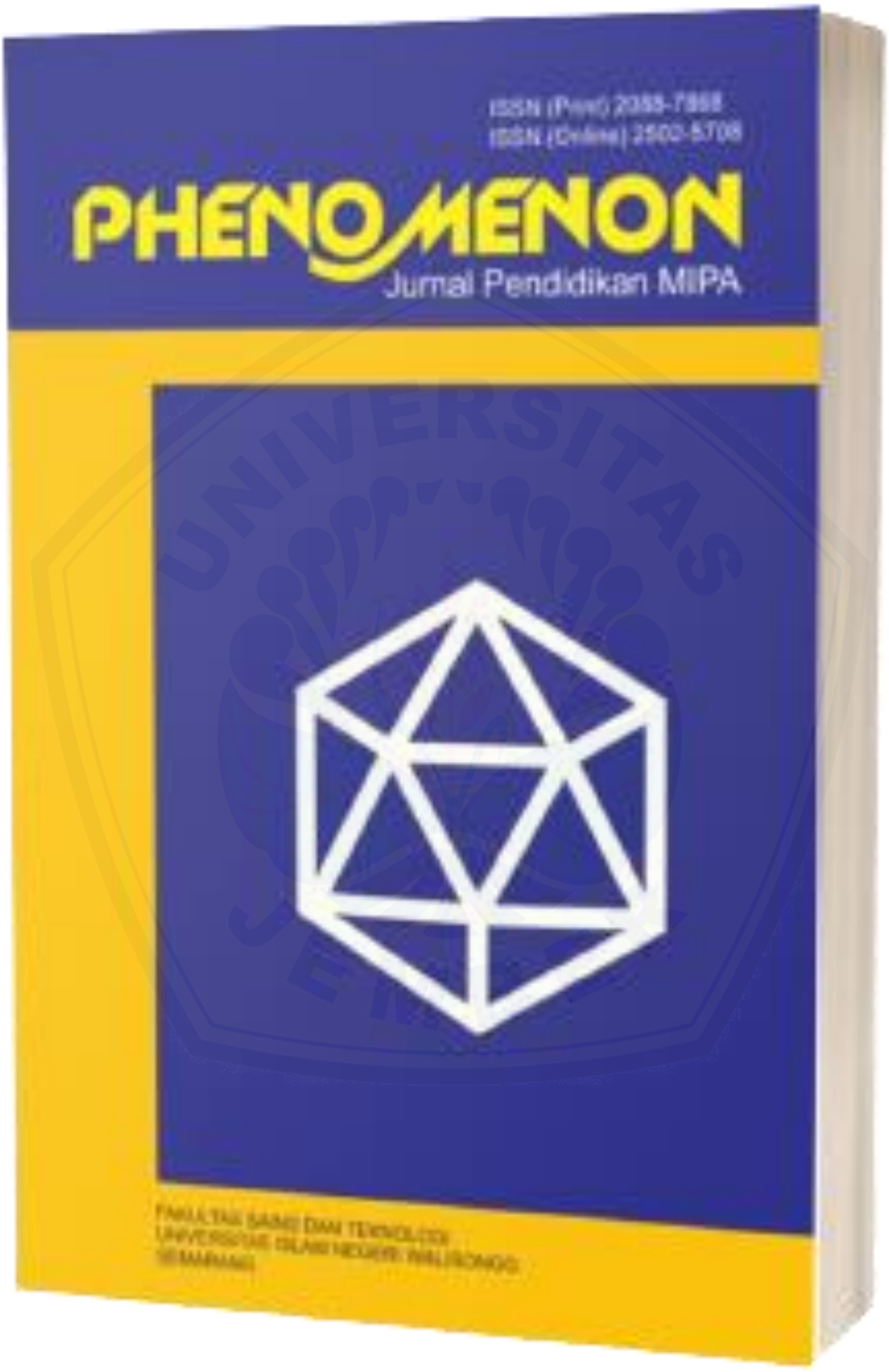

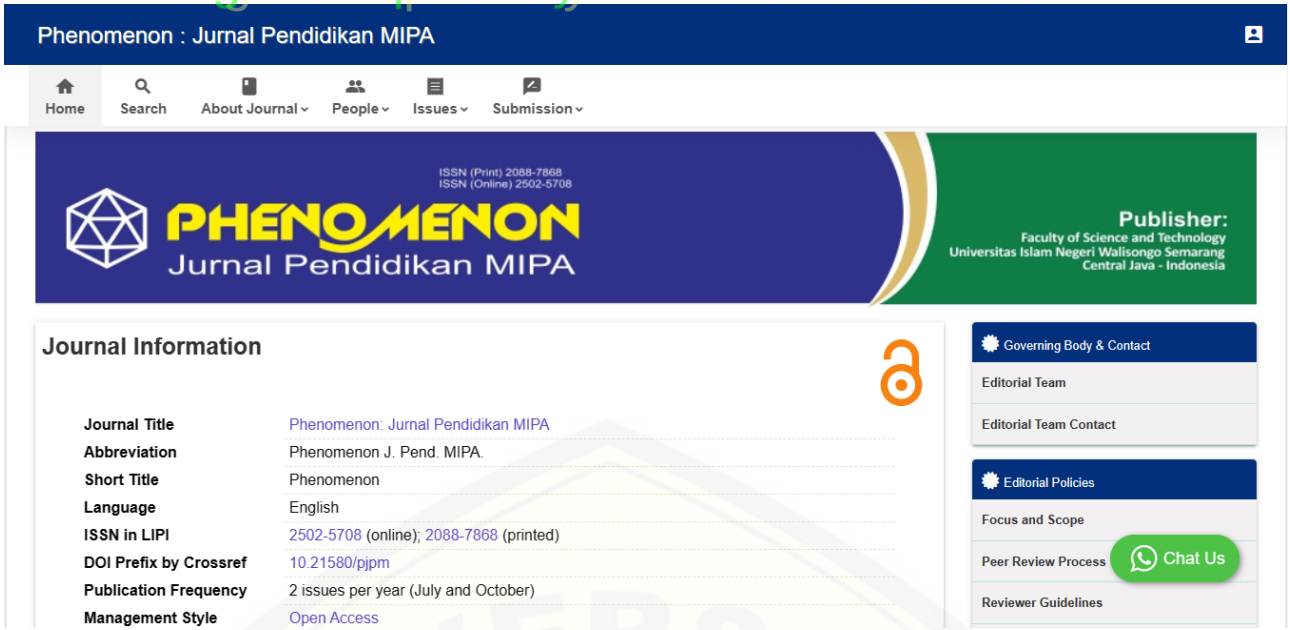

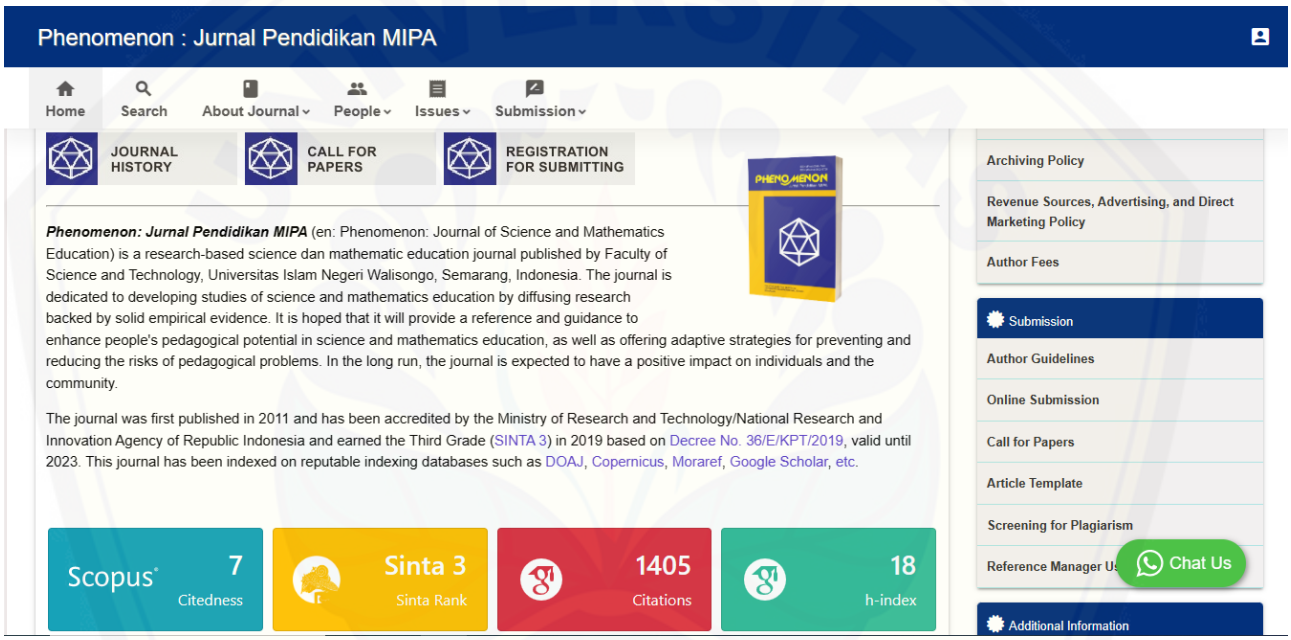

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The Development of De Djawatan Local Potential-Based E-Module for Science Learning to Improve Science Process Skills of Junior High School Students

Dian Fajar Nuryah[1], Ulin Nuha[2], Sri Wahyuni[3]
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Abstract

Science process skills are the ability to study natural phenomena in certain ways to acquire knowledges and develop it in the future. Students who have science process skills will be able to solve problems, form concepts, and be able to develop creativity. Based on the previous studies, science process skills in science learning are still low. One of the factors that cause the low science process skills is the lack of teaching materials that facilitate the development of students' science process skills. One of the factors that cause students' science process skills to be low is the lack of teaching materials that facilitate the development of students' science process skills. This study aims to develop an De Djawatan's local potential-based e-module that is valid, practical, and effective to improve students' science process skills. This research was conducted according to the stages in the ADDIE model, namely analyze, design, develop, implement, and evaluate. The results of the study show that the local potential-based e-modules are included in the following criteria: (1) valid with a value of 85%; (2) very practical with a value of 89.2%; and (3) effective with moderate improvement category. Students showed a positive response with a percentage of 86%.

Keyword: E-module based on local potential, ADDIE model, Validity, Practicality, Effectiveness.

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Pengembangan E-Modul Berbasis Potensi Lokal De Djawatan Pada Pembelajaran IPA Untuk Meningkatkan Keterampilan Proses Sains Siswa SMP

Abstrak

Keterampilan proses sains merupakan keterampilan untuk mempelajari fenomena alam untuk memperoleh dan mengembangkan ilmu pengetahuan. Siswa yang memiliki keterampilan proses sains akan dapat memecahkan masalah, membentuk konsep, dan mampu mengembangkan kreativitas. Hasil penelitian sebelumnnya menunjukkan bahwa keterampilan proses sains pada pembelajaran IPA masih rendah. Hal tersebut dikarenakan beberapa faktor seperti kurangnya bahan ajar untuk digunakan agar keterampilan proses sains meningkat. Penelitian ini bertujuan mengembangkan e-modul berbasis potensi lokal De Djawatan yang valid, praktis, dan efektif untuk meningkatkan keterampilan proses sains siswa. Penelitian dilakukan sesuai dengan tahapan pada model ADDIE, yaitu *analyze, design, develop, implement,* dan *evaluate*. Hasi penelitian menunjukkan bahwa e-modul berbasis potensi lokal termasuk ke dalam kriteria: (1) valid dengan nilai sebesar 85%; (2) sangat praktis dengan nilai 89,2%; dan (3) efektif dengan kategori peningkatan sedang. Siswa menunjukkan respon positif dengan persentase 86%.

Kata kunci: *E-modul berbasis potensi lokal, model ADDIE, Keefektifan, Kepraktisan, Validitas,*

INTRODUCTION

Natural Sciences is a combination of knowledge that has a systematic arrangement which is not only studied based on facts but also based on scientific methods and attitudes through discovery. Science learning does not only focus on product mastery but also mastering process skills and scientific attitudes. According to Rahayu et al. (2017), process skills in science learning are known as science process skills. Process skills in science learning are known as science process skills (Wahyuni et al., 2017). Science process skills are skills that can develop and arouse curiosity, independent learning, responsibility, and student's ability to apply the scientific method (Lestari dan Diana, 2018). Science process skills are taught in learning activities so that students can practice expressing their opinions (Hartini et al., 2018). If students have mastered process skills, they will be able to learn at a high level, namely conducting research and solving problems (Marlena et al., 2019). According to Wildayanti et al. (2020), if students already have science process skills, they will be able to solve problems, get knowledge to form concepts, develop concrete thinking levels and be able to increase creativity.

The fact shows that students' science process skills are still low in science learning.

Based on the previous study in one class of SMP Negeri 21 Surabaya, students didn't have science process from the results of research skills (Tantia *et al,* 2016). Study conducted by Siswanto et al. (2017) show that only 20-50% students who have the science process. Based on the interviews with science teachers at MTs Negeri 5 Banyuwangi, online learning makes students less active in learning. In addition, the school has not implemented a learning process that improve science process skills.

The low science process skills are caused by several factors. According to Saleh et al. (2020), science process skills is low due to the lack of development of teaching materials so that science process skills increase. Wake et al. (2019) stated that the low science process skills were due to the absence of relevant learning resources to improve science process skills. The learning resources used are textbooks that are difficult for students to understand and student notes in the form of explanations from the teacher. According to (Luh et al., 2018) the cause of the low ability of the science process is the learning that is carried out is not related to life in the student's environment.

We can use an innovative teaching material to improve science process skills. The teaching materials contain the concept that is related to everyday life. Teaching materials can be in the form of e-modules based on local potential. The local potential is a regional characteristic that includes crops, traditions, culture, natural resources, human resources, and others that are superior products of an area. Based on previous research, the development of local potential modules can improve science process skills (Hayati et al., 2019). E-modules are electronic learning media that are systematically arranged and used for independent learning so that students are required to solve problems (Fausih and Danang, 2015). According to Syahrial et al. (2019), the use of e-modules can make teachers easier to introduce the culture and environment around students, and teachers can involve local potential in learning. The goal is for students to know the local potential that exists in their area.

Science process skills can be improved in several ways. Fajriyanti et al. (2018) uses Project Based Learning-based worksheets to improve science process skills through project assignments that have been provided. Qosim et al. (2020) developed learning media based on the Atmega microcontroller to improve science process skills. Rusdi et al. (2021) developed a virtual lab learning media in order to improve science process skills. Yunita et al. (2017) developed science learning tools with a guided inquiry model

supported by Phet media. Oktafiani et al. (2017) develop a versatile optical kit props to improve science process skills. Hardiyanti et al. (2017) implement the PBL model to improve science process skills. Lusidawaty et al. (2020) uses an inquiry learning strategy that can improve students' science process skills.

This research is different from the research described above. The development of local potential-based e-modules is still rarely done. Local potential can be an interesting theme in science learning. In addition, science learning that utilizes local potential can provide a more real student learning experience (Jayanti et al., 2017). One of the local potentials in Banyuwangi is De Djawatan, a mini forest that have a collection of hundred years old trees. The benefit of this research is to provide innovative teaching materials to increase student interest in learning to use e-modules based on local potential.

METHOD

This study is research and development (R&D) using the ADDIE design that consists of 5 stages: Analyze, Design, Develop, Implement, and Evaluate. The research was conducted in MTs Negeri 5 Banyuwangi on February 2022. The subjects of this study were students of class VII A at MTs Negeri 5 Banyuwangi. Data collection techniques consist of questionnaire, interview, documentation, and tests. Data collection instruments consist of validation sheets, implementation observation sheets, and student response questionnaires. The validity of e-module was analyzed based on the results of validation by experts. The practicality of e-modules was analyzed based on the implementation of learning using e-modules. The effectiveness of e-module was analyzed based on the results of improving students' science process skills and student responses when using e-modules.

The formula used to calculate the level of validity of the E-module based on De Djawatan's local potential:

$$\boldsymbol{P = \frac{\sum X}{N} \times 100\%,\ NA = \frac{\sum P}{n}}$$

(Arikunto, 2010)

Table 1 E-module validity criteria based on local potential de Djawatan

Percentage (%)	Criteria
$75 \leq P \leq 100$	Valid
$50 \leq P < 75$	quite valid
$26 \leq P < 50$	not valid
$P < 26$	Invalid

(Arikunto, 2010)

Based on these criteria, the e-module is said to be valid if the percentage reaches 75≤ P 100 with valid criteria.

The formula used to calculate the practicality of the E-module:

$$\boldsymbol{Vp} = \frac{TSEp}{S-max} \times 100\%$$

Table 2 practical criteria for E-modules based on local potential de Djawatan

Percentage (%)	Criteria
75,01-100%	Very practical
50,01%-75,00%	Practical
25,01%-50,00%	Less practical
00,00%-25,00%	Not practical

(Akbar dan Sriwijaya, 2011)

Based on these criteria, E-module is said to be practical if the percentage reaches an assessment of 50.01%. Effectiveness was measured based on the improvement of pretest and posttest and student responses to the E-module. The increase in science process skills is measured by a science process ability test based on six indicators, namely observing, classifying, predicting, measuring, concluding, and communicating skills. The increase in science process skills is calculated using the N-gain test:

$$g = \frac{Sposttest - Spretest}{Smax - Spretest}$$

with the description: g = gain score

S posttest= posttest score

S pretest= pretest score

Smax=maximum score

Table 3 shows the categories of N-gain scores.

Table 3 Gain criteria

Gain Score	Improvement Criteria
g> 0,7	High
0,7> g > 0,3	Moderate
g> 0,3	Low

(Hake,1998)

Student responses were analyzed based on the results of student response questionnaires on the use of e-modules. Student response questionnaires were distributed after students used the e-modules. The percentage of student responses can be measured using the following formula:

$P=\frac{A}{B}$x 100%

(Trianto, 2010)

Table 4 shows the results of the analysis of student responses.

Table 4 student response criteria

Percentage (%)	Criteria
$25\% \leq P < 43\%$	Not positive
$44\% \leq P < 62\%$	Less positive
$63\% \leq P < 81\%$	Positive
$82\% \leq P < 100\%$	Very positive

(Sudjana, 2011)

The indicators of science process skills used in this study are indicators according to Dewi (2008) which consist of six indicators, namely observing, classifying, predicting, measuring, concluding, and communicating skills. The indicators and sub-indicators used are described in table 5.

Table 5 Indicators of science process skills

Indicator	Sub Indicator
Observing	Observing objects based on the senses
Classify	Able to compare an object, find similarities and differences Looking for grouping base
Predict	Estimating the possibilities that occur based on observational data
Measure	Measuring observational data Understand the working system of the tools used
Communicating	Convey and clarify ideas orally or in writing Make notes from observations
Conclude	Using a variety of information to make a statement

RESULT AND DISCUSSION

The product of this development research is a De Djawatan potential-based e-module based. The e-module was implemented in 7th-grade students. The e-module is said to be feasible if it meets the valid, practical, and effective criteria. Validation is done by three

validators. The local potential-based e-module validation uses a linert scale that uses a scale of 1-4, that are: (1) 4 for valid criteria; (2) 3 for quite valid criteria; (4) 2 for not valid criteria; and (1) 1 for invalid criteria. The results of the validator's assessment of the e-module are presented in table 6.

Table 6 E-module validation results based on local potential

No	Assessment Aspect	Interval Score			Average (%)	Criteria
		Validator 1	Validator 2	Validator 3		
1.	Format	79,2	83,3	83,3	81,9	Valid
2.	Language	75	81,2	93,7	83,3	Valid
3.	Contents	85	85	100	90	Valid
4.	E-module suitability with local potential	75	100	100	91,7	Valid
5.	E-modules train science process skills	85,7	85,7	82,1	84,5	Valid
Average		79,9	87	91,8	86,3	Valid

Based on the validation result, the average score of the e-module from the three validators is 86.3% with valid criteria. The e-module has not received a maximum score because there are still several revisions from the validators. The revision of the e-module is on the format and the language aspect. Some picture on the e-module is unclear. Improvement made by the researcher is replacing the picture used with a clearer and more complete picture. According to Simamora et al. (2018), the presentation of images can be reviewed based on good image readability, image positions that are in sync with text, and appropriate image location and size. Putri et al. (2021) state that the pictures and videos presented in the e-module should be able to help explain the material.

The validator suggests the researcher revise some sentences or words that are not quite right. Improvements made by the researchers were replacing some words that were not standardized and replacing sentences that were not following general Indonesian spelling guidelines. The presentation of teaching materials on language development products must be easy and communicative (Rambe, 2019). Ahmad (2021) states that e-modules must use language that is following enhanced spelling, is unambiguous, and easy for students to understand.

The practicality of the e-module was analyzed based on the trial phase with four meetings. During the learning activities, three observers observed the implementation of

the learning activities. The results of the implementation of the learning process are presented in Table 7.

Table 7 Results of the analysis of the implementation of learning using e-modules

Activity	**Meeting**				**Average Percentage (%)**	**Category**
	1	2	3	4		
Introduction	88,9	90	93,3	95	91,8	Very practical
Core activities						
1. Access the e-module on the link provided	83,3	91,7	91,7	100	91,7	Very practical
2. Reading the material on the e-module	75	83,3	91,7	91,7	85,4	Very practical
3. Observing the videos or images in the e-module	91,7	91,7	91,7	91,7	91,7	Very practical
4. Analyzing the facts in the e-module	83,3	83,3	91,7	91,7	87,5	Very practical
5. Delivering the results of the discussion	83,3	83,3	83,3	83,3	83,3	Very practical
6. Answering evaluation questions on e-modules	91,7	91,7	91,7	100	93,8	Very practical
Closing	87,5	87,5	87,5	91,7	88,5	Very practical
Overall average	85,6	87,8	90,33	93,14	89,2	Very practical

Table 6 shows that the percentage of implementation of learning using E-modules based on De Djawatan's local potential is 89.2% which is classified as very practical criteria. The practicality of the e-module was analyzed based on the results of observations on the implementation of learning. E-modules are said to be practical because the learning activities have been carried out well.

The analysis of the implementation of learning shows the percentages of: (1) the preliminary stage is 91.8%; (2) the core stage is 88.9%; (3) and the closing stage is 88.5%. The practicality assessment focuses on the core activity stage: the stage of applying the product development results to learning. The lowest percentage at the core stage is when students present the discussion result (83.3%). Based on research conducted by Qosim et al., 2020, students have difficulty making conclusions and lack confidence. According to Ahmad et al. (2020), students difficult to conclude, so teacher assistance is needed. The highest percentage is when students answered the evaluation questions in local potential-based e-modules. Students are easy to learn the material because there are material and practice questions (Laili et al., 2019). According to Yuliawati et al. (2020), students feel happier when working on practice questions on e-modules.

The effectiveness of e-module was analyzed based on the increasing science process skills and the response of students. The indicators of science process skills used in this study are in accordance with the six indicators of science process skills from Dewi (2008). The average pretest score of class VII-A students is 30, while the average posttest score is 76. The increase in test scores is calculated using N-gain. Table 8 shows the increase in students' science process skills scores.

Table 8 The effectiveness of the results of students' science process skills

Indicator	**Average (%)**		***N-gain***	**Criteria**
	Pretest	**Postest**		
Observe	77	94	0,77	High
Classify	44	84	0,71	High
Predict	23	70	0,61	Moderate
Measure	19	67	0,58	Moderate
Communicating	4	69	0,68	Moderate
Conclude	11	73	0,69	Moderate
Overall Average	30	76	0,66	Moderate

Based on the N-gain test, the N-Gain value obtained is 0.66 (Table 8). It shows that there was an increase in students' science process skills after using the De Djawatan's local potential-based e-module. The increase is classified in the medium criteria. Student response analysis can be seen in table 9

Table 9 Results of the Recapitulation of Student Response Questionnaires

No.	Indicator	Response percentage (%)	Criteria
1.	Interest	85	Very positive
2.	Learning materials	86	Very positive
3.	Language	88	Very positive
Average		86	Very positive

Based on the results of the average student response results obtained a score of 86%. This shows that if the questionnaire score criteria for student responses get a very good response. The effectiveness of De Djawatan's local potential-based e-module was reviewed based on a science process skills test that was tested with N-gain to find out the amount of improvement after using De Djawatan's local potential-based e-module. Data analysis of the effectiveness of the science process skills test of VIIA students shows that the N-gain value is included in the moderate criteria with a score of 0.66. It shows that De Djawatan's local potential-based e-module is quite effective in improving the science process skills of class VIIA students at MTs Negeri 5 Banyuwangi. The results of research conducted by Sriyati et al. (2021) showed that dadiah local potential-based teaching materials had a significant effect on improving students' science process skills. In addition, research conducted by Hayati et al., (2019) shows that the local potential module can improve students' science process skills.

The results of the study stated that the De Djawatan potential-based e-module was suitable for use in learning because it met the valid, practical and effective criteria. Based on the results of the local potential-based e-module validation, De Djawatan obtained an average percentage of 86.1%. According to (Wahyu et al., 2021) e-module is valid to be used if the score is 61% on each criterion and the material is aligned with competency standards and basic competencies. In line with the statement by research Oktaviana (2022) which shows that the validation questionnaire analysis which shows a value of 61%-80% is categorized as a valid criterion and a value of 81%-100% is categorized as a very valid criterion. The results of the observation of the implementation of learning stated that if the e-module based on local potential De Djawatan was included in the very practical criteria with an average percentage of 89.2%. Nainggolan et al. (2021) states that the implementation of learning is in the good category if the implementation of learning is achieved. The data on the analysis of the effectiveness of the VIIA student's science process skills test showed moderate criteria. This shows that De Djawatan's local

potential-based e-module is quite effective. Local potential-based e-modules can improve science process skills because it encourage students to get contextual learning experiences. Local potential-based e-modules have several advantages so that they get a very positive response from students. Local potential-based e-modules are equipped with pictures and videos so that they can attract students' interest in learning. In line with the statement of Larasati et al. (2020) e-modules are equipped with videos and pictures so that students are more interested in learning activities.

CONCLUSION

Based on the results of the analysis and discussion that have been described in this study, it can be concluded that De Djawatan potential-based e-module is valid (85%), practical (89,2%), and effective to increase the science process skill. Local potential-based e-modules can improve students' science process skills with an average N-gain of 0.66 with moderate category. The average student response results showed a percentage of 86% with a very positive category. Suggestions for further researchers is to develop products that are equipped with clear instructions for use so that students can use them more easily.

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