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Development of E-Modules Based on Local Potential in Grenden Village to Improve the Digital Literacy of Junior High School Students

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Abstract

This study develops an e-module for Natural Science learning by integrating the local potential of Grenden Village to enhance junior high school students' digital literacy. The integration of local potential is relevant because it provides contextual learning experiences, making science concepts more relatable and engaging for students. The e-module was developed using the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation. The research was conducted at SMP Negeri 2 Puger, involving 36 students. Key results indicate that the e-module achieved a validity score of 90% (highly valid), a practicality score of 94% (very practical), and an N-gain score of 0.64 (medium effectiveness). Additionally, student satisfaction reached 88%, reflecting a positive response. In conclusion, the e-module based on Grenden Village's local potential is valid, practical, and effective in improving students' digital literacy. By integrating local contexts, it provides a meaningful learning experience, enhances student motivation, and supports independent learning.

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INTRODUCTION

Digital literacy in science learning plays a very important role in developing students' science literacy. In modern learning, science literacy is one of the crucial aspects that must be mastered by students, because science literacy is not only related to understanding science concepts. It is an important basis for students to be able to think critically, solve problems, and make decisions based on scientific understanding (Makhdum, 2022). Digital literacy is the ability to understand, analyze, evaluate, organize, and appreciate information using digital technology. Digital literacy can be achieved through the ability to use digital devices. Every individual must have a sense of responsibility in using the technology used to gather information, communicate and surf in the digital space (Mahrawi et al., 2023). Digital literacy includes a variety of skills, which include cognitive, technical, and sociological skills, which must be mastered by individuals to be able to complete various tasks and face various challenges and problems that arise in the digital environment, be it in personal, social, educational, and professional contexts, so as to adapt to technological change (Wahyuni *et al.,* 2022).

Digital literacy in Indonesia needs attention because it is still relatively low. The survey conducted by the Program for International Student Assessment (PISA) conducted by the Organization for Economic Co-operation and Development (OECD) in 2022 regarding the level of reading comprehension, the score achieved decreased and Indonesia was still ranked 11th lowest in the ranking there were 81 countries listed (Ningrum *et al.,* 2024). Furthermore, Wahyuni et al. (2022) stated that the level of digital literacy can also be seen from the results of the initial analysis at SMP Negeri 7 Jember which is classified as moderate. The average digital literacy of students in class VIII E in the category of using digital tools obtained a score of 3.09.

The problem of low digital literacy is caused by a lack of understanding of the concept of correct digital literacy or because the implementation of literacy implementation is less supportive due to students not being able to learn independently (Ningrum et al., 2024). Low digital literacy results in not achieving the objectives of the learning process in teaching and learning. The problem of low digital literacy skills if not overcome can cause reading difficulties in capturing information through online media. Improving digital literacy skills here is needed to receive and understand before concluding a material concept (Pratiwi & Indana, 2022).

The majority of teacher-used modules are verbal or textual in nature, which deters pupils from paying attention to them. Creating a module with graphics or illustrations to help students comprehend it is one way to get their attention and encourage them to study the material. The majority of teacher-used modules are verbal or textual in nature, which deters pupils from paying attention to them. The creation of a module with graphics or illustrations to aid in comprehension is one way to get pupils interested in studying the material (Meryastiti et al., 2023). With help of E-Modules, teachers can develop teaching materials that are more interesting and more practical and effective, because teachers organize them systematically to make it easier for students to understand the information available. The development of E-Modules for junior high school students is one of the efforts to utilize technology to improve students' digital digital literacy (Chairunisa & Zamhari, 2022).

Previous research revealed that digital literacy in students can be improved through the application of the use of interesting teaching materials in the form of e-modules. Based on research conducted by Pratiwi and Indana (2022) E-modules can improve digital literacy skills which were originally at an average percentage of 91.22% in the good category. Relevant to the research of Wahyuni et al. (2020) said the module was very effective in improving the digital literacy skills of SMPN 7 Jember students with a practicality value of 96.8%. This shows that students' digital literacy can be improved through the use of E-Modules as teaching materials to improve students' digital literacy experience.

Local potential that can be used as a learning resource is an important asset in the education process, especially in creating contextual and meaningful learning experiences for students. This potential includes the diversity of natural resources, as well as community economic activities that are closely related to the utilization and management of natural ecosystems in a sustainable manner. In this

case, integrating the local potential of Grenden Village into a science learning E-Module is a strategic step to improve student understanding. Through this approach, students not only learn abstract concepts such as energy and its changes, but can also relate them to real examples they encounter in the surrounding environment. This helps students understand the connection between theory and practice and encourages them to care more about the environment, while increasing their awareness of the importance of preserving local resources that support people's lives as a whole (Andwitasari et al., 2023).

Based on the background description that has been presented regarding the low digital literacy of junior high school students, to overcome this, researchers are trying to improve digital literacy through the learning process, one of which is compiling and developing science learning E-Modules that are relevant to the local potential of Grenden Village (Ramadhina & Pranata, 2022). Learning E-Modules based on local potential can provide a more contextual and meaningful learning experience for students, because they relate the subject matter to their surrounding environment. Through E-Modules based on local potential, it can improve digital literacy, which includes skills to understand, apply, and interpret science concepts in everyday life, an important competency that must be possessed by students. Therefore, a research was conducted entitled "Development of E-Modules Based on Local Potential in Grenden Village to Improve the Digital Literacy of Junior High School Students".

METHODS

Research Design

The research design uses the ADDIE model which has five stages. The use of the ADDIE model is suitable for developing e-modules based on the local potential of Grenden village. The ADDIE model is often used in instructional development and is easy to implement. The e-module was developed using the ADDIE model, which includes five stages: analysis, design, development, implementation, and evaluation (Hanifa et al., 2023).

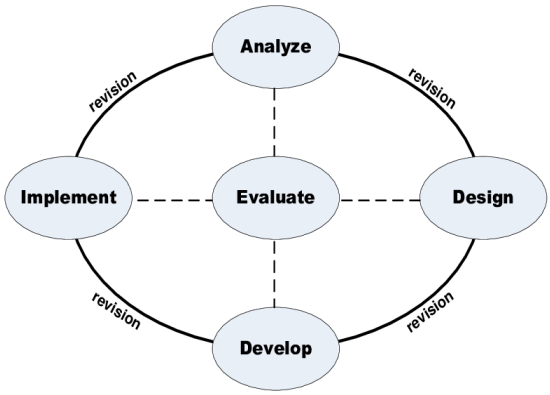

Figure 1. Model stage ADDIE (Branch, 2009)

The created e-module can help students visualize abstract concepts, improve their understanding of the material being taught, and make the delivery of the material more engaging by including more images and videos and easily accessible journal links for further information. In addition, the module will include new information, tests, and discussion questions to help students become more independent and develop their critical thinking abilities (Faridah et al., 2023).

Research Subject

The study was subject at SMP Negeri 2 Puger, involving 36 students from class VII E, who follow the independent curriculum (Kurikulum Merdeka). which emphasizes student-centered learning and digital literacy skillsSeveral research instruments were used to ensure comprehensive data collection: Validation Sheets – Completed by three validators (two teachers and one lecturer) to assess content, presentation, language, and graphic aspects. Observation Checklists – Used by observers to evaluate the practicality of e-module implementation in real classroom settings. Pretest and Posttest Assessments – Administered to measure students' improvement in digital literacy, analyzed using the N-gain formula. Student Response Questionnaires – Collected feedback on engagement, ease of use, and overall satisfaction with the e-module.

Data Analysis Technique

1. Validity Test Analysis

Validation was conducted by three validators. Two validators from SMPN 2 Puger ia expert as educator for five years and one expert science

education lecturer, University of Jember. Then the results are calculated based on the value of the validation sheet that has been filled in by the validator, the formula used is as follows:

$$Percentage\ validity\ E-Module = \frac{Total\ score\ by\ validators}{Total\ score\ maximum} \times 100\%$$

Table 1. Criteria of validity

Value Criteria (%)	Validity Level
0-25	Invalid
26-50	Less Than Valid
51-75	Valid
76-100	Perfectly Valid

(Masrurah, 2022)

2. Practicality Test Analysis

The practicality test was measured from the observation of the implementation of learning activities through the use of the developed Grenden Village local wisdom-based module. The practicality of the module was calculated using the following formula.

$$Percentage\ of\ Practicality\ of\ E-Module = \frac{Total\ score\ by\ validators}{Total\ score\ maximum} \times 100\%$$

Table 2. Criteria of practicality

Value Criteria (%)	Criteria
0-25	Not Practical
26-50	Quite Practical
51-57	Practical
76-100	Highly Practical

(Kumalasari, 2018)

3. Effectiveness Test AnalysisAnalisis Tes

Effectiveness is measured by the *N-gain* formula which is determined based on the average value of the gain score (g). The *N-gain* value can be calculated by the formula:

$$< g >= \frac{Rmean\ posttest\ score\ -\ mean\ pretest\ scoret}{Maximum\ score - Average\ posttest\ score}$$

Table 3. Criteria N-*gain*

Criteria For Achievement	Category
$g \geq 0.7$	High
$0.3 \leq g < 0.7$	Medium
$g < 0.3$	Low

(Hake, 1998)

4. Student Response Analysis

Student response is calculated using a student response questionnaire. Here's how to measure student response with the formula:

$$Percentage\ of\ student\ response = \frac{Score\ earned}{Maximum\ score} \times 100\%$$

Table 4. Response criteria

Value Criteria (%)	Category
$80 \leq P < 100$	Excellent
$60 \leq P < 80$	Good
$40 \leq P < 60$	Good Enough
$20 \leq P < 40$	Not Good

(Yahya & Bakri, 2017)

RESULTS AND DISSCUSION

The development research that has been conducted by researchers produces products in the form of teaching materials in the form of e-modules and based on the local potential of Grenden Village with the material Classification of Living Things. This research uses the ADDIE model development design which consists of the stages of analyze, design, development, implementation, and evaluation. This research was conducted in Grenden Village, Puger District, Jember Regency, the results of this study were designed to improve the digital literacy of SMPN 2 Puger class VIII E students on the material of Classification of Living Things.

Figure 2. Grenden Village farmland

The e-module based on the local potential of Grenden Village was designed on Canva which can be accessed online, either through the application. The Canva application was chosen as the module design platform so that the developed module has an attractive appearance and design, so that it can overcome the challenges experienced by teachers in the teaching and learning process according to the

results of the analysis that has been done. Ninta & Hadi (2023) said Canva is a lightweight and easy-to-use software that does not provide a burden that can reduce the performance of the user's cellphone or laptop during the module design process. Canva also offers a variety of features, allowing module authors to be creative more freely.

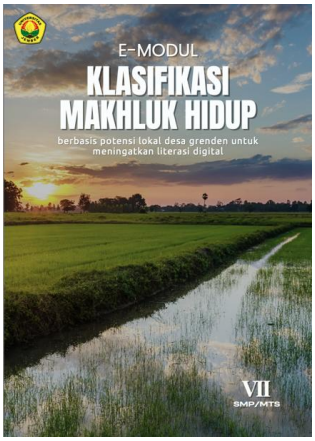

Figure 3. Cover of local potential e-module based on local potential of Grenden Village

Figure 4. E-module materials and activities

The e-module that has been developed has the advantage of involving the use of electronic devices in the Classification of Living Things material. The display of teaching materials is very well presented with the support of images that are relevant, interesting, easy to understand, and related to local potential around students' daily lives. E-modules can be a learning resource that supports students in carrying out the learning process independently (Lastri, 2023).

Validitas E-Modul

The e-module based on the local potential of Grenden Village that has been developed will continue at the validity test stage by three validators to ensure there is a match between the material with the learning standards set and the local wisdom raised. The module validity test process involved three validators, consisting of one lecturer from the Bachelor of Science Education study program at the University of Jember, and two science subject teachers from SMP Negeri 2 Puger. The validation process was carried out by submitting the module along with the validation sheet to each validator. The validation data obtained was then calculated and the results were compared with the predetermined validation criteria scale to determine the validity level of the developed module.

Table 5. Results of e-module validation

No.	Assessment Aspect	Validator Percentage (%)			Percentage (%)	Category
		1	**2**	**3**		
1.	Content and Materials	81	93	93	89	Perfectly Valid
2.	Presentation	94	94	100	96	Perfectly Valid
3.	Language	94	87	75	85	Perfectly Valid
4.	Graphic	87	94	87	89	Perfectly Valid
Average score		89	92	87	90	Perfectly Valid

The results of data analysis of the validity of e-modules based on the local potential of Grenden Village in Table 1 obtained an average validity percentage score of 90% which indicates that the module is in the category of very valid validity. In line with this, Zainab et al. (2022) emphasized that a product is considered feasible to be applied in a learning activity if the product is in a very valid category based on the assessment of experts. There are four aspects that are tested for validity in the developed module, including content aspects, material aspects, language aspects, and graphical aspects.

The results of the content aspect validation obtained a percentage of 89% which was categorized as very valid. This means that the module is arranged systematically and completely, has material that is presented in order, can be used for self-study, has attractiveness, has the feasibility to be called a local wisdom-based module in accordance with indicators of digital literacy skills. The validation results from the material aspect show a percentage of 95.83% which is in the very valid category. According to Nadira et al. (2022), the material aspect includes several key elements, such as the suitability of the material description and the applicable curriculum, the accuracy of the concepts conveyed in the material, and a clear link to the predetermined achievement indicators. Based on this statement, the acquisition of a very valid category in the material aspect means that the module developed is in accordance with the applicable curriculum and learning outcomes (CP), and in accordance with local wisdom in the environment around students.

The validation results from the language aspect show a percentage value of 85% so that it is categorized as very valid. According to Sa'diyah (2024), the language aspect shows its validity if it uses the Refined Spelling (EYD), clear and precise word selection, and avoids multiple interpretations that can confuse students. Thus, the use of appropriate and appropriate language will make it easier for students to understand the content or subject matter. The results of the validation of the graphical aspects obtained a very valid category with a validity percentage of 89%. According to Takim (2021), a high percentage in the graphic aspect means that the developed module can make students give a positive response to the e-module design, so that it can arouse curiosity in reading the e-module very high. Thus, the excellent validity in the grammatical aspect shows that the module is not only aesthetic, but also functional, so that later it can support a more effective and enjoyable learning process for students.

Practicality of E-Modules

The valid module based on the local potential of Grenden Village can then be implemented directly in learning activities. To measure the application of the module in learning activities, several learning implementation sheets are needed. This sheet can be filled in by three observers during the learning process, which is four meetings. The observers involved in this study consisted of three students from the University of Jember. The results of data analysis on the implementation of the effectiveness of e-modules based on the local potential of Grenden Village in learning activities are presented in Table 6.

Table 6. Observation data results of learning implementation

No.	Assessment Aspect	Meeting to - 1 (%)	2 (%)	3 (%)	4 (%)	Percentage (%)	Category
1.	Introduction	95	97%	97%	97%	96	Highly Practical
2.	Core						
a.	Instructions for using the e-module	95	97	98	98	97	Highly Practical
b.	Operate the e-module	85	90	95	98	92	Highly Practical
c.	Performing e-module activities	85	95	97	98	92	Highly Practical
3.	Closing	95	95	95	95	95	Highly Practical
	Average score	91	95	95	97	94	Highly Practical

The data above shows that the average value of the practicality of using e-modules in all meetings is 94% and is in the very practical category. Practicality according to Damayanti et al. (2024) aims to the practicality of the designed practicum guide needs to be done to determine the level of use. E-Modules allow teachers to deliver material more smoothly and structured, so that the teaching process can take place more effectively. On the other hand, students can also learn independently more effectively. Therefore, a module that is considered practical means that the developed module can facilitate the learning process, and provide the necessary support for students to achieve learning goals without feeling burdened. Thus, it can be concluded, from the acquisition of a very practical category at each meeting. This can reflect that the learning carried out using the module based on the local potential of Grenden Village has run very well. This shows that the developed module is effective in facilitating the learning process of students, learning can be considered practical if the application of development products during the activity can be carried out well.

Digital literacy tests were conducted through pretest and posttest. The pretest was conducted before the learning began, while the posttest was conducted after the learning using the e-module based on the local potential of Grenden Village was completed. The results of the effectiveness of learning using modules are calculated based on the average test scores obtained, then calculated using the n-gain calculation formula to obtain the effectiveness criteria of the use of modules in improving students' digital literacy skills. If the posttest value obtained is higher than the pretest value, it can be concluded that the e-module is effective in improving students' digital literacy skills. The results of the pretest and posttest can be seen in table 7 below.

Table 7. Results of n-gain data analysis for each digital literacy indicator

Science Literacy Indicators	*N-gain*	Category N-gain
Internet searching	0.9	High
Hypertextual navigation	0.3	Medium
Content evaluation	0.5	Medium
Knowledge assembly	0.9	High

Based on the data from table 7, the competency indicator of internet searching obtained the lowest n-gain value of 0.90 which is in the high category. This indicates that students' analytical skills reach the expected target. The high ability of internet searching competence is due to the times, students are able to search the internet easily. According to Ditiaharman et al. (2022), driven by advances in information and communication technology, students can find steps to access information using the internet. In contrast, the low n-gain value is shown in the hypertextual navigation competency indicator which reaches a value of only 0.31 and is included in the moderate category. This is due to the lack of student ability and less directed to open the links that have been set by researchers so that students acquire new abilities to open the links

shown by researchers to improve digital literacy skills.

The effectiveness of the developed e-module is based on the responses given by students after conducting learning activities using the e-module (Awwaliyah et al., 2021). The results of the student response questionnaire that showed a positive response reflected that the developed module was well received by students in learning activities. This indicates that the e-module based on the local potential of Grenden Village is not only relevant to student needs, but also able to increase student interest and involvement in the learning process. The response questionnaire filled out by students consists of eleven statements divided into three main categories: interest, convenience, and satisfaction. The results of the student response questionnaire analysis can be seen in Table 8.

Table 8. Results of student response questionnaire analysis

Aspect	Percentage (%)	Category
Attraction	88	Good enough
Ease	87	Good enough
Satisfaction	88	Good enough
Avarage score	88	Good enough

The results of the analysis of student response questionnaires showed an average assessment with a very good category at a percentage of 88%. This means that students give very positive responses to the modules used in learning. The interest aspect obtained a percentage of 88% which was included in the very good category. This shows that students feel interested in the material presented in the module. The convenience aspect obtained a percentage of 87% so that it was in the very good category, indicating that students felt that the module was easy to understand and apply in learning activities. Finally, the satisfaction aspect recorded the highest percentage of 88%, meaning that students were satisfied with the learning experience gained through the use of the module. According to Nugroho (2024), satisfaction is one of the positive attitudes shown by students towards the services provided by teachers in the teaching and learning process that arises because of the match between what is needed and the reality received by students. In this case, students are satisfied with the learning E-module, the material presented, and the interaction between students and teachers. So that overall, the questionnaire results show that the use of e-modules in learning has proven to be effective in enhancing students' digital literacy through several key mechanisms. First, e-modules allow students to access and navigate digital content independently, improving their skills in searching, evaluating, and utilizing information effectively. Additionally, by utilizing the Canva platform, this e-module provides a more interactive learning experience through multimedia elements such as images, hyperlinks, and digital-based activities, stimulating students' critical thinking and analytical skills (Pedroso et al., 2023). Furthermore, integrating the local potential of Grenden Village into the learning material helps students connect theoretical concepts with real-world applications, enhancing their understanding and ability to apply scientific knowledge in daily life.

The developed e-module has several significant advantages. In terms of validity and practicality, it achieved a validity score of 90% and a practicality score of 94%, indicating that it is well-structured and effective for use in learning. Moreover, incorporating local potential makes learning more contextual and relevant to students, increasing their motivation and comprehension of the material. The effectiveness of the e-module is also evident in students' learning improvements, as shown by an N-gain score of 0.64, categorized as medium. Students' responses to this module were highly positive, with an average satisfaction level of 88%, indicating that they found the module engaging and beneficial for their studies.

However, there are some limitations in implementing this e-module. One major challenge is students' limited ability to navigate more complex digital content, such as using hyperlinks, as reflected in the N-gain score for hypertextual navigation, which only reached 0.3, categorized as medium. Additionally, access to digital devices and the internet remains a constraint for some students, potentially limiting the effectiveness of digital learning modules. Furthermore, self-directed learning through e-modules may result in cognitive overload for students who are not accustomed to digital-based learning methods.

For future development, several opportunities can be explored to enhance the effectiveness of this e-module. One possible strategy is to incorporate more structured navigation guides to help students better understand how to use interactive features within the module. Additionally, integrating gamification elements such as interactive quizzes and simulations can further increase student engagement and motivation. Given the challenges of internet access, an offline version of the e-module should also be developed to ensure accessibility for students with limited digital resources. Furthermore, this local potential-based approach could be expanded to other subjects to improve digital literacy across different fields of study.

Compared to previous research, this e-module demonstrates a similar or even higher level of effectiveness and practicality. For instance, the study by Pratiwi and Indana (2022) found that e-modules improved digital literacy with an effectiveness rate of 91.22%, while Wahyuni *et al.* (2020) reported an e-module practicality score of 96.8%. The findings of this study support these results, showing a relatively high level of effectiveness. However, the main advantage of this e-module compared to previous research is the integration of local potential into learning. This not only enhances digital literacy but also makes learning more meaningful and contextual for students. Therefore, this local potential-based e-module contributes not only to improving students' digital literacy but also to increasing engagement and the relevance of learning to their everyday lives.

CONCULSION

The development of the e-module based on the local potential of Grenden Village has proven to be a valid, practical, and effective tool for enhancing students' digital literacy. Both content and construct validation scores exceeded 90%, categorizing the module as highly feasible. Additionally, the readability assessment score of 88% further supports its usability in the learning process. The module's effectiveness was demonstrated by a significant improvement in students' digital literacy skills, as reflected in an N-gain score of 0.64 (medium category). These findings indicate that the e-module successfully supports students in acquiring essential digital literacy competencies, including information searching, content evaluation, and knowledge assembly. The integration of local potential also enhances contextual learning, making digital literacy development more meaningful and relevant. Given its success, it is recommended that this e-module be implemented in science learning at SMPN 2 Puger. Future research should focus on refining the module by incorporating more interactive elements, addressing digital navigation challenges, and expanding its application to other subjects to further enhance students' digital literacy.

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