draw appropriate conclusions about the nutritional content of "makan bajamba". 3. Students can make and justify accurate predictions regarding food additives or their impact on body health. 4. Students can analyze energy needs and their relationship with body weight through the food menu on "makan bajamba". 5. Students will be able to identify assumptions, evidence and reasoning about disorders that may affect the digestive system. 6. Students can explain the potential implications of scientific knowledge about the "makan bajamba" as an effort to protect the digestive organs.

3. Development

The development phase is the stage in realizing the design prepared at the design phase. E-Module based on local culture "makan bajamba" developed with Articulate Storyline 3 as professional software. This product can be accessed online via device, laptop or computer. Cover and background designs of e-module based on local culture "makan bajamba" are created in Canva for easy editing. The appearance of the e-module can be seen in Figure 4.



The preparation of the e-module is then adjusted to the storyboard that has been created. The processing is carried out by arranging the module elements using Articulate Storyline 3 software, so that it becomes an interactive e-module consisting with learning content, practice questions, explanatory videos and pictures that are appropriate to the content being studied. Baga et al (2022) explain the interactive e-modules is very helpful in forming students conceptual understanding because it contains visuals and audiovisuals which can increase student understanding and stimulate students.



Figure 4. Table of contents and investigation activities in e-module

The learning content in the e-module being developed is divided into four chapters, including nutrition in food, additives in food, food as a source of energy and diseases or disorders of the human digestive system. Gyta et al (2024) explain by accommodating students can discovering new ideas through direct scientific evidence, students can improve

their scientific literacy skills because they are able to form scientific ideas. Therefore, learning is also carried out through investigative or inquiry activities. Inquiry learning requires the active participation of students to observe, experience and understand a concept, thereby ultimately improving science learning outcomes and scientific understanding (Nurseha et al., 2024). The table of contents and investigation activities can be seen in Figure 5.



Figure 5. Videos and assignments in e-module "makan bajamba"

In general, the use of teaching materials in form of printed media are still very frequently used, in fact students are less interested because they tend to be monotonous (Ramadhani & Andriani, 2024). Therefore, e-modules are not only equipped with images, but also videos and animations. So, by providing various visualizations for students, it is hoped that they can study harder which will have an effect on improving students learning abilities. Explaining learning content using animated videos and text can help students visualize learning with clear descriptions and students can enjoy learning (Hamida & Rahayu Utami, 2024). A good learning process requires an evaluation of the quality of learning. Because the degree of success or failure of the learning process can be determined by the results of the learning evaluation (Sakti et al., 2021). Assignments in evaluations and student

worksheets are created by LiveWorksheets. LiveWorksheets is a website-based instrument that is available free of charge so that it can be accessed by everyone easily. LiveWorksheets can turn conventional worksheets into interactive online exercises while automatically correcting answers (Prakoso & Rusnilawati, 2024). Students can complete worksheets online as well as send their answers to teachers online. The video section and evaluation assignments in e-module "makan bajamba" can be seen in Figure 6.

In the development phase, the e-module being developed will also be assessed by experts to assess its feasibility. The feasibility assessment or also known as the validity test on e-module "makan bajamba" was carried out by four experts, it consist of two lecturers from the Department of Sciences Education, Universitas Pendidikan Indonesia and two science teachers from Junior High School. The aspects assessed by the validator are content validity and construct validity. Assessment is carried out using a Likert scale of one to four for each question. The results of content validity and construct validity can be seen in Table 5.

Table 5. Content validity and construct validity

No.	Assessment Aspects	Percentage	Category
1.	Content	93%	Very valid
2.	Construct	96%	Very valid

Content validity aims to determine the relationship between the educational materials developed by the researchers and the educational materials (Sari et al., 2024). This importance includes of coherence between local wisdom and scientific literacy as well as coherence with educational content. The validity results for each indicator of assessment can be seen in Table

6.

Table 6. Content validity

No.	Indicator of Assessment	Percentage	Category
1.	Educational content	94%	Very valid
2.	Ethnoscience or local wisdom	97%	Very valid
3.	Scientific literacy	90%	Very valid

In terms of learning content indicators, the local culture-based e-module "*makan bajamba*" to increase scientific literacy obtained a percentage of 94%, including it in the very valid category. E-modules are currently containing local wisdom which can help students understanding of learning content (Fikriyah et al., 2024). Local wisdom used in e-modules can provide examples and cases that exist in students environments so that they can help students understand learning content more easily and can increase their scientific literacy. The scientific literacy indicators in the e-module "*makan bajamba*" have been fulfilled covering several aspects, namely students ability to make and justify predictions correctly; explain the potential implications of scientific knowledge for society; train students ability to identify questions that can be explored in scientific studies; students can evaluate the methods used to explore certain problems scientifically; the ability to analyze, interpret data and draw appropriate conclusions; as well as the ability to identify assumptions, evidence and reasoning related to science. An example of an activity contained in the e-module that can train students scientific literacy is the activity of testing food content in *bajamba* food. Through these investigative activities, students can identify the types of nutrients found in food, evaluate ways to identify nutritional

content in food, and other scientific abilities because the worksheets for investigative activities are made according to guided inquiry. Student worksheet for the *bajamba* food content test can be seen in Figure 7.



Figure 6. Example of inquiry activity to identify types of nutrients in makan bajamba food

Construct validity considers the construct aspects of the learning material. In terms of construct validity, it is divided into instructional presentation validity, language validity and media design validity. The construct validity for each indicator of assessment can be seen in Table 7.

Table 7. Construct Validity

No.	Indicator of Assessment	Percentage	Category
1.	Instructional presentation	96%	Very valid
2.	Language	95%	Very valid
3.	Media design	96%	Very valid

Aspects of the instructional

presentation has percentage 96% with very valid category, this e-module include choosing the design of text size and color, font, text color, background and images as well as presenting example questions, practice questions and summaries. The presentation in this e-module uses an attractive appearance with a match between text color, font and background which takes into account both aesthetic and functional aspects to make it easier for students to use it as a learning resource. Baga et al (2022) explain fonts have characteristic functions and meanings, so appropriate use is important so that the meaning can be conveyed and minimizes misunderstandings. The combination of colors and background used is designed to be comfortable and easy to read to produce an attractive appearance that can influence students reading interest (Permata Sari et al., 2024). Presentation of other complementary elements such as example questions which function to make it easier for students to learn as well as practice questions which can train the extent of students understanding of food and the human digestive system. The practice question sheet is interactive online which can correct answers automatically. Then, the e-module also has a summary of material that can be read to further strengthen the concepts that students have learned. The automatically scoring in interactive practice sheet in e-module based on local culture "*makan bajamba*" can be seen in Figure 8.



Figure 7. The automatically scoring in interactive practice sheet in e-module "*makan bajamba*"

The language aspects in this e-module include Language aspect includes five aspects of assessment, namely straightforward, communicative, dialogic and interactive, adequacy of student development, and conformity to linguistic rules. The language used in this e-module uses language that is in accordance with Indonesian language rules, coherent and communicative. Communicative language is a way of using language in accordance with the communication functions of language so that it is easy for readers to understand (Ramadhani & Andriani, 2024). When writing, using vocabulary and applying punctuation correctly is necessary so that the meaning of the writing can be conveyed. The language aspect of the E-module "*makan bajamba*" obtained a percentage of 95%, which is included in the very valid category.

Aspects of media design in this e-module include the e-module with ISO standards, the practicality of the e-module and ease of use, the cover layout of the e-module, the type of font and size of the font used and the meaning of each illustration and image displayed. The media design aspect of the E-module based on local culture "*makan bajamba*" obtained a percentage of 96%, which is included in the very valid category.

Conclusion (5%)

Based on the results of the analysis and discussion, it can be concluded that the E-module based on local culture "makan bajamba" which was developed is suitable for use as a teaching material. E-module based on local culture "makan bajamba" can be used in the learning process to increase students' scientific literacy on food and the human digestive system in terms of content and construct validity with a very valid category.

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References

- Ambrosino, C. M., & Rivera, M. A. J. (2022). Using ethological techniques and place-based pedagogy to develop science literacy in Hawaii's high school students. *Journal of Biological Education*, 56(1), 3–13. <https://doi.org/10.1080/00219266.2020.1739118>
- Ananda, G., & Nawir, M. (2024). The influence of local culture-based simulation learning methods on the interest and learning outcomes of social studies. *Edumaspul Jurnal Pendidikan*, 8(1), 253–260.
- Arsal, M., Danial, M., & Hala, Y. (2019). Pengembangan Media Pembelajaran E-Modul Materi Sistem Peredaran Darah Pada Kelas XI MIPA SMAN 6 Barru. *Prosiding Seminar Nasioal Biologi VI*, 434–442.
- Atmojo, S. E., Lukitoaji, B. D., & Muhtarom, T. (2021). Improving Science Literation and Citizen Literation through Thematic Learning Based on Ethnoscience. *Journal of Physics: Conference Series*, 1823(1). <https://doi.org/10.1088/1742-6596/1823/1/012001>
- Aurora, Z. F., & Rochintaniawati, D. (2022). Analisis Penggunaan Bahan Ajar Digital terhadap Kecerdasan Majemuk Peserta Didik di SMAN 1 Mande. *BIO EDUCATIO: The Journal of Science and Biology Education*, 7(2), 95. <https://doi.org/10.31949/be.v6i2.3317>
- Branch, R. M. (2009). Instructional design: The ADDIE Approach. In *Instructional Design: The ADDIE Approach*. Springer US. <https://doi.org/10.1007/978-0-387-09506-6>
- BSNP. (2014). *Instrumen Penilaian Buku Teks Pelajaran Tahun 2014*.
- Carles, C., Gulo, R., Harefa, B., Telaumbanua, A., & Zega, A. (2024). Development of Interactive Power Point Based Learning Media on Principles of Land Measurement for Construction. *Edumaspul Jurnal Pendidikan*, 8(1), 261–284.
- Coppi, M., Fialho, I., & Cid, M. (2023). Assessing Portuguese Elementary School Students' Scientific Literacy: Application of the ALCE Instrument. *Social Sciences*, 12(7), 374. <https://doi.org/10.3390/socsci12070374>
- Dewi, C. A., Erna, M., Martini, Haris, I., & Kundera, I. N. (2021). Effect of Contextual Collaborative Learning Based Ethnoscience to Increase Student's Scientific Literacy Ability. *Journal of Turkish Science Education*, 18(3), 525–541. <https://doi.org/10.36681/tused.2021.88>
- Gyta, D., Harahap, S., Rafi'y, M., & Normalita De Lima, C. (2024). Pengembangan Instrumen Tes Berfikit Literasi Sains Berdasarkan PISA

- dalam Melatih Keterampilan Berfikir Tingkat Tinggi Mahasiswa. *BIOCHEPHY: Journal of Science Education*, 4(1), 150–157. <https://doi.org/10.52562/biocephy.v4i1.1066>
- Hamida, N., & Rahayu Utami, N. (2024). Development of Android-Based E-Module Media through Problem Based Learning on Environmental Change Material to Improve Critical Thinking. *Journal of Biology Education*, 13(1), 85–90. <http://journal.unnes.ac.id/sju/index.php/ujbe>
- Herdiana, L. E., Sunarno, W., & Indrowati, M. (2021). Studi Analisis Pengembangan E-Modul IPA Berbasis Inkuiri Terbimbing dengan Sumber Belajar Potensi Lokal terhadap Kemampuan Literasi Sains. *Jurnal Pendidikan IPA*, 10(2), 87. <https://doi.org/10.20961/inkuiri.v10i2.57247>
- Kartini, Tolla, A., Jasruddin, & Juanda. (2019). The design of local culture-based Indonesian language teaching materials. *Journal of Language Teaching and Research*, 10(2), 363–371. <https://doi.org/10.17507/jltr.1002.19>
- Maftuhah, & Rochintaniawati, D. (2023). Analisis Kebutuhan Pengembangan Multimedia Interaktif berbasis Smartphone pada Materi Pelajaran Biologi. *Jurnal Ilmiah Ilmu Pendidikan*, 6(12). <http://jiip.stkipyapisdompu.ac.id>
- Mutiaramses, M., & Fitria, Y. (2022). Development of Problem Based Learning (PBL) Oriented Digital Comic to Improve Students' Science Literacy. *Jurnal Penelitian Pendidikan IPA*, 8(2), 699–704. <https://doi.org/10.29303/jppipa.v8i2.1349>
- Najuah, Lukitoyo, P. S., & Wirianti, W. (2020). *Modul Elektronik: Prosedur Penyusunan dan Aplikasinya*. Medan: Yayasan Kita Menulis.
- Nurhasnah, Lufri, & Asrizal. (2022). Effect Size Analysis of the Implications Ethnoscience Approach to the Improvement of 21st Century Skills in Science Learning. *Jurnal IPA & Pembelajaran IPA*, 6(3), 287–299. <https://doi.org/10.24815/jipi.v6i3.26116>
- Nurseha, I., Mawardini, A., & Hamamy, F. (2024). Pengaruh Model Pembelajaran Inkuiri terhadap Kemampuan Literasi Sains Peserta Didik di SDN Babakan Madang 03 Kabupaten Bogor. *Karimah Tauhid*, 3(4), 4673–4694.
- OECD. (2019a). *PISA 2018 Assessment and Analytical Framework*. OECD Publishing. <https://doi.org/10.1787/b25efab8-en>
- OECD. (2019b). *PISA 2018 Results: Combined Executive Summaries Volume I, II & III*. www.oecd.org/about/publishing/corrigenenda.htm.
- OECD. (2023). *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. Paris: OECD Publishing. <https://doi.org/10.1787/53f23881-en>
- Prakoso, N. A., & Rusnilawati, R. (2024). Analisis Model Project Based Learning Berbantuan LiveWorksheets dalam Meningkatkan Prestasi Belajar dan Keterampilan Literasi Sains. *Muallimuna : Jurnal Madrasah Ibtidaiyah*, 9(2), 88. <https://doi.org/10.31602/muallimuna.v9i2.14304>
- Prasetya Adi, N., Alpin Yulianto, R., & Zaini, M. (2019). Menumbuhkan Sikap Ilmiah (Kolaborasi, Keterbukaan Diri dan Tanggung Jawab) Melalui Pembelajaran Kontekstual. *SPEKTRA: Jurnal Kajian Pendidikan Sains*, 5(2). <https://doi.org/10.32699/spektra.v5vi2i.98>
- Ramadhani, A. A., & Andriani, A. E. (2024). Development of Interactive E-Module Based on Inquiry Learning to Enhance IPAS Learning Outcomes for Students Public Elementary School.

- Jurnal Pijar Mipa*, 19(2), 209–215.
<https://doi.org/10.29303/jpm.v19i2.6587>
- Riduwan. (2009). *Skala Pengukuran Variabel-Variabel Penelitian*. Bandung: Alfabeta.
- Risdianto, E., Dinissjah, M. J., Nirwana, & Kristiawan, M. (2020). The effect of Ethno science-based direct instruction learning model in physics learning on students' critical thinking skill. *Universal Journal of Educational Research*, 8(2), 611–615.
<https://doi.org/10.13189/ujer.2020.080233>
- Romance, N., & Vitale, M. (2017). Implications of a Cognitive Science Model Integrating Literacy in Science on Achievement in Science and Reading: Direct Effects in Grades 3–5 with Transfer to Grades 6–7. *International Journal of Science and Mathematics Education*, 15(6), 979–995. <https://doi.org/10.1007/s10763-016-9721-2>
- Rosenthal, S. (2020). Media Literacy, Scientific Literacy, and Science Videos on the Internet. In *Frontiers in Communication* (Vol. 5). Frontiers Media S.A.
<https://doi.org/10.3389/fcomm.2020.581585>
- Sakti, I., Nirwana, N., & Swistoro, E. (2021). Penerapan Model Project Based Learning untuk Meningkatkan Literasi Sains Mahasiswa Pendidikan IPA. *Jurnal Kumparan Fisika*, 4(1), 35–42.
<https://doi.org/10.33369/jkf.4.1.35-42>
- Sinurat, L., Sriyati, S., & Solihat, R. (2023). Pengembangan Modul Berbasis Keterampilan Proses Sains untuk Meningkatkan Kemampuan Pemecahan Masalah Berdasarkan Realitas Lokal Danau Toba. *Lectura : Jurnal Pendidikan*, 14(1), 1–14.
<https://doi.org/10.31849/lectura.v14i1.10889>
- Sriyati, S., Marsenda, P. H., & Hidayat, T. (2022). Pemanfaatan Kearifan Lokal Orang Rimba di Jambi Melalui Pengembangan Bahan Ajar Untuk Meningkatkan Literasi Lingkungan Siswa. *Jurnal Pendidikan Sains Indonesia*, 10(2), 266–278.
<https://doi.org/10.24815/jpsi.v10i2.23548>
- Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Bandung: Alfabeta.
- Suryanti, S., Mariana, N., Yermiandhoko, Y., & Widodo, W. (2020). Local wisdom-based teaching material for enhancing primary students' scientific literacy skill. *Jurnal Prima Edukasia*, 8(1), 96–105.
<https://doi.org/10.21831/jpe.v8i1.32898>
- Wati, E., Yuberti, Saregar, A., Fasa, M. I., & Aziz, A. (2021). Literature Research: Ethnoscience in Science Learning. *IOP Conference Series: Earth and Environmental Science*, 1796(1). <https://doi.org/10.1088/1742-6596/1796/1/012087>
- Zakiyah, N. A., & Sudarmin. (2022). Development of E-Module STEM integrated Ethnoscience to Increase 21st Century Skills. *International Journal of Active Learning*, 7(1). <http://journal.unnes.ac.id/nju/index.php/ijal>
- Zaldy, A., Anwar, S., & Sriyati, S. (2022). Using Jambi Local Wisdom of Lubuk Larangan as Theme for Development of Science Teaching Materials to Improve Students' Environmental Literacy. *Jurnal Pendidikan MIPA*, 23(1), 162–172.
<https://doi.org/10.23960/jpmipa/v23i1.pp162-172>