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DEVELOPMENT OF SCIENCE MODULE BASED ON ETHNOSCIENCE OF BRICK PROCESSING ON THE MATERIAL OF SUBSTANCE FORM CHANGE

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ABSTRACT

The background of this research is based on the importance of integrating local wisdom in science learning to make it more contextual and meaningful. The formulation of the research problem includes how to develop a module, how the module's feasibility is based on validation by media experts and material experts, and how students and teachers respond to the module. This research aims to develop an ethnoscience-based science learning module by highlighting the local potential of the brick center in Prambatan, Kaliwungu, Kudus as a learning context on the material of substance form change, to determine the feasibility of the module based on validation by media experts and material experts, and to determine students and teachers responses to the module. The method used is research and development (Research and Development) with a 4D model (define, design, develop, disseminate), but this research is only carried out until the development stage due to time constraints. The module development process includes the needs analysis stage, module design, validation by media experts and material experts, revision of validator input, and limited trials for grade VII D students at MTs NU Nurul Huda Kedungdowo Kaliwungu Kudus. The research population is all grade VII students at MTs NU Nurul Huda which totals 270 students. The sampling technique used random sampling by selecting 22 students as limited trial subjects. Data analysis uses qualitative descriptive and uses the Content Validity Index (CVI) technique which is then calculated using the Gregory validity technique which shows a high level of validity with scores of 0.70 (media) and 0.60 (material) respectively. The limited trial involved 22 students and one science teacher with student response results showing a very high level of feasibility (average 88.00%) and the response of science teachers showing a very high level of feasibility (average 97.5%). This module succeeds in integrating the values of local wisdom into science learning so that it can strengthen the relationship between science and daily life.

A. INTRODUCTION

Natural Sciences is one of the learning content in schools. Science subjects equip students with knowledge, ideas, and concepts about the natural environment gained from experience (Panggabean et al., 2021). The learning process leads to the transfer of knowledge and experience directly because science learning includes contextual learning which means that the learning is closely related to real objects in life (Rahmawati et al., 2021). Science learning or science can be integrated with the surrounding environment because science itself studies things related to nature. So that the use of local wisdom in the surrounding environment can potentially be a viable learning resource to be used in science learning (Ni'mah & Noor, 2023). Local wisdom is a cultural order in the knowledge, rules, and skills of the community in an area which can meet the needs of life that are inherited from generation to generation (Hidayati, 2016).

The importance of integrating local wisdom in learning is also strengthened by the phenomenon that occurs at this time, where there is often a decrease in students' attention or interest in learning in optimizing the potential that exists in their area (Suryani dan Mirnawati., 2019). In this context, brick making is one example of local wisdom that is relevant to science learning, especially in the material of changing the form of substances. However, often students do not understand the process of making

bricks from a scientific perspective of changing the form of substances. So that the integration of local wisdom in an area into the scope of learning is very necessary in the hope of instilling a sense of love for culture and local wisdom in students (Sumiati et al., 2020). The integration of culture, potential and local wisdom into science learning will make students' attention focused on the real learning context of the surrounding environment. Therefore, educators are expected to be more responsive to empowering self-creativity in order to be able to plan and carry out learning activities, especially in terms of utilizing local wisdom as a learning resource (Ramlah & Julyyanti, 2025). One of the ways that is considered to be able to study and then transform the original knowledge of the community into scientific knowledge so that it can become a source of learning is through ethnoscience studies (Rahmatih et al., 2020). A similar research was conducted by Siagian & Tamba, namely the development of ethnoscience-based science modules on energy source materials. Based on this research and development, the modules developed are very feasible to be used as a learning resource in the form of teaching materials (Siagian & Tamba, 2023).

The use of learning resources in the form of learning media and teaching materials is one of the reasons for success in learning (Susilawati, 2025). In addition to using textbooks, teachers must also have other teaching materials to support increasing the effectiveness of competency achievement and creating effective, efficient, and student-centered learning (Amali & Kurniawati, 2019). Therefore, the researcher is interested in developing teaching materials in the form of ethnoscience-based modules with the content of brick-making activities, especially in the Prambatan Kaliwungu area, so that students can continuously get to know the local wisdom of the surrounding bricks. The Prambatan Kaliwungu area has a significant brick-making center or industry so the availability of such centers allows researchers to directly observe the brick-making process, collect data, and develop relevant learning modules. This is also supported by the independent curriculum policy which requires teachers to develop modules as a tool that is quite crucial for the smooth learning process (Setiawan et al., 2022). Modules are packages that are arranged in the form of specific units and designed in such a way as to facilitate student learning (Wulandari et al., 2024).

As an important teaching material, the module is designed to facilitate independent learning, provide structured guidance, and support students in mastering concepts systematically. The ethnoscience-based module developed in this study emphasizes local wisdom as a contextual approach to make science learning more meaningful and relevant, particularly on the topic of substance form change. Material changes in the form of substances have characteristics that are close to daily life and can be done directly. The process of making bricks involves several changes in the form of substances such as evaporation of water during drying and heating and compaction of materials during printing. The characteristics of these materials can allow students to learn through hands-on experience and relate scientific concepts to real practice. The reason the researcher raised the ethnoscience of the brick center as a learning resource is because brick making is part of the environment that students know, especially in the Prambatan Kaliwungu Kudus area, so it is relevant and interesting for them.

Furthermore, the research conducted by Nailiyah et al., stated that the thematic science module based on ethnoscience in Jember Regency on the theme of tobacco cultivation in junior high schools is valid instructionally and technically (Nailiyah et al., 2016). Based on similar research that has been conducted, it can be concluded that the development of ethnoscience-based science modules is valid and feasible to be used in the science learning process. Based on this description, the researcher is interested in conducting research on "Development of Science Modules Based on Ethnoscience of Brick Processing on The Material of Substance Form Change" which aims to develop an ethnoscience-based science module, to determine its feasibility as a science learning resource based on validation by media experts and material experts, and to determine the responses of students and teachers to the developed science module.

B. RESEARCH METHOD

This research uses the Research and Development (R&D) method because it aims to develop products in the form of science modules as teaching materials in science learning and test the product (Putra et al.,

2020). The development model used is the 4D model (Define, Design, Develop, and Disseminate) (Thiagarajan, 1920). The 4D model is one of the systematic learning design models (Indaryanti et al., 2025). Here's a picture of the 4D development model.

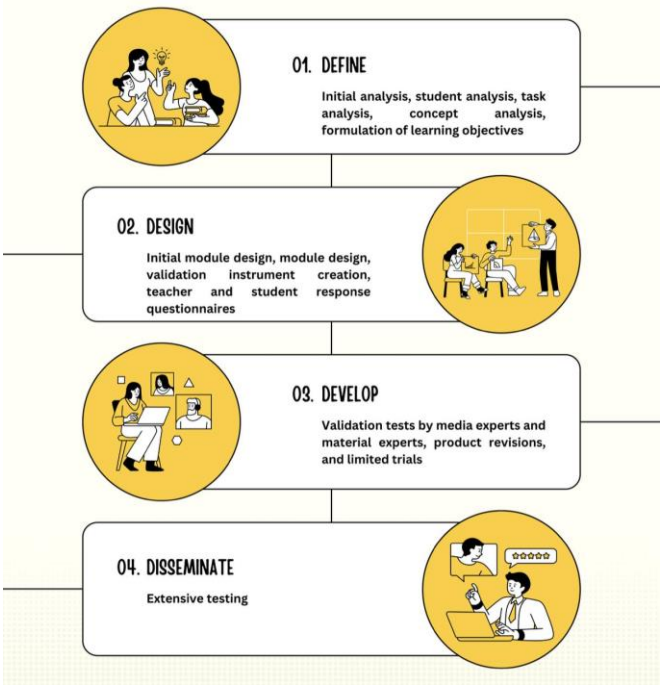

Figure 1. *4D Development Model*

The 4D development model has four stages, namely Define, Design, Develop, and Disseminate. However, in this study, it will only reach the development stage without doing the disseminate stage, because the researcher has limited time to continue the research to that stage. In the research conducted Yanti et al., (2023) also uses a 4D development model which is then modified by the researcher into 3D without going through the disseminate stage. The explanation of the development stages used in this study is as follows.

At the definition stage, the researcher conducted an initial analysis, namely about the material of changing the form of substances, the analysis of students, namely the lack of scientific understanding related to the process of making bricks, especially on the material of changing the form of substances, task analysis, namely determining the type of tasks that were presented in the module about the change in the form of substances through the context of the ethnoscience of the brick center, concept analysis, namely how to make bricks scientifically related to the concept of change in form substance, and the formulation of the learning objective, which is to relate the scientific concept of changing the form of a substance to the process of making bricks.

In the design stage, the researcher conducted the initial design of the module, namely by designing what components are contained in the module, designing modules, making validation instruments for media experts and material experts, and making student response questionnaires and teacher responses.

In the development stage, the researcher conducted a validation test of media experts and validation of material experts, revise modules of the validation test results, and test on a limited basis to find out the responses of students and teachers.

The subjects in this study were 22 students who were randomly selected from a population of 270 students in class VII MTs NU Nurul Huda Kedungdowo Kaliwungu Kudus. The sample size was determined based on Slovin's formula according to Sugiyono (2013) with a 20% margin of error, which resulted in approximately 22 students. Therefore, the sample of 22 students was considered adequate to represent the population in this limited trial. The researcher chose the MTs because of its strategic location with the brick center, so that it can relate scientific concepts with the real context of life around the brick center. The object of this research is a science module based on brick-centered ethnoscience on material changes in the form of substances. The data collection technique used is through expert validation sheets and respondent questionnaires. The data analysis technique used is qualitative descriptive data analysis by grouping information from descriptive data in the form of inputs, suggestions, and comments. In addition, it also uses the Content Validity Index (CVI) technique which is then calculated using the Gregory validity technique, which is as follows.

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

Vc = Construct validity
A = Testers strongly disagree
B = Testers disagree
C = Testers agree
D = Testers strongly agree (Gregory et al., 2011).

The Gregory validity method was chosen because it was considered the most appropriate to ensure that the measurement instrument used covered all aspects and dimensions of the concept to be measured. The validity of the content itself aims to assess the extent to which the items in the instrument

really represent the concept being studied. The Gregory method offers a systematic approach to calculating the validity of content, which involves a panel of experts who are tasked with assessing the relevance of each item to the construct being tested. The assessment is based on clear criteria so that it can minimize subjective bias and improve the accuracy of measurement results. In addition, the Gregory method produces a CVI value, which is an index that provides a quantitative picture of the level of validity of the content of an instrument, which can strengthen the objectivity of the analysis and allow researchers to evaluate the instrument more precisely and measurably. So the use of the Gregory method helps researchers ensure that the instrument used is really valid in measuring the concept in question and improving the reliability of the overall results (Larasati & Syamsurizal, 2022). The results of the construct validity calculation are then converted into cumulative values that are adjusted to the predetermined assessment standards. The assessment standards are as follows (Gregory et al., 2011).

Table 1. Criteria for Validation of Gregory Test Results

Value Range	Criterion
0,80 – 1,00	Very High Validity
0,60 – 0,79	High Validity
0,40 – 0,59	Medium Validity
0,20 – 0,39	Low Validity
0,00 – 0,19	Very Low Validity

Furthermore, the product trial process was carried out using a questionnaire filled out by students and teachers as respondents. The questionnaire used used a Likert scale with a total of 4 assessment scores to obtain data on student and teacher's responses and perceptions of the developed modules. The Likert scale was chosen because it is able to measure the extent to which students and teachers agree or disagree with various statements related to the feasibility of the product. Thus, the data obtained can be used to assess the quality and feasibility of products more objectively and measurably based on user perceptions, namely students and teachers (Santika et al., 2023). The Likert scale used in this study consisted of four answer choices, namely Strongly Disagree (score 1), Disagree (score 2), Agree (score 3), and Strongly Agree (score 4), as shown in table 2.

Table 2. Product Trial Likert Scale Assesment Score

Answer	Assesment Score
Strongly Disagree	1
Disagree	2
Agree	3
Strongly Agree	4

After the data is collected, the score obtained from the respondents is then calculated as a percentage. This percentage calculation uses a formula developed by Purwanto (2020) which are as follows.

$$NP = \frac{R}{SM} \times 100 \quad (2)$$

NP = Percent value searched

R = Raw score obtained

SM = Ideal maximum score

100 = Fixed number (Purwanto, 2020).

The average score produced is then converted into a qualitative value. This qualitative value is determined based on the assessment criteria that have been set. The assessment criteria are presented in the form of a percentage of student and teacher response results which can be seen in the following table.

Table 3. Percentage of Students and Teacher Response Results

Percentage	Category
81% - 100%	Highly Worth It
61% - 80%	Proper
41% - 60%	Less Worthy
21% - 40%	Not Eligible
0 - 20%	Very Unworthy

Table 3 shows the percentage categories of students and teacher responses to the developed module. If the percentage of responses is in the range of 81%–100%, it is categorized as Highly Worth It. A percentage of 61%–80% is categorized as Proper, while 41%–60% is categorized as Less Worthy. Meanwhile, a percentage of 21%–40% indicates that the product is Not Eligible. These categories are used as a reference to determine the level of feasibility of the module based on student and teacher perceptions.

C. RESULT AND DISCUSSION

The main product produced from this research is an ethnoscience-based science learning module with the topic of changing the form of substances integrated with the local wisdom of the brick center in Prambatan Kaliwungu. In this section, the results of the development of a science module based on ethnoscience of the brick center will be presented using a 4D model, namely define, design, develop, and disseminate which is then modified by the researcher into three stages, namely define, design, and develop.

At the stage *Define* or the definition of the researcher performing some analysis. The initial analysis was carried out by analyzing the needs of the learning module which showed that the material used in this module was material on the change of the form of substance. Material on the change of the form of substance became the material used in this module because in the material there are several things that are rarely done or encountered by students directly. In this regard, the development of a science learning module based on ethnoscience of the brick center is considered appropriate if applied to material on changes in the form of substances so that learning is not only centered on teachers but also on students (Oktavianti et al., 2023). The next stage of analysis is student analysis which shows that the lack of scientific understanding of students who in their lives are around the brick center. They do not understand that the process of making bricks is also related to scientific concepts, especially in the matter of changing the form of substances. Furthermore, an assignment analysis was carried out which showed that in the module a type of task about the change in the form of substances through the context of brick center ethnoscience. In the module, there are practicum activities so that students can directly analyze that there is a relationship between the material of changing the form of substances and the process of making bricks. In addition, students can find out that the local wisdom around them also stores scientific concepts so that they can increase their involvement in learning (Agus et al., 2020). The next stage of analysis is concept analysis which shows how the manufacture of bricks scientifically relates to the concept of changing the form of substances. Based on the results of the analysis that has been carried out by the researcher, the learning objective is obtained, namely to relate the scientific concept of changing the form of substances with the process of making bricks. The learning objectives are then referred to the success of student learning.

At the stage *Design* or the design of the researcher conducts the initial design of the module, namely by designing what components are contained in the module and compiling the material. The main focus in the preparation of components and materials is to align the concept of changing the form of substances with local wisdom contained in the process of making bricks, such as the use of sun and fire for evaporation, so that students can understand scientific concepts while appreciating local cultural values (Muamanah et al., 2024). In the preparation of the material, it not only focuses on understanding scientific concepts but also integrates local wisdom of the brick center process so that the material is more contextual and meaningful. After the material is arranged in depth, then the module design is carried out which includes the selection of attractive presentation formats such as layout design, the selection of images and illustrations, and the appropriate fonts so that the module material is more communicative, attractive, and easy to understand by students. The results of the module design stages can be seen in the following image.

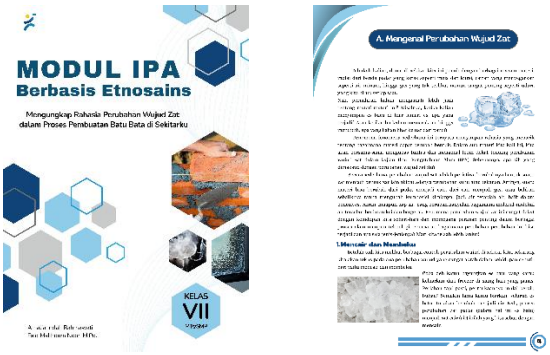

Figure 2. *Front Cover Display;*
Figure 3. *Material Display of Substance Shape Change*

Figure 4. *Integration of Science with Brick Center;*
Figure 5. *Practicum Activities*

At this stage, the researcher not only compiles materials and designs modules, but also makes validation instruments for media experts and material experts, as well as making questionnaires for student responses and teacher responses.

In the *development stage*, the researcher conducts a media expert validation test and a material expert validation test to ensure that the developed science module is in accordance with scientific standards, relevant to the teaching material, and supports the achievement of learning objectives. The media

validation was carried out by Achmad Ali Fikri, M.Pd. who is a lecturer in Biology at Sunan Kudus State Islamic University. Media validation was carried out to assess the quality of the design of the science module, the clarity of the presentation of the material, the layout, aesthetics, and the usefulness of the science module as a teaching material. Meanwhile, the validation of the material was carried out by Sulasfiana Alfi Raida, M.Pd. who is a lecturer in Science Studies, Sunan Kudus State Islamic University. Material validation is carried out to evaluate the feasibility of the material content, the correctness of the concept, and its suitability with the curriculum and student needs.

After the material and media validation test is carried out, the next stage is to conduct a validity test of the instrument using the Gregory method. This method was chosen because it is able to systematically test the accuracy of the instrument through assessments from experts (Setemen, 2018). The test results are then recapitulated in the form of a table of validation results.

Table 4. Media Expert Validation Results

	Disagree	**Agree**
Testers	A = 0	C = 3
	B = 0	D = 7

Based on the table above, the coefficient of validity of the content of media expert instruments can be calculated using the Gregory formula.

$$Vc = \frac{D}{A+B+C+D} \quad (3)$$

$$Vc = \frac{7}{0+0+3+7}$$

$$Vc = \frac{7}{10} = 0{,}70$$

Based on the results of the calculation using the Gregory formula, a validity value of 0.70 was obtained, which if based on table 1 shows that the media expert validation instrument is included in the high validity category. Assessments from media experts provide important input regarding shortcomings in the presentation of images and illustrations in the module.

Tabel 5. Material Expert Validation Results

	Disagree	**Agree**
Testers	A = 0	C = 4
	B = 0	D = 6

Based on the table above, the coefficient of validity of the content of the material expert instrument can be calculated using the Gregory formula.

$$Vc = \frac{D}{A+B+C+D} \quad (4)$$

$$Vc = \frac{6}{0+0+4+6}$$

$$Vc = \frac{6}{10} = 0{,}60$$

Based on the results of the calculation using the Gregory formula, a validity value of 0.60 was obtained, which if based on table 1 shows that the validation instrument of the subject matter expert is included in the high validity category. Assessments from material experts provide important input regarding shortcomings in the depth of material content.

The validation of the science module based on ethnoscience at the brick center was carried out comprehensively through a review process from experts consisting of lecturers in the field of science education and lecturers in the field of biology education. This validation includes various important aspects such as the suitability of the material content with the curriculum, the accuracy of science concepts, the integration of local wisdom values, the use of language that is communicative and in accordance with the level of student understanding, the completeness of the presentation of visual media, and the integration between learning activities and the achievement of learning objectives. In the context of ethnoscience, the ethnoscience-based science module of the brick center is designed to relate science material to the real life of the community, especially local potential in the form of brick industry centers which are one of the local wisdom in a certain area. Through this integration, students are expected to be able to understand the concepts of science, namely the change in the form of substances through direct experiential learning activities that are relevant to daily life. Thus, learning becomes more meaningful because it connects science material with the surrounding environment (Cahyani et al., 2024). Based on the results of validation from media experts and material experts, the results were obtained that the ethnoscience-based science module of the brick center is included in the category of high validity. From these results, it can be concluded that the ethnoscience-based science module of the brick center is suitable for use with revisions. Some

suggestions and inputs from experts will be considered by the researcher for further revision.

The next step after the validation and revision of the module according to the input of experts is to test the product on a limited basis. A limited trial was carried out for grade VII students at MTs NU Nurul Huda involving 22 students and one science teacher as research subjects. The main purpose of this limited trial is to evaluate the response of students and teachers to the ethnoscience-based science module of the brick center that has been developed. This limited trial was carried out in stages that included providing modules to students and teachers and collecting data through response questionnaires to determine the level of readability, material understanding, interest, and integration of ethnoscience with scientific concepts in the developed modules. The results of the analysis of the student response questionnaire can be seen in the following table.

Table 6. Results of Students Response Questionnaire Analysis

Aspects	Average (%)	Criterion
Ease of Use	80,11%	Proper
Display	90,34%	Highly Worth It
Language	90,90%	Highly Worth It
Ethnoscience Integration	85,99%	Highly Worth It
Engagement and Learning Interest	90,90%	Highly Worth It
Understanding the Concept of Change in Substance Form	89,77%	Highly Wort It
Overall Average	**88,00%**	**Highly Worth It**

Based on the results of the analysis of the student response questionnaire to the ethnoscience-based science module of the brick center, an average overall score of 80.00% was obtained, which if based on table 3 is included in the very feasible category. Each aspect assessed showed positive results with relatively high scores. The aspect of ease of use obtained a score of 80.11% with a decent category, showing that most students can already use the module well although there is still room for improvement, especially in terms of delivering instructions for use. The display aspect received a score of 90.34% with a very decent category which shows that the module has an attractive design and supports the learning process. The language in the module is considered very feasible with a score of 90.90% which reflects that the use of language is in accordance with the student's level of understanding and can help them master the material more easily. The aspect of ethnoscience integration also received a very decent assessment with a score of 85.99% which shows that the ethnoscience concept raised, namely the brick center, has been successfully integrated into the learning material in a relevant manner. Student involvement and interest in learning in the module also showed very positive results with a score of 90.90% which indicates that the module is very feasible in attracting students' interest in learning and actively involved in learning. The understanding of the concept of changing the form of substances obtained a score of 89.77% with a very feasible category which shows that the material delivered through the module can help students understand the concept clearly and deeply. Overall, with an average score of 88.00% which is in the very feasible category, it can be concluded that the developed brick-centered ethnoscience-based science module is very effective in the science learning process. However, the aspect of ease of use can continue to be improved so that the module is more optimal in helping students learn.

In addition to the analysis of student response questionnaires, researchers also analyzed teacher response questionnaires. The results of the analysis of the teacher's response questionnaire can be seen in the following table.

Table 7. Results of the Survey Analysis of Science Teacher Response

Aspects	Average (%)	Criterion
Content Eligibility	100%	Highly Worth It
Language Qualifications	87,5%	Highly Worth It
Presentation Eligibility	100%	Highly Worth It
Graphic Qualification	100%	Highly Worth It
Ethnoscience Qualifications	100%	Highly Worth It
Overall average	**97,5%**	**Highly Worth It**

Based on the results of the analysis of the teacher's response questionnaire to the science module, excellent results were obtained with an overall

average of 97.5% which is included in the very feasible category. All aspects assessed received high scores which showed that the quality of the modules was excellent based on the perspective of the science teacher. In detail, the feasibility aspect of the content obtained a perfect score of 100% with a very decent category. This shows that the content of the material in the module is very much in accordance with the curriculum, relevant to learning needs, and supports the achievement of learning goals. The language feasibility aspect received a score of 87.5% with a very feasible category. Although slightly lower than other aspects, this score still shows that the language used in the module is very good, communicative, and easy for students to understand. The aspects of presentation feasibility, graphic feasibility, and ethnoscience feasibility, each obtained a score of 100% with a very feasible category. This shows that the presentation of the material in the module is very clear, systematic, and supports the student learning process. The graphic aspect or the appearance of the module is also considered very good by the teacher so that it supports the clarity of the content and the interest in the students. Meanwhile, the feasibility of ethnoscience shows that the integration of local wisdom values in the module is very good and relevant to help students understand the material in the context of daily life. Based on this description, it can be concluded that the science module based on the ethnoscience of the brick center that was developed is very suitable for use in the learning process at school. These results show that science teachers consider the modules to be not only effective in supporting learning, but also feasible to be used more widely to improve the quality of science learning based on local wisdom.

It is hoped that the results of this limited trial can provide a clear picture of the advantages and disadvantages of the module, so that the science module based on the ethnoscience of the brick center developed can make a positive contribution to improving the quality of science learning in schools. Thus, the modules developed are not only teaching materials, but also a means to introduce local culture and local wisdom to students, especially in the context of science learning (Mailani et al., 2024). After the limited trial was carried out, the next was the submission of a science module based on ethnoscience of the brick center developed to science teachers to be used at MTs NU Nurul Huda Kedungdowo Kaliwungu Kudus.

A similar research was conducted by Siagian & Tamba, namely the development of ethnoscience-based science modules on energy source materials. Based on this research and development, the modules developed are very feasible to be used as a learning resource in the form of teaching materials (Siagian & Tamba, 2023). Furthermore, the research conducted by Nailiyah et al., stated that the thematic science module based on ethnoscience in Jember Regency on the theme of tobacco cultivation in junior high schools is valid instructionally and technically (Nailiyah et al., 2016). Based on similar research that has been conducted, it can be concluded that the development of ethnoscience-based science modules is valid and feasible to be used in the science learning process.

D. CONCLUSION AND SUGESTION

This research succeeded in developing an ethnoscience-based science module with the theme of material on changes in the form of substances that is integrated with the local wisdom of the brick center in Prambatan Kaliwungu. The module development process is carried out through a 4D model which is then modified by the researcher into 3 stages, namely define, design, and develop. The results of validation by media experts and material experts show that the module has a high level of validity with input from experts that has been used as the basis for revision. A limited trial of 22 students of grade VII D MTs NU Nurul Huda showed that the module obtained a very feasible category with an average score of 88.00%. The results of the responses of science teachers at MTs also support the feasibility of the module with an average score of 97.5% which is included in the very feasible category. Based on the results of the module development that has been carried out, this module is expected to help students understand the concept of changes in the state of matter through learning experiences that are relevant to everyday life while simultaneously fostering a love for local culture and wisdom. Therefore, the science module based on the ethnoscience of the brick center is very suitable for use as teaching material in schools, especially in learning science on material on the change in the form of substances.

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REFERENCES

Agus, P., Dwipayana, P., Redhana, W., & Prima Juniartina, P. (2020). Analisis Kebutuhan Pengembangan Multimedia Interaktif Berbasis Konteks Budaya Lokal untuk Pembelajaran IPA SMP. *Jurnal Pendidikan Dan Pembelajaran Sains Indonesia (JPPSI)*, *3*(1), 49–60. https://doi.org/10.23887/JPPSI.V3I1.24628

Amali, K., & Kurniawati, Y. (2019). Pengembangan Lembar Kerja Peserta Didik Berbasis Sains Teknologi Masyarakat pada Mata Pelajaran IPA di Sekolah Dasar. *JNSI: Journal of Natural Science and Integration*, *2*(2), 191–202.

Cahyani, C. W., Djudin, T., & Tanjungpura, U. (2024). Pembelajaran IPA Berbasis Lingkungan untuk Siswa Sekolah Dasar : Sebuah Kajian Literatur. *Jurnal Pendidikan Dasar Perkhasa*, *10*(2), 1102–1116.

Gregory, A., Cornell, D., & Fan, X. (2011). The Relationship of School Structure and Support to Suspension Rates for Black and White High School Students. *American Educational Research Journal*, *48*(4), 904–934. https://doi.org/10.3102/0002831211398531

Hidayati, D. (2016). Memudarnya Nilai Kearifan Lokal Masyarakat dalam Pengelolaan Sumber Daya Air. *Jurnal Kependudukan Indonesia*, *11*(1). https://ejournal.brin.go.id/jki/article/view/11279

Indaryanti, R. B., Harsono, H., Sutama, S., Murtiyasa, B., & Soemardjoko, B. (2025). 4D Research and Development Model: Trends, Challenges, and Opportunities Review. *Jurnal Kajian Ilmiah*, *25*(1), 91–98. https://doi.org/10.31599/NA7DEQ07

Larasati, F., & Syamsurizal, S. (2022). Validitas Instrumen Tes Keterampilan Berpikir Kritis Peserta Didik Kelas XII SMA/MA tentang Materi Mutasi. *Journal on Teacher Education*, *4*(1), 365–372. https://doi.org/10.31004/JOTE.V4I1.6073

Mailani, E., Saragih, D. I., Lubis, F. P., Siregar, N. B., Putri, S., Angel, R., & Simanjuntak, S. (2024). Penerapan Kearifan Lokal Samosir dalam Mengeksplorasi Bentuk-Bentuk Geometri. *Indo-MathEdu Intellectuals Journal*, *5*(5), 5684–5697.

Muamanah, S., Rahmatiani, L., & Firmansyah, Y. (2024). Hambatan Penguatan Nilai Kearifan Lokal Melalui Kurikulum Jabar Masagi dalam Membentuk Sikap Berkebhinekaan Siswa. *Jurnal Pendidikan Pancasila & Kewarganegaraan*, *09*(02), 496–500.

Nailiyah, M. R., Subiki, S., & Wahyuni, S. (2016). Pengembangan Modul IPA Tematik Berbasis Etnosains Kabupaten Jember Pada Tema Budidaya Tanaman Tembakau Di SMP. *Jurnal Pembelajaran Fisika Universitas Jember*, *5*(3), 261–269. https://www.neliti.com/id/publications/116943/

Ni'mah, S. N., & Noor, F. M. (2023). Development of Ethnoscience-Based Science Learning Module Oriented Science Process Skills of Students. *Journal of Insan Mulia Education*, *1*(1), 1–10. https://doi.org/10.59923/joinme.v1i1.3

Oktavianti, S., Oktaviana, A., & Susanti, S. S. (2023). Penerapan SCL (Student Centered Learning) pada Mahasiswa Prodi PIAUD STAI Darussalam Lampung. *Azzahra: Jurnal Pendidikan Anak Usia Dini*, *5*(1), 34–56. https://staidarussalamlampung.ac.id/ejournal/index.php/azzahra/article/view/521

Panggabean, F., Simanjuntak, M. P., Florenza, M., Sinaga, L., & Rahmadani, S. (2021). Analisis Peran Media Video Pembelajaran dalam Meningkatkan Hasil Belajar IPA SMP [Analysis of the Role of Learning Video Media in Improving Middle School Science Learning Outcomes]. *Jurnal Pendidikan Pembelajaran IPA Indonesia (JPPIPA)*, *2*(1), 7–12.

Purwanto, N. (2020). *Prinsip - Prinsip dan Teknik Evaluasi Pengajaran* (16th ed.). PT REMAJA ROSDAKARYA.

Putra, D. D., Okilanda, A., Arisman, A., Lanos, M. E. C., Putri, S. A. R., Fajar, M., Lestari, H., & Wanto, S. (2020). Kupas Tuntas Penelitian Pengembangan Model Borg & Gall. *Wahana Dedikasi: Jurnal PkM Ilmu Kependidikan*, *3*(1), 46–55. https://doi.org/10.31851/DEDIKASI.V3I1.5340

Rahmatih, A. N., Maulyda, M. A., & Syazali, M. (2020). Refleksi Nilai Kearifan Lokal (Local Wisdom) dalam Pembelajaran Sains Sekolah Dasar: Literature Review. *Jurnal Pijar Mipa*, *15*(2), 151–156. https://doi.org/10.29303/JPM.V15I2.1663

Rahmawati, S., Paradia, P. A., & Noor, F. M. (2021). Meta Analisis Media Pembelajaran Ipa Smp/Mts Berbasis Virtual Reality. *OPTIKA: Jurnal Pendidikan Fisika*, *5*(1), 12–25. https://doi.org/10.37478/optika.v5i1.752

Ramlah, S., & Julyyanti, Y. (2025). Pandangan Guru Terhadap Integrasi Kearifan Lokal dalam Pembelajaran : Studi Deskriptif pada Tingkat SMA.

Didaktika:Jurnal Kependidikan, *14*(1), 111–122.

Santika, A. A., Saragih, T. H., & Muliadi, M. (2023). Penerapan Skala Likert pada Klasifikasi Tingkat Kepuasan Pelanggan Agen Brilink Menggunakan Random Forest. *JUSTIN (Jurnal Sistem Dan Teknologi Informasi)*, *11*(3), 405–411. https://doi.org/10.26418/JUSTIN.V11I3.62086

Setemen, K. (2018). Pengembangan Dan Pengujian Validitas Butir Instrumen Kecerdasan Logis-Matematis. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *15*(2), 178–187. https://doi.org/10.23887/jptk-undiksha.v15i2.14197

Setiawan, R., Syahria, N., Andanty, F. D., & Nabhan, S. (2022). Pengembangan Modul Ajar Kurikulum Merdeka Mata Pelajaran Bahasa Inggris SMK Kota Surabaya. *Jurnal Gramaswara: Jurnal Pengabdian Kepada Masyarakat*, *2*(2), 49–62. https://doi.org/10.21776/UB.GRAMASWARA.2022.002.02.05

Siagian, I. R., & Tamba, R. (2023). Pengembangan Modul IPA Berbasis Etnosains pada Materi Sumber Energi untuk Meningkatkan Literasi Siswa Sekolah Dasar. *Pascal: Journal of Physics and Science Learning*, *7*(2), 67–74. https://doi.org/10.30743/PASCAL.V7I2.8541

Sugiyono. (2013). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (19th ed.). Alfabeta.

Sumiati, T., Wachid, N., & Majid, A. (2020). Penanaman Nilai Kearifan Lokal dalam Pembelajaran Calon Guru di LPTK Purwakarta. *Jurnal Pendidikan Dasar Dan Pembelajaran*, *10*(1). https://doi.org/10.25273/pe.v10i1.5333

Suryani dan Mirnawati. (2019). Analisis Faktor Penyebab Kurangnya Minat Belajar Siswa di Era Digital. *Jurnal Pendidikan Dan Pembelajaran*, *8*(2), 45–56.

Susilawati, S. (2025). Peran Bahan Ajar , Media dan Sumber Belajar : Kunci Sukses dalam Pembelajaran Pendidikan Agama Islam. *At-Thullab Jurnal*, 1–21.

Thiagarajan, S. (1920). Instructional Development for Training Teachers of Exceptional Children: A Sourcebook. In *Indiana University Bloomington, Indiana* (Issue Mc).

Wulandari, T. R., Wahyuni, S., & Suparti. (2024). Efektivitas E-modul Berbasis Problem Based Learning dalam Keterampilan Berpikir Kritis Materi Bangun Datar. *Kalam Cendekia: Jurnal Ilmiah Kependidikan*, *12*(2). https://jurnal.uns.ac.id/jkc/article/view/87482

Yanti, N. K. M., Pujani, N. M., & Juniartina, P. P. (2023). Pengembangan Modul IPA Terpadu Berbasis Problem Based Learning dengan Tema Jajanan. *Jurnal Pendidikan Dan Pembelajaran Sains Indonesia (JPPSI)*, *6*(1), 55–66. https://doi.org/10.33650/EDURELIGIA.V2I2.459