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Development of Junior High School Science E-Module Integrated with Socio-Cultural of Balinese Society to Improv Students Science Literacy

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Abstract: The research aimed at analyzing and explaining the validity, practicality, and effectivity of e-module science for junior high school integrated with the Balinese Socio-Cultural to improve students' scientific literacy. This research and development were modified from Borg Gall and Thiagarajan's models. The research design used the effectiveness of the e-module was One Group Pretest Posttest Design. The instruments used were expert validation questionnaires, practicality questionnaires, and scientific literacy tests. Development stages of the e-module development consisted of 1) data collection, 2) product design, 3) product development, 4) limitary out, 5) product test theoretically, 6) empirical product test, and 7) product finalization. The results show that 1) the e-module is valid from a material point of view with very good qualifications, language validity with very valid qualifications, the validity of media with very good qualifications, and suitability of Balinese culture with very valid qualifications, 2) e-module is very practical to be used on the field, and 3) e-module is effective to improve the scientific literacy of students.

Keywords: E-module; Scientific literacy; Socio-cultural of Balinese society

Introduction

The scientific literacy abilities of Indonesian students are categorized as low. Yusmar (2023) stated that the PISA results in 2022 decreased by 13 points compared to the PISA results in 2018. Indonesia's scientific literacy in 2022 obtained an average score of 383, while the average score for OEDC scientific literacy was 489. Several of these findings indicate that there has been a gap in science learning which has an impact on students' low scientific literacy abilities. Fuadi (2020) stated that one of the factors causing students' low scientific literacy is their ability to read and interpret reading which is still low. Misunderstanding the content of science reading will result in errors in understanding science (Toharudin, 2011). Weak learning activities make it difficult for students to learn and affect students' scientific literacy. Hermawan (2020) stated that students were less motivated in learning, causing low science learning outcomes. The low motivation for student learning is caused by a lack of reading materials as a learning resource that attracts students' interest in learning. Anisa (2021) said that limited reading facilities and infrastructure, such as the availability of libraries and a variety of reading books, are one of the factors causing the low literacy culture in Indonesia. There are still many schools in Indonesia that still rely only on the availability of textbooks for teaching and learning activities in the classroom.

Based on the findings of these problems, innovations are needed in science learning to support students' independent learning, one of which is in terms of developing teaching materials in the form of modules. Zulhaini (2016) states that modules are teaching materials that are written by educators themselves to make it easier for students to study the material independently. Modules are grouped into two types, namely printed modules and electronic modules (e-

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modules). Both printed and electronic modules have their respective characteristics, advantages, and disadvantages. To support improving students' literacy skills and learning in the era of the Industrial Revolution 4.0 that is integrated with technology, interactive science modules are needed that can make learning more meaningful, namely through electronic modules (e-modules).

E-modules can be integrated with the local community's social culture and innovative learning models that require students to actively practice scientific literacy skills. According to Pertiwi (2019), success in scientific literacy is shown if students can understand what they have learned and can apply it in solving various problems in everyday life. It is important to integrate community social culture into science material so that it can help increase students' scientific literacy. Thus, this research aims to analyze and explain the validity, practicality, and effectiveness of the socio-culturally integrated SMP science e-module for Balinese society to increase students' scientific literacy. Modules as teaching materials that can be used to support students' independent learning can be integrated with the culture in the students' environment to provide contextual learning. Contextual learning can support students' scientific literacy abilities. Research results of Lubis (2021); Nihwan (2020); Shofiyah (2020); and Rediani (2023) show that the development of culture-based modules provides interesting and relevant learning experiences for students so that they are effective in improving students' scientific literacy abilities. Rediani (2023) research results show that involving local wisdom in the learning process can have a positive influence on learning because it allows students to appreciate and understand the values, traditions, and knowledge inherent in their own culture.

Method

This type of research is development research by modifying the Borg and Gall and Thiagarajan development models according to development needs consisting of 1) information gathering, 2) product design, 3) product development, 4) limited trials, 5) theoretical product testing, 6) empirical product testing, and 7) product finalization. The development procedures in this research are presented in the following flow diagram (see Figure 1).

The data analysis techniques used in this research development are qualitative descriptive analysis techniques and quantitative descriptive analysis techniques. Qualitative data is obtained from data from reviews or input from experts. Data resulting from reviews or input from experts, namely material experts, language experts, and media experts, as well as data from needs analysis. These data were analyzed descriptively qualitatively. The results of this analysis are then used to revise the e-module product being developed to improve the product. This qualitative descriptive technique is also used to process data obtained through an open questionnaire in descriptive form by the teacher. Quantitative data was obtained through validation questionnaires from material experts, media experts, language experts, and teacher practice using Likert scale assessment criteria. These data were analyzed quantitatively descriptively. Validity data by material experts will be analyzed using the Gregory equation to measure the validity score of the e-module that has been developed as a whole. The results obtained from the implementation of teacher and student practicality tests were analyzed by converting the scores obtained to a scale of one hundred. The Gregory tabulation matrix for content, language, and media validation is stated in Table 1.

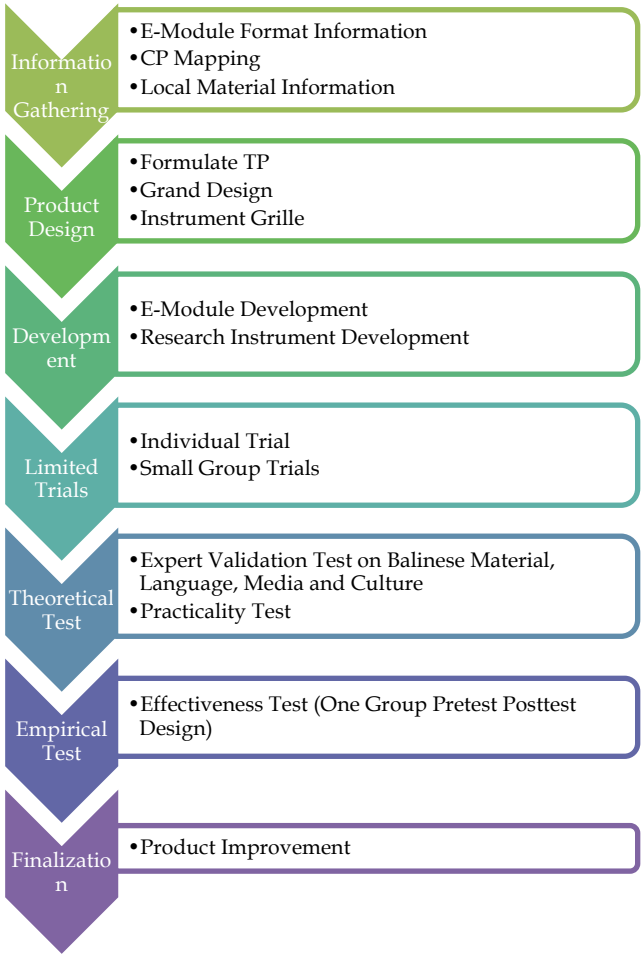

Figure 1. Development Procedure

Table 1. Gregory Tabulation Matrix

Validator		Expert I	
		TL	L
Expert II	TL	A	B
	L	C	D

(Gregory, 2000)

Description:
TL = Not Feasible
L = Worthy

The expert assessment results will then be analyzed using the Gregory equation, namely Equation 1.

$$KVGKVG = \frac{D}{A+B+C+D} \quad (1)$$

Description:
KVG = Gregory validation coefficient
A = Cell that shows the discrepancy between the two experts
B and C = Cells that show differences in views between the two experts
D = Cell that shows agreement between the two experts

The coefficient categories according to Gregory (2000), are stated as follows.
0.81 – 1.00 = excellent
0.61 – 0.80 = good
0.31 – 0.60 = medium
0.21 – 0.30 = poor
0.00 – 0.20 = not good (unusable)

The e-module product that has been developed is declared to be valid from a material perspective if the Gregory coefficient score is at least 0.61 in the good category. The validity data by linguists, media experts, and Balinese culture experts as well as the teacher's practicality were analyzed by converting the scores obtained into a scale of one hundred using equation 2.

$$FF = \frac{\sum x}{SMI} \times 100 \quad (2)$$

Description:
F = The total score of all indicators
∑x = Number of correct scores
SMI = Ideal Maximum Score

Next, to calculate the score or scores for all subjects from each test implementation, the following formula is used (Equation 3).

$$\bar{X} = \frac{\sum x}{N} \quad (3)$$

Description:
$\bar{X}$ = Average score of all aspects
∑x = Score/overall score of the aspect
N = Total number of indicators

In the validity test of Balinese language, media, and culture, the questionnaire used has a range of scores, namely a maximum score of five and a minimum score of one for each question item. The average results of Balinese language, media, and culture have been processed into a scale of one hundred. The e-module product is declared valid, at least meeting the completion of the average score of 66 with valid qualifications. If the product has achieved the specified minimum completeness, then the resulting e-module product can be considered valid and can be used in the learning process.

In the teacher practicality test, the questionnaire used has a range of scores, namely a maximum score of four and a minimum score of one for each item of the statement. The average practical test results that have been processed on a scale of one hundred will then be qualified based on the Benchmark Reference Assessment in Table 2.

Table 2. Qualification Guidelines Validation and Practicality

Score Intervals	Validation Qualification	Practicality Qualification
80 – 100	Very valid	Very practical
66 – 79	Valid	Practical
56 – 65	Fairly valid	Quite practical
40 – 55	Not valid	Not practical
0 – 39	Very invalid	Very impractical

The e-module product is stated to be practical, at least fulfilling the average score of 66 with practical qualifications. If the product has achieved the specified minimum completeness, then the e-module product produced can be considered practical and can be used in the learning process.

The test instrument is first tested to obtain a valid and reliable instrument. The scientific literacy test that has been prepared is then tested for the feasibility of each test item by two material expert lecturers. The test instrument is assessed in terms of depth of content, suitability to scientific literacy indicators, systematics, and language used. The feasibility test results were analyzed using the Gregory equation. The scientific literacy test is declared appropriate in terms of content if the Gregory coefficient score is at least 0.61 with good qualifications. Internal consistency of an item is the ability of an item to measure what it should measure (Santyasa, 2005). The analysis used to obtain internal consistency of test items is using the product moment formula as follows (Equation 4).

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{(N.\sum X^2 - (\sum X)^2)(N\sum Y^2 - (\sum Y)^2)}} \quad (4)$$

Description:
r_{xy} = Item correlation index
N = Number of respondents
X = Item score
Y = Total score

The items that are accepted are those that have a coefficient score above 0.300, while the items whose coefficient is below 0.300 are recommended for revision (Santyasa, 2005). For further clarity, the internal

consistency criteria for these items are written in Table 3.

Table 3. Item Internal Consistency Criteria

Item Internal Consistency Interval	Description
$r_{xy} \geq 0{,}800$	Very high
$0.600 \leq r_{xy} < 0.800$	High
$0.400 \leq r_{xy} < 0.600$	Enough
$0.200 \leq r_{xy} < 0.800$	Low
$r_{xy} \geq 0.200$	Very low

(Santyasa, 2005)

The reliability coefficient is calculated using the Cronbach's Alpha coefficient method. Cronbach's Alpha coefficient is determined by Formula 5.

$$r_{11} = \frac{n}{n-1}\left[1 - \frac{\sum Si^2}{Sx^2}\right] \quad (5)$$

Description

r_{11} = Cronbach's Alpha coefficient
n = Number of questions
Si^2 = Item variance
Sx = Total test variance

Questions with a reliability index in the medium, high, and very high categories. Questions with a reliability index in the medium, high, and very high categories are tolerated for use in research (Santyasa, 2005). The higher the reliability index of the questions, the better the questions are to be used in research, and vice versa, the lower the reliability index of the questions, the better the questions must be revised. The reliability criteria are presented in more detail in Table 4.

Table 4. Reliability Index Criteria

Reliability Index Interval	Description
$0.00 \leq r_{11} \leq 0.20$	Very low
$0.20 \leq r_{11} \leq 0.40$	Low
$0.40 \leq r_{11} \leq 0.60$	Medium
$0.60 \leq r_{11} \leq 0.80$	High
$0.80 \leq r_{11} \leq 1.00$	Very high

(Santyasa, 2005)

Testing the effectiveness of the science e-module was carried out by measuring students' scientific literacy abilities before and after learning with the e-module being developed. The test used is a description test. The analysis used is descriptive analysis which is an analysis technique that aims to describe the average or mean score, frequency distribution, normalized gain score, and standard deviation of the distribution of students' scientific literacy ability test data. The average score and standard deviation described are the average score and standard deviation of students' initial scientific literacy abilities obtained through the pretest and students' scientific literacy abilities after being given treatment obtained through the posttest. The pretest and posttest scores for students' scientific literacy abilities are obtained using the following formula (Equation 6).

$$Value = \frac{Score\ obtained}{Maximum\ score} \times 100 \quad (6)$$

The average score of students' scientific literacy abilities can be calculated using the following formula (Equation 7).

$$\overline{X} = \frac{\sum_{i=1}^{k} x_i}{n} \quad (7)$$

Description:

$\bar{X}$ = arithmetic average
$xi = xi$ = score of the i sample
n = number of samples

The average pretest score and post-test score are converted first to a scale of 100, then described referring to the five scale Benchmark Assessment (PAP) qualification guidelines. The results of the assessment of scientific literacy skills are qualified based on the PAP assessment reference as in Table 5.

Table 5. Qualification of Scientific Literacy Ability

Score Interval	Qualification
80 – 100	Excellent
66 – 79	Good
56 – 65	Good enough
40 – 55	Poorly
0 – 39	Very less

Based on the results of the analysis using the benchmark assessment (PAP), students' scientific literacy abilities are said to be good if they get a score of 66-79. If the average score of a student's scientific literacy ability has achieved the specified minimum completeness, then it is considered that there has been an increase in the student's scientific literacy ability. Next, the standard deviation score for students' scientific literacy abilities is determined using the following formula (Equation 7).

$$s = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}} \quad (7)$$

Description

s = standard deviation
$\bar{x}$ = arithmetic average
xi = score of the i sample
n = number of samples

The pretest and posttest scores were then analyzed using the normalized gain score with the following formula (Equation 8).

$$< g > = \frac{<S_f> - <S_i>}{100 - <S_i>} \quad (9)$$

Description

$< g >$ = Normalized N-gain

$< S_f >$ = average pretest score for scientific literacy skills
$< S_i >$ = average posttest score for scientific literacy skills

The criteria used to reference the normalized gain score level is presented in Table 6.

Table 6. Normalized Gains Score Qualification

Normalized Gain Score ($< g >$)	Qualification
$(< g >) \geq 0.7$	High
$0.7 > (< g >) \geq 0.3$	Medium
$(< g >) < 0.3$	Low

The e-module product is said to contribute to improving students' scientific literacy abilities if the minimum N-gain score is more than 0.3 in the medium category. Based on the results of the average analysis and N-gain score of scientific literacy abilities above, the e-module is said to be effective in improving students' scientific literacy abilities if it meets the minimum average score of 66 with good qualifications, and meets the normalized N-gain score of more than 0.3 in the medium category. If the average score of students' scientific literacy skills and N-gain score have achieved the specified minimum completeness, then the e-module resulting from the development is considered to have been effective in improving students' scientific literacy skills and can be used in learning.

Before being used, the scientific literacy instrument prepared in this research was tested to obtain a valid and reliable instrument. The science e-module effectiveness test was carried out by measuring students' scientific literacy abilities before and after learning with the developed e-module. The test used is a description test. The analysis used is descriptive analysis which is an analysis technique that aims to describe the average or mean score, frequency distribution, normalized gain score, and standard deviation of data distribution of students' scientific literacy ability tests.

Results and Discussion

This research aims to develop an integrated social and cultural e-module for junior high school science in Balinese society. The results of this research are 1) information collection, 2) product design, 3) product development, 4) limited trials, 5) theoretical product testing, 6) empirical product testing, and 7) product finalization. The information obtained in the first stage, namely the e-module format, mapping of Independent Curriculum Middle School Science Learning Achievements, and local material in the Social and Cultural Culture of the Balinese Community. Based on the information gathered, it was determined that the Classification of Living Creatures material was integrated with the use of plants and animals in Yadnya, the Interaction of Living Creatures material was integrated with the Bikul Ngaben tradition, and the Solar System material was integrated with the Pawukon and Pengalantaka Calendars. The information collected is used as a reference at the product design stage.

The results obtained at the product design stage, namely the formulation of learning objectives, the grand design of the e-module, the validation and practicality questionnaire instrument grid, as well as the scientific literacy test instrument grid. The e-module design stage was assisted with the Canva application, Microsoft Word 2016, Adobe Acrobat, and Nitro Pro. The formats used at the e-module design stage are starting from docx and pdf formats. Based on the results of compiling these components, a grand design for the e-module was produced.

The initial component of the e-module consists of the e-module title which describes the characteristics of the e-module, several supporting images, the Kemdikbudristek logo, the Tut Wuri Handayani logo, the Merdeka Belajar logo, the Undiksha logo, class level and semester, the name of the author, and the name of the supervising lecturer. The appearance of the front cover design can be seen in Figure 2.

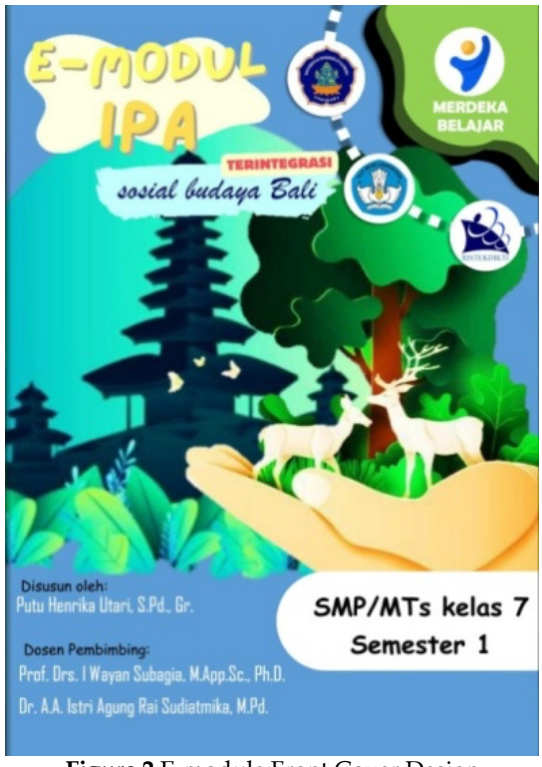

Figure 2 E-module Front Cover Design

The e-module introductory component consists of four parts, namely foreword, instructions for using the e-module, table of contents, and list of images. The introductory section of the e-module can be seen in the Figure 3.

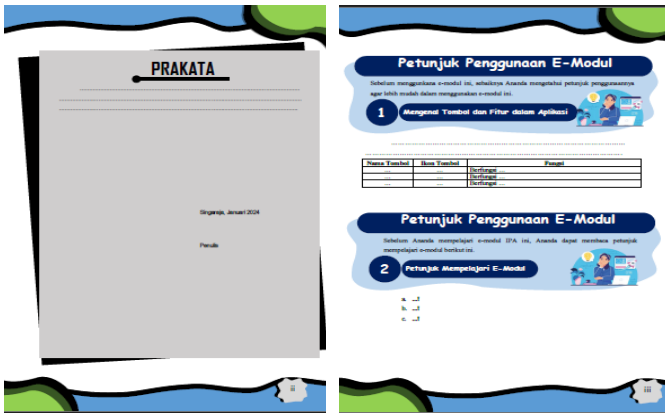

Figure 3 Preliminary Component Design of E-Module

The e-module content component consists of three chapters, each of which is divided into two sub-chapters that have the same component composition. At the beginning of the chapter, there is a cover containing the title of the material. Each sub-chapter consists of three components, namely introduction (chapter cover, scope of material, and flow of learning objectives), learning (sub-chapter title, learning objectives, keywords, apperception, Balinese cultural space, material description, science facts, science applications, summary, and formative tests), and closing (end of chapter summative test and self-reflection). The design results of the e-module content components can be seen in Figure 4, 5, and 6.

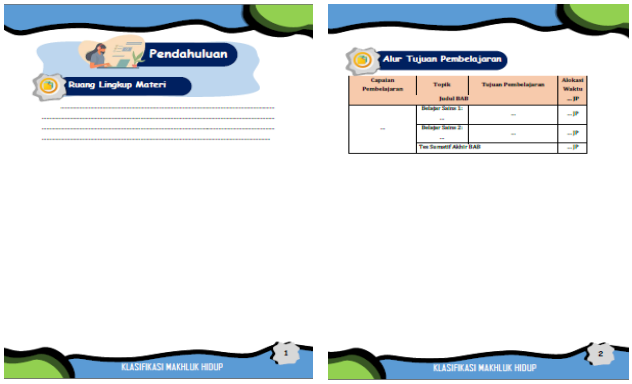

Figure 4 Preliminary Design of E-Modules

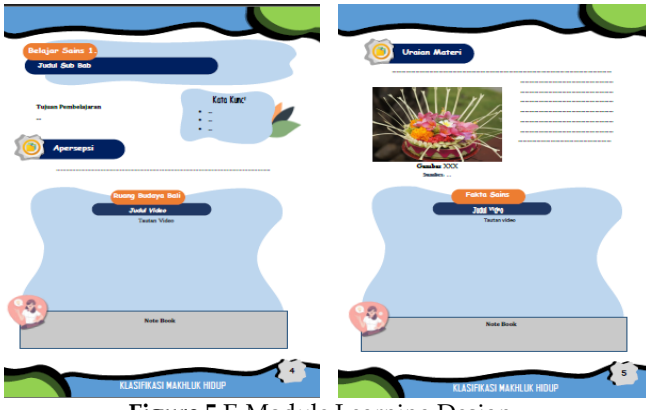

Figure 5 E-Module Learning Design

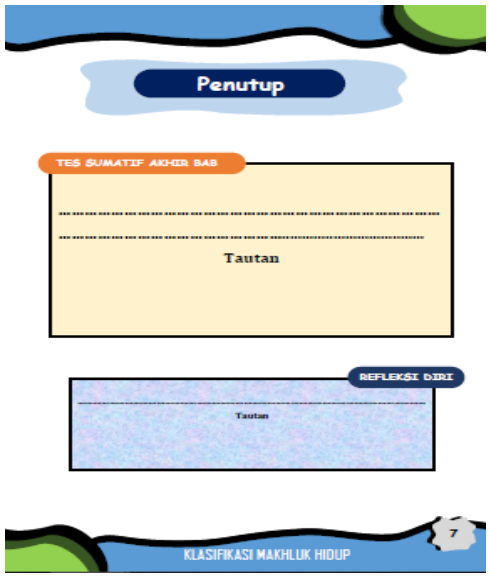

Figure 6 E-Module Cover Design

The final part of the e-module consists of a glossary, references, and the back cover of the e-module. Writing references using the Mendeley application uses APA (American Psychological Association Style) 7th Edition style. The final component design of the e-module can be seen in Figure 7.

Figure 7 E-Module Final Component Design

The e-module development stage was prepared with the help of the main application, Flip Builder, and assisted with the Canva, Microsoft Word 2016, Adobe Acrobat, and Nitro Pro applications. The formats used in developing e-modules start from .docx, pdf, and flipbook formats. The e-module developed was combined with the help of video media from the YouTube platform, pictures, interactive LKPD with the help of Liveworksheets, and online questions from the Quizizz application.

After the first e-module was developed, it continued with limited trials. A limited trial was carried out to determine the obstacles as well as the advantages and disadvantages of the module in terms of implementation, ease of access, and efficiency of learning time for students. Limited trials consist of

individual trials and small group trials. Each student is asked to access and study using draft I of the Balinese social and cultural integrated e-module on the Classification of Living Creatures sub-chapter Learning Science 1 (Plant Classification). At the same time, observations were made on the use of e-modules in terms of ease of access, implementation, efficiency of learning time for students, and obstacles faced. Improvements to draft I of the e-module integrated into the social and culture of Balinese society resulted in draft II of the e-module.

At the theoretical product testing stage, a validation test was carried out which aims to determine the validity of the scientific literacy test product. Material validation was carried out by two experts who have educational backgrounds and expertise in the science field. The material validity data by the two experts was analyzed using the equation. The recapitulation of the results of the material validity analysis using the Gregory equation is presented in Table 7.

Table 7. Recapitulation of Material Validity Analysis Results of the Gregory Equation

Aspect	KVG	Qualification
Feasibility and scope of material	1.00	Very good
Material accuracy	1.00	Very good
Accuracy of terms	1.00	Very good
Accuracy of serving procedures	1.00	Very good
Suitability of evaluation questions	1.00	Very good
Presentation elements	1.00	Very good
Validity of E-Module Material	1.00	Very good

Based on the results of calculations using the Gregory equation, it can be concluded that the Grogory Validation Coefficient (KVG) in terms of material in each aspect obtained a value of 1.0 with very good qualifications, while the Grogory Validation Coefficient (KVG) for the e-module as a whole obtained a value of 1. 0 with a very good category. Thus, it can be concluded that the material presented in the e-module is valid and good to use. In terms of feasibility and coverage of material in terms of topic selection, material coherence, and depth of material, it refers to learning objectives. The suitability of the material to the learning objectives was also conveyed by Maudina (2020) that the valid category of teaching materials was caused by the material displayed being in line with the indicators and learning objectives and made coherently and completely. The data and facts contained in the e-module are relevant to the material discussed. The accuracy of the data and facts in the e-module material is intended so that students do not experience misconceptions. This is in line with the findings of Abdullah (2022) who stated that the material is presented accurately following data, facts, and concepts to prevent students from having misconceptions. Each activity in the e-module is presented with appropriate procedures to prevent students from making errors in completing the activity. Firdaus (2014) expressed the same thing, namely that the steps or procedures are explained clearly and coherently so that students avoid systematic errors. The assessment aspect of the e-module is equipped with formative and summative tests that are in accordance with the learning objectives. The difference between formative and summative assessments is explained by Anggraona (2022) that formative assessments are carried out during the learning process to provide learning feedback, while summative assessments are carried out at the end of learning to report on the achievement of the overall learning objectives. Thus, preparing formative and summative tests on e-modules that are by learning objectives can provide accurate information regarding the achievement of learning objectives. Apart from that, the e-module is also equipped with self-reflection which aims to build independence and responsibility in the learning process.

Sixth, the e-module, seen from the aspect of the presentation, is categorized as very good because it has fulfilled the initial, core, and closing components. The initial component of the e-module includes the front cover, foreword, table of contents, list of images, and instructions for using the e-module. The core components contain apperception, material descriptions, additional information, practical instructions, student worksheets, supporting images, formative tests, and summative tests. The closing component contains a summary, glossary, and bibliography. This is in line with Abdullah's (2022) findings that the completeness of the book's presentation is categorized as very good because it contains an introduction, the correct proportion of images and text, a summary, a glossary, and an evaluation.

Language validation is carried out by one expert who has expertise in the field of Indonesian. The language validity score is carried out by finding the average for each aspect which is then converted into a scale of 100. The results of the language validity recapitulation are presented in Table 8.

Table 8. Recapitulation of Language Validation Data

Aspect	Average value	Qualification
Language suitability	87.5	Very Valid
Suitability to student development	100.0	Very Valid
Legibility	100.0	Very Valid
Clarity in the use of terms and symbols/symbols	92.5	Very Valid
Punctuation accuracy	75.0	Valid
Writing sources for quotations	100.0	Very Valid
Language Validity	92.5	Very Valid

The results of this analysis show that the overall linguistic validity of the e-module obtained a score of 92.5 with very valid qualifications. Thus, it can be concluded that the language used in the e-module is very valid and well-used in the learning process. The Balinese Social and Cultural Integrated Middle School Science e-module product obtained a very valid qualification because the e-module has been prepared by the General Guidelines for Indonesian Spelling (PUEBI) so that the language in the e-module complies with good and correct Indonesian language rules. This is in line with the research results of Maudina (2020) which states that learning media is said to be in the valid category because the language used in the media is by PUEBI.

Media validation is carried out by one lecturer who is competent in the field of media. The media validity score is analyzed by finding the average for each aspect which is then converted into a scale of 100. The results of the media validity recapitulation are presented in Table 9.

Table 9. Recapitulation of Media Validation Data

Aspect	Average value	Qualification
E-module display	91.67	Very Valid
Font and text suitability	97.22	Very Valid
Image alignment	87.50	Very Valid
Alignment of supporting media	100	Very Valid
Use	66.67	Valid
Media Validity	88.61	Very Valid

Based on the results of the assessment by media experts, the overall average score for the e-module was 88.61 with very valid qualifications. This indicates that the e-module has an attractive appearance, the right size and type of letters, the right color composition, harmony of images and media according to the material, and smooth access to the e-module without hangs, lags, or crashes. This is supported by the results of research by Nerita (2018) which states that teaching materials are said to be valid from a graphic (media) aspect because they are supported by an attractive appearance, such as covers, use, and type of letters, suitability of layout, and suitability of colors. This is in line with the results of Purwati (2015) research which states that harmonious image layout and color determination can influence the suitability of graphics in the e-module being developed.

Validation of Balinese culture is carried out by one expert who has an educational background and expertise in the field of Balinese culture. Media validity scores are analyzed by finding the average for each aspect which is then converted into a scale of 100. The results of the recapitulation of Balinese cultural validity are presented in Table 10.

Table 10. Recapitulation of the Validity of Balinese Culture

Aspect	Average value	Qualification
Use of words or expressions in Balinese	100.0	very valid
Presentation of Balinese cultural concepts	100.0	very valid
Integrating the Balinese cultural context with the material	100.0	very valid
Validity of Balinese Culture	100.0	very valid

The results of this analysis show that the average score in terms of Balinese culture in each aspect received a score with very valid qualifications, while the average score for the e-module as a whole obtained a score of 100.0 with very valid qualifications. Thus, it can be concluded that the media used in the e-module is very valid and good for use in the learning process.

A practical test was carried out on 10 junior high school science teachers in Buleleng Regency via a questionnaire sent online. The criteria for science teachers involved in the practicality test are junior high school science teachers with PNS or PPPK status who actively teach in classes VII, VIII, and IX. The following is a summary of the results of the teacher practicality test, presented in Table 11.

Table 11. Recapitulation of Teacher Practicality Test Results

Aspect	Average value	Qualification
Presentation of content or material	83.3	very practical
Suitability of time allocation	96.0	very practical
Ease of use	86.0	very practical
Usefulness	87.5	very practical
Practicality of E-Modules	88.2	very practical

The overall analysis results mean the practicality test by teachers is 88.2 with very practical qualifications. This shows that the integrated social and cultural social and cultural science e-module for the Balinese people that was developed is very practical for use in the field. The e-module prepared is stated to be very practical in terms of content so that the material in this e-module can be easily understood by students. This finding is in line with the research results of Zidatunnur (2021) which states that the level of product practicality can be seen from the content of the material which is easy for students to understand. This e-module is stated to be very practical in terms of the adequacy of the allocated time to complete all activities. This statement is strengthened by the results of research by Suniasih (2019) which states that the practicality of teaching materials is also assessed by the efficiency of using

teaching materials by the time plan so that all activities in the teaching materials can be carried out. Judging from the aspect of ease of use, this e-module obtained a very practical qualification which indicates that the e-module can be accessed and used easily by students. The practicality of accessibility was also expressed by Desyandri (2019) In terms of usefulness, this e-module is stated to be very practical in helping students' learning independence. This is supported by the results of research conducted by Savira (2019) which states that e-modules that are prepared very well and appropriately can support students in learning independently.

The effectiveness test aims to analyze and explain the effectiveness of the socio-cultural integrated social and cultural science e-module of Balinese society in increasing students' scientific literacy. This research used One Group Pretest Posttest Design which was carried out in class VII with 32 students participating. In implementing this design, only one class was used, which at the beginning of the activity was given an initial scientific literacy test (pretest) before independent e-module learning activities, and at the end of the activity, students were given a scientific literacy test (posttest). The pretest and posttest scores are then analyzed to find the pretest and posttest scores on a scale of 100. The next stage is to calculate the N-gain score for the pretest and posttest scores. The distribution of N-gain score data can be seen in Table 12.

Table 12. Distribution of N-gain score data

Normalized N-gain score	Number of students	Percentage (%)	Qualification
$(< g >) \geq 0.7$	5	15.6	High
$0.7 > (< g >) \geq 0.3$	25	78.1	Medium
$(< g >) < 0.3$	2	6.3	Low
Total	32	100	

The distribution of student data for each N-gain score criterion shows that after using the e-module, there were still 2 students (6.3%) who experienced an increase in scientific literacy with low qualifications. This is because students are not used to accessing e-modules online and are not used to taking scientific literacy tests, so students need to get used to accessing independent teaching materials online and practicing doing scientific literacy questions. This is in line with the results of research conducted by Wibowo (2020) which states that increasing the N-gain score in the low category is influenced by internal factors within students, namely not being used to taking scientific literacy tests and not being used to studying regional local wisdom culture in the context of scientific material. so students need more time to understand the material in the context of regional culture. However, the distribution of student data for each n-gain score criterion shows that as many as five students (15.6%) experienced an increase in scientific literacy with high qualifications and the most increase in student scores was in the medium criteria, namely 25 students (78.1%). The average pretest and posttest N-gain score results are presented in Table 13.

Table 13. N-gain score results, average pretest, and posttest

Average Scientific Literacy Score		Average n-gain score	Qualification
Pretest	*Posttest*		
42.48	73.99	0.55	Medium

E-modules are said to be effective in improving students' scientific literacy skills if they meet the minimum average score of 66.0 with good qualifications, and meet the normalized N-gain score of more than 0.3 in the medium category. Based on the data obtained, the average post-test score was 73.99 in the good category. Judging from the average pretest and posttest scores, the N-gain score was 0.55 with moderate qualifications. Based on the results of this analysis, it can be concluded that the SMP science e-module integrated with the socio-culture of Balinese society is effective in increasing students' scientific literacy. Research results Lubis (2021); Nihwan (2020); Shofiyah (2020); Rediani (2023) are in line with this statement that the implementation of local culture-based e-modules has a good impact on improving students' scientific literacy skills. Culture-based learning creates contextual and meaningful learning so that it helps to improve students' scientific literacy. This is in line with the results of research conducted by Pertiwi (2019) which states that scientific literacy skills can be trained by implementing learning that utilizes the social and cultural environment (ethnoscience) as a source of learning in everyday life. The results of Suja's research (2022) show that the combination of real science and scientific knowledge is useful in producing scientifically literate students. The increase in students' scientific literacy for each indicator is presented in Table 14.

Table 14. N-gain score results per Scientific Literacy Indicator

Scientific Literacy Indicators	*N-gain score*	Qualification
Analyze natural phenomena	0.54	Medium
Identify scientific issues or problems	0.53	Medium
Interpret data and evidence scientifically	0.33	Medium
Identify natural phenomena and their changes	0.64	Medium
Evaluate actions that influence natural change	0.56	Medium

The highest increase in scientific literacy was achieved by students, namely in the indicator of identifying natural phenomena and their changes with an N-gain score of 0.64 with medium qualifications. Followed by the indicator of analyzing scientific phenomena with an N-gain score of 0.54 with medium qualifications. This indicates that integrating material with the socio-cultural context of Balinese society presents phenomena originating from the students' environment, making it easier for students to be able to identify natural phenomena and their changes and analyze scientific phenomena. Rediani (2023) states that scientific literacy skills can be improved by paying attention to students' characteristics and potential and developing teaching materials that are appropriate to students' learning environments to train students in analyzing scientific phenomena.

The indicator evaluates actions that influence natural change with an N-gain score of 0.56 with medium qualifications. The indicator of identifying scientific issues or problems with an N-gain score of 0.54 meets the medium qualifications for increasing scientific literacy. These results indicate that the social and cultural integration of Balinese society in the developed e-module has trained students to identify scientific issues or problems because the material in the e-module presents issues and problems that occur in the students' environment. This is in line with the results of research conducted by Rini (2021) which states that students' ability to identify questions about scientific issues or problems is related to aspects of the knowledge students have regarding events encountered in everyday life.

The lowest increase in scientific literacy achieved by students is the indicator of interpreting data and evidence scientifically with an N-gain score of 0.33 with moderate qualifications. Students' lack of ability to interpret data and evidence scientifically indicates that students are not able to understand the questions well. When working on scientific literacy questions, you need careful reading and the ability to understand the content of the reading, including quantitative data presented in the form of tables, graphs, and charts. Rohana (2020) stated that students are not used to answering scientific literacy questions equipped with quantitative data. Students are not used to answering questions in the form of tables, graphs, or diagrams so students have difficulty interpreting data. This indicates that the development of material in the e-module has not fully trained students' abilities in interpreting data and scientific evidence.

Integrating the socio-culture of Balinese society into e-module material, apart from providing real learning experiences to students so that learning becomes contextual, also provides space for students to gain knowledge about the socio-culture of Balinese society. Rediani's (2023) research results show that involving local wisdom in the learning process can have a positive influence on learning because it allows students to appreciate and understand the values, traditions, and knowledge inherent in their own culture. Similar findings were also conveyed by Utari (2021) that Balinese culture which is integrated into science material can provide formal knowledge originating from real phenomena and objects that are close to the students' environment and contain spiritual knowledge, especially for Hindus in Bali.

Conclusion

Based on the results and discussion of the research presented previously, it can be concluded that the integrated socio-cultural E-module for the Balinese people that has been developed has met the requirements for material validity with very good qualifications, linguistic validity with very valid qualifications, media validity with very valid qualifications, and suitability for cultural aspects. Bali with very valid qualifications. The integrated socio-cultural e-module for Balinese society that has been developed has met the practical requirements with the qualification of being very practical for use in the field. The integrated socio-cultural e-module for Balinese society that has been developed has met the effectiveness requirements. The results of this analysis can conclude that the integrated social and cultural e-module of Balinese society is effective in increasing students' scientific literacy.

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Author Contributions

Authors have their contributions. Putu Henrika Utari carried out product development, and investigations, analyzed data, and wrote drafts; I Wayan Subagia and Anak Agung Istri Agung Rai Sudiatmika carried out supervision and reflection.

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Conflicts of Interest

The authors declare there are no conflicts of interest.

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