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## **Ethnopedagogy E-Module Development to Accommodate the Diversity of PGMI Students' Learning Styles**

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**Abstract.** PGMI students need to study Ethno pedagogy as a concrete effort to foster cultural and civic literacy in schools. The variety of student learning styles results in the learning process needs of each student being different. This study aims to develop ethno pedagogy e-modules that can accommodate the diversity of PGMI students' learning styles. The development uses the Research and Development (R&D) method with the ADDIE model, involving 40 PGMI students in the 5th semester consisting of 10 students for limited trials and 30 for field trials. Learning style analysis shows a distribution of 45% visual, 30% auditory, and 25% kinesthetic. The validation results from material, media, and ethno-pedagogy experts show an excellent feasibility level, with an average score after revision reaching 3.80 (95%). The implementation of e-modules resulted in increased learning outcomes that varied based on learning styles: visual (32.5%), auditory (28.7%), and kinesthetic (27.6%), with an average total increase of 29.6%. Students' responses to the implementation of e-modules were very positive, with an average of 92.4%, covering aspects of content interest, understanding of the material, suitability of learning styles, relevance of cultural values, and learning motivation. The paired t-test showed a significant difference between the pre-test and post-test ( $t\text{-count} = 8.45 > t\text{-table} = 2.03$ ) at a significance level of 5%. The results of the study prove that e-module Ethno pedagogy effectively accommodates the diversity of learning styles, improves the learning outcomes of PGMI students, and successfully integrates local wisdom values in digital learning.

**Keywords:** Ethno pedagogy; e-modules; learning styles; local wisdom; digital learning media

### **INTRODUCTION**

The rapid development of digital technology, especially after the Covid-19 pandemic, has given rise to various challenges and opportunities in the education system in Indonesia, including in the realm of higher education (Maharani & Putra, 2023). Face-to-face (offline) learning is now changing towards digital technology-based learning presented online (online) or hybrid (Khairi et al., 2022). This change cannot be avoided in the higher education system. In the scope of the education of prospective elementary school teachers (PGMI), changes in the learning system need to consider more complex aspects, one of which is the integration of local wisdom values in learning (Ethno pedagogy). PGMI students need skills in integrating local wisdom values into their learning. Integrated local wisdom values in learning can help create the nation's next generation that is dignified and has a complete Pancasila character (Nadlir, 2014).

Integrating local wisdom values can be achieved by optimizing digital learning needs that accommodate various student learning styles. Therefore, learning resources are needed that can act as a medium for conveying messages that help with differences in physical limitations, sensory limitations, and various learning styles (Suci et al., 2020).

Ethno pedagogy is a learning approach that integrates local cultural values into learning and the educational process and recognizes that local culture and potential are essential resources in learning (Wardani et al., 2024). This approach plays a role in shaping the character and competence of students in integrating cultural values with learning that will be taught later. Integration and transformation of culture in the younger generation are essential to be applied in school learning (Rahayu et al., 2021). Integrating cultural values and local wisdom in this educational process is based on the Pancasila Student Profile in the Local Wisdom dimension. Understanding local wisdom can encourage students to behave and act according to Pancasila values and not be easily influenced by foreign cultures (Nurasiah et al., 2022). In addition to the urgency of ethno-pedagogy, the variety of learning styles of PGMI students (visual, kinesthetic, auditory) requires an adaptive and inclusive learning approach to accommodate all learning styles.

Based on the learning style questionnaire results conducted before the study, data showed that 45% of PGMI students have a visual learning style, 30% auditory, and 25% kinesthetic. Learning dominated by lectures and monotonous assignments tends only partially to accommodate the variety of student learning styles. Teaching materials that are heavy-text, assignments in writing papers, and presentations are considered less interactive, so they could be more optimal in meeting the needs of diverse student learning styles. The development of educational technology, namely the preparation of e-modules that provide a variety of activities for students, can be a more adaptive learning solution. E-modules can help integrate various learning content formats like text, images, and videos (Kumalasan & Eilmelda, 2022). In addition to the learning content format, e-modules can be a reference for integrating ethnopedagogical values in an attractive and easily accessible digital format. This study is based on previous research relevant to ethnopedagogy. Ethno pedagogy, or the integration between culture and specific fields of science, is still a problematic study for teachers. Teachers have difficulty connecting science fields, for example, mathematics with culture or the contribution of mathematics to various cultural systems (Mariana et al., 2023). The difficulties experienced by teachers in understanding ethnopedagogy can be caused by several factors, namely: 1) knowledge of ethnopedagogy is still lacking; 2) the ability to connect culture with learning is still lacking; and 3) the application of ethnopedagogy in schools is very lacking (Andayani et al., 2022). The results of this study are based on the initial observations made by the researcher, namely that students have difficulty integrating competencies with local wisdom/culture (65%) and do not understand the concept of ethnopedagogy (55%).

Ethnopedagogy-based modules have been developed at various levels of educational units. Some of these Ethno pedagogy modules include: 1) an ethnoSTEM-based e-module assisted by Canva integrated with the Gorang Sambilan musical instrument which can improve the communication skills of students at MTsN 1 Model Padangsidempuan; and 2) a biodiversity module with a local wisdom and cultural

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approach for students in Purworejo Regency, with module characteristics that are by 21st-century skills, prioritize tolerance, contain literacy components, and are student-centered learning (Adinugraha & Ratnapuri, 2020; Inayah et al., 2022). These modules are designed so that students can connect culture with certain subjects. However, some teachers need help integrating culture and certain subjects (Mariana et al., 2023). The difficulties experienced by teachers are used as material for improvement, so ethno-pedagogy is considered important for teaching students. Several types of Ethno pedagogy modules are designed to help improve student understanding. The development of textbooks through integrative themes based on ethnopedagogical studies is designed to improve competencies to support the profile of UNESA PGSD students. This textbook presents cross-field study material based on ethno-pedagogy to enrich textbooks at the tertiary level (Gunansyah et al., 2018). Research related to ethnopedagogy for students still needs to be improved, while research related to developing ethnopedagogy modules is almost nonexistent. Some of these studies include: 1) The aspects of knowledge and implementation of the concept of ethnopedagogy for UPI PGSD students are included in the high category, namely 74% and 73%; and 2) As many as 65.6% of UNSIQ PGMI students know about ethnopedagogy but do not understand how to apply Ethno pedagogy in learning (Alditia & Wahyudin, 2024; Fajar et al., 2023). Among these studies, no Ethno pedagogy module is intended for students, especially PGMI students. The existing modules are considered to pay less attention to learning styles, so there needs to be module development by considering the learning styles of each student. Modules for students are also still minimal; most are modules for elementary to high school students.

Based on this research, there needs to be more development of e-modules designed explicitly for PGMI study programs by considering aspects of Ethno pedagogy and diversity of learning styles. These gaps include 1) minimal integration of local wisdom values in digital learning content; 2) student worksheets that are limited in accommodating various learning styles; and 3) variations in e-module content formats limited to text only. Therefore, developing Ethno pedagogy e-modules that accommodate the diversity of PGMI students' learning styles is necessary. This development is expected to solve the gap between the need for the digital transformation of education and the preservation of local wisdom values while facilitating a more effective learning process for students with various learning styles. The objectives of this study include: 1) producing ethnopedagogy e-modules that can accommodate a variety of student learning styles through variations in student worksheets; 2) testing the feasibility of the developed ethnopedagogy-based e-module; and 3) analyzing the effectiveness of ethnopedagogy e-module in improving the learning outcomes of PGMI students.

## **METHOD**

This study uses a Research and Development (R&D) approach with the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model. The ADDIE model was selected based on its suitability with the research objectives, namely the development of Ethno pedagogy e-modules that can meet the needs of students'

learning styles. This model comprises five systematic and comprehensive stages in developing digital learning products.

The research steps include the analysis, design, development, implementation, and evaluation stages. At the analysis stage, the identification of student needs related to learning styles is carried out through the VAK (Visual, Auditory, Kinesthetic) questionnaire. In addition to identifying student learning styles, an analysis of needs and material content related to cultural values that can be integrated into learning is also carried out. At the design stage, content design is carried out, which consists of mapping teaching materials according to the PGMI curriculum, designing variations in content formats, and designing variations in student worksheets. The development stage consists of two phases. The first phase is developing multimedia content (text, images, videos), integrating interactive student worksheets, and developing an assessment system. The second phase is validation, which involves two expert validators: material experts and learning media experts. The criteria used by material experts are: 1) the accuracy of the ethnopedagogy concept; 2) suitability to the local cultural context; 3) integration of local wisdom values; 4) relevance of examples to ethnopedagogy practices; and 5) potential implementation in learning. Meanwhile, the criteria for media experts include 1) content suitability, 2) presentation suitability, 3) language suitability, and 4) graphic aspects. Input from the validators is used as the basis for product revision. The product implementation stage is carried out through two trial stages. Limited trials are carried out on small groups of 10 students to obtain feedback for initial revisions.

Furthermore, field trials are carried out in one class consisting of 30 students to obtain more comprehensive data, followed by the final product revision process. The evaluation stage is carried out formatively and summatively. Formative evaluation occurs during development by analyzing feedback from each stage and revising the product. Summative evaluation is carried out to assess the effectiveness of the final product, analyze the influence of e-module Ethno pedagogy, and evaluate student responses. The results of this evaluation are the basis for product refinement and recommendations for further development. The research subjects were PGMI semester 5 students who were determined through purposive sampling techniques (Sugiyono, 2019). The sample consisted of 10 students for limited trials and 30 for field trials. The selection of subjects considered the representation of various learning styles and levels of academic ability. Data collection used several validated instruments, including expert validation sheets (materials and media), VAK questionnaires, learning observation sheets, student response questionnaires, and student performance assessments. These instruments were developed based on theoretical studies and expert validation to ensure their feasibility. Data analysis was carried out qualitatively and quantitatively. Qualitative analysis includes data reduction, data presentation, conclusion, and analysis of validator input. Meanwhile, the quantitative analysis includes an analysis of the effectiveness of the e-module Ethno pedagogy by comparing the pre-test and post-test results.

Product feasibility is determined based on three criteria, namely: 1) Validity score of at least 70% maximum score from the assessment of each validator; 2) practicality

criteria of at least 75% of students give positive responses; and 3) effectiveness criteria of at least 70% of students achieve KKM, namely a score of 70.

## RESULTS AND DISCUSSION

### Product Development Results

Ethno pedagogy e-module is a digital learning development product that integrates local wisdom values by considering students' learning styles through variations in content formats and student worksheets. The Ethno pedagogy e-module product is explained in Figure 1. as follows.

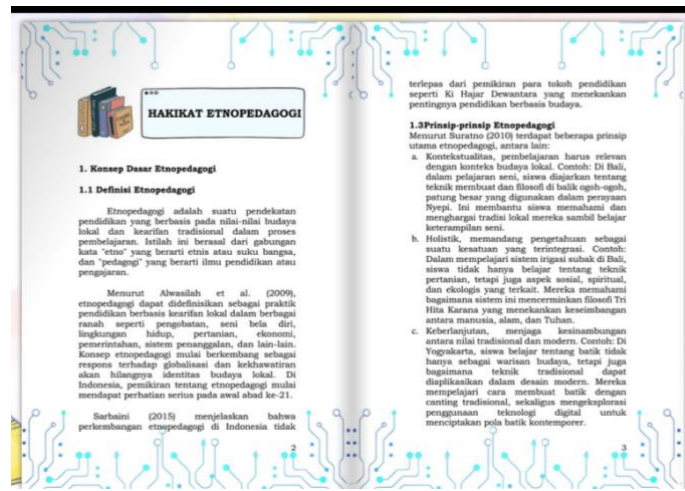


Figure 1. Materials Related to Ethnopedagogy

The beginning of each chapter consists of materials presented as text or images. In addition to the materials, there are other Ethno pedagogy e-module components such as summaries, cultural materials in the form of videos, student worksheets, exercises, answer keys, and bibliographies. The student worksheets consist of learning activities that vary according to three learning styles: auditory, visual, and kinesthetic. The variation of the worksheets is expected to attract interest and improve student learning outcomes. Other components are explained in Figure 2. as follows.

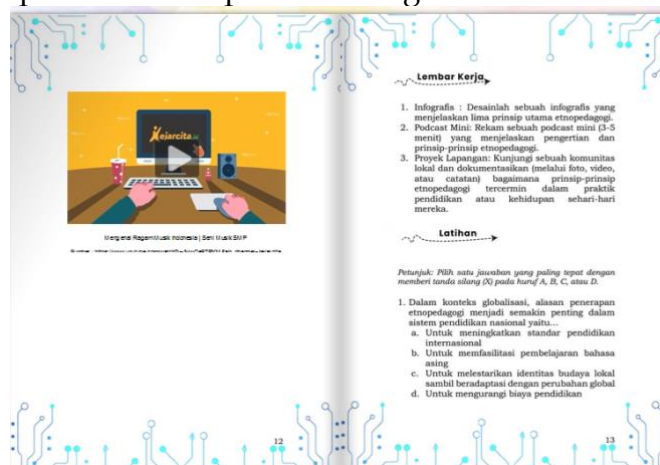


Figure 2. Components of Video, Student Worksheets, and Exercises

Product development follows the ADDIE model, which produces important findings in each stage. These findings are explained in Table 1.

Table 1. Important Findings in Each Stage

No	Findings	Stage
1.	Analysis Stage	The results of the VAK questionnaire completed by 30 PGMI students showed a diverse distribution of learning styles: 45% have a visual learning style, 30% auditory, and 25% kinesthetic. The needs analysis showed that 85% of students need digital modules that can be accessed flexibly, are fascinating, and can foster enjoyable learning.
2.	Design Stage	Ethnopedagogy is one of the Integrative Thematic Learning course's achievements. Ethno pedagogy e-modules can be designed with various content formats, containing educational practice studies and variations in student worksheets.
3.	Development Stage	a. Variations in content formats include text, images, and videos. b. Educational practice studies include steps for implementing the integration of cultural values in learning in MI/SD and examples of learning implementation designs c. Variations in student worksheets include different assignments, adjusted to the learning style of each student
4.	Implementation Stage	a. Limited trial stage. At this stage, there were several inputs, namely the addition of contextual examples (53% of respondents) and the addition of interactive worksheets (40% of respondents) b. Field trial stage. At this stage, there were several findings, namely that ease of access and flexibility of study time were highly appreciated by students, and variations in worksheets helped students understand the material according to their respective learning styles
5.	Evaluation Stage	a. The limited trial stage showed an increase in learning completeness of 27.2%, and 85.2% of students gave a positive response to the application of the e-module Ethno pedagogy b. The field trial stage showed an increase in learning completeness of 29.6%, and 92.4% of students responded positively.

The Ethno pedagogy e-module product was validated by two validator experts, material experts, and media experts. The validation results showed an excellent feasibility level, with an average score from material experts of 3.75 (93.75%) and media experts of 3.65 (91.25%). The validators provided several constructive inputs for product improvement, including: 1) adding a glossary of cultural terms to clarify the integrated local wisdom concepts; 2) improving the audio quality of learning podcasts to accommodate auditory learning styles; and 3) simplifying the user interface to improve accessibility and ease of navigation. After revisions were made based on these inputs, the validation score increased in the second validation test, with an overall average reaching 3.80 (95%). This indicates that the developed Ethno pedagogy e-module has met the feasibility standards in terms of material, media, and integration of local wisdom values and is ready to be implemented in learning.

## Product Trial Results

### A. Limited Trial Results

The limited trial involved ten students selected by purposive sampling considering the diversity of learning styles: four visual students, three auditory students, and three kinesthetic students. During the trial, students used the ethno-pedagogy e-module to learn the Integrative Thematic Learning course, which contains ethno-pedagogy achievements. Table 2 explains the assessment of the product's practicality in the limited trial.

Table 2. The Assessment of The Product's Practicality in The Limited Trial

Assessment Aspect	Average Score	Percentage	Category
Ease of Use	3.4	85%	Very Good
Readability	3.5	87.5%	Very Good
Display Quality	3.3	82.5%	Very Good
Ease of Navigation	3.4	85%	Very Good
Media Quality	3.3	82.5%	Very Good
Average Total	3.38	84.5%	Very Good

In addition to the practicality assessment, student performance assessment was also carried out in the form of skills in compiling ethno-pedagogy-based learning plans. The results of the pre-test and post-test in the limited trial are shown in Table 3.

Table 3. The Results of The Pre-Test and Post-Test in The Limited Trial

Aspect	Pre-test	Post-test	Improvement
Average Score	64.7	82.3	27.2%
Highest Score	78	95	-
Lowest Score	52	75	-
Learning Completeness	40%	86.7%	46.7%

Implementing the ethno-pedagogy e-module can improve students' skills in compiling ethno-pedagogy learning plans by up to 27.2%. The module contains applicable examples, helping students create teaching materials, LKS, and integrated evaluations of cultural values . Meanwhile, the results of the student response questionnaire on the ethno-pedagogy e-module are shown in Table 4.

Table 4. The Results of The Student Response Questionnaire

<b>Response Aspect</b>	<b>Percentage Positive</b>
Interest in content	86.7%
Understanding of material	83.3%
Suitability to learning style	85.3%
Relevance of cultural values	88%
Learning motivation	82.7%
<b>Average</b>	<b>85.2%</b>

#### B. Field Trial Results

The field trial involved 30 PGMI semester 5 students, comprising 15 visual students, nine auditory students, and six kinesthetic students. Implementation was carried out after revision based on the limited trial results. The practicality assessment data in the field trial are explained in Table 5.

Table 5. The Practicality Assessment Data in The Field Trial

<b>Assessment Aspect</b>	<b>Average Score</b>	<b>Percentage</b>	<b>Category</b>
Ease of Use	3.7	92.5%	Very Good
Readability	3.8	95%	Very Good
Display Quality	3.6	90%	Very Good
Ease of Navigation	3.7	92.5%	Very Good
Media Quality	3.6	90%	Very Good
Average Total	3.68	92%	Very Good

Calculating the improvement of student learning outcomes according to learning styles can reveal this. The results of learning outcomes based on learning styles are explained in Table 6.

Table 6. The Results of Learning Outcomes Based on Learning Styles

<b>Learning Style</b>	<b>Pre-test</b>	<b>Post-test</b>	<b>Improvement</b>
Visual	66.3	87.8	32.5%
Auditory	65.5	84.3	28.7%
Kinesthetic	65.7	83.8	27.6%
Total Average	65.8	85.3	29.6%

The results of the Paired t-test show a t-count score = 8.45, a t table = 2.03, and a significance level of 5%. Thus, it can be concluded that there is a significant difference



between the pre-test and post-test, meaning that the e-module ethno pedagogy is effectively applied in the Integrative Thematic Learning course. Meanwhile, the results of the response questionnaire after the revision are shown in Table 7.

Table 7. The Results of The Student Response Questionnaire

<b>Response Aspect</b>	<b>Percentage Positive</b>
Interest in content	93.5%
Understanding of material	91.2%
Suitability to learning style	92.8%
Relevance of cultural values	94.3%
Learning motivation	90.4%
Average	92.4%

### **Product Development Aspects**

A systematic approach through the ADDIE model consisting of 5 stages makes the ethnopedagogical structure of the e-module more systematic and to student needs. The preparation of ethnopedagogical e-modules is more targeted to help realize meaningful learning for students according to various learning styles. Needs analysis is necessary to develop digital learning media (Fatimah et al., 2021). Ideally, teaching materials/materials are presented based on theory and needs. Modules within the university scope are used as learning guides for students, and they are systematically arranged so that they can help students when attending lectures (Budiarti & Riwanto, 2021). E-modules are alternative modules with a more attractive appearance than printed modules. E-modules are digitally presented modules containing text, images, or simulations that meet the eligibility requirements for application in learning (Herawati & Muhtadi, 2018). E-modules have several advantages, including: 1) presenting problem orientation to students; 2) organizing students to learn; 3) providing individual and group guidance; and 4) presenting an evaluation of the problem-solving process (Sugihartini & Jayanta, 2017).

The study of educational practices in e-module ethnopedagogy is an innovation that provides significant added value. The steps for preparing systematic learning plans help students realize contextual and meaningful social interaction-based learning. Social interaction in this learning is by Vygotsky's social constructivism learning theory (Supardan, 2016). The use of local cultural examples in learning not only improves conceptual understanding but also strengthens students' cultural identity. Integration of cultural values in learning is a significant effort to strengthen local cultural resilience to overcome globalization's flow (Santoso & Wuryandani, 2020). Integrating culture into teaching materials is also used to minimize lost self-identity through education, which reveals the potential strengths within humans (Alwasilah et al., 2009). The culture used in education can adopt local wisdom, such as martial arts, medicine, agriculture, and so on, as a basis for education (Kurniawan & Suryani, 2018).

### **Accommodation Aspect of Learning Style**

Students tend to prefer varied learning according to each individual's learning style (Wahyuni, 2017). Ideally, all students can be facilitated to learn effectively with their

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respective learning styles. Learning characteristics that are by each learning style include: 1) visual: information is readily accepted through diagrams, symbols, colored images, and concept maps; 2) auditory: information needs to be conveyed repeatedly and needs to involve music in learning; and 3) kinesthetic: prefer applied project assignments or activities with physical activity (Sari, 2014)

The Ethno pedagogy e-module accommodates various learning styles so that each student gets the same opportunity to learn meaningfully. This can be seen from the results of positive responses given by students, namely 92.4%. The availability of various applied student worksheets, including visual, auditory, and kinesthetic element worksheets, has proven effective in facilitating different learning styles. These findings support research on the effectiveness of multimodal learning in higher education (Firmansyah & Suchaina, 2023). Further analysis showed that students with visual learning styles showed the highest increase in learning outcomes (32.5%), followed by auditory (28.7%) and kinesthetic (27.6%) learners. This difference shows that although the e-module Ethno pedagogy has succeeded in accommodating various learning styles, there is still a need for improvement for other learning styles, such as auditory and kinesthetic.

### **Learning Effectiveness Aspect**

The effectiveness of e-module Ethno pedagogy is shown by a significant increase in learning outcomes (in performance assessments) of 29.6%. Factors that influence the effectiveness of e-module Ethno pedagogy include the following.

1. Personalization of learning experiences through accommodation of individual learning styles. Visual students (45%) can learn optimally through student worksheets with interactive infographics and mind-mapping assignments. Auditory students (30%) can learn through student worksheets with assignments in podcasts or interactive dialogues. Kinesthetic students (25%) can learn through simulations of culture-based practices and interactive digital projects that encourage experiential learning
2. Integrating cultural values can increase the relevance and engagement of learning. Concrete examples of local wisdom and contextualization in teaching materials and the application of cultural values in assignments can help increase awareness and appreciation of local culture.
3. Accessibility and flexibility allow independent learning so that students are free to choose materials and adjust the pace of learning according to their individual needs.

The application of e-module Ethno pedagogy that accommodates all student learning styles is in accordance with the Student-Centered Learning (SCL) approach, which is indeed recommended for the higher education system based on the mandate of SN-Dikti article 14, lectures. According to Weimer, there are five principles of SCL, namely: 1) increasing active student participation in learning; 2) lecturers no longer take the leading role but act as facilitators; 3) stimulating critical thinking; 4) help construct student knowledge as well as an arena for reflection (strengths and weaknesses); and 5) assessments are motivating and informative (Dirjen Dikti Kemendikbud, 2020). Although

not the primary source, lecturers still have an essential role, including facilitating students in the learning process and providing various learning experiences that students need to achieve the competencies required by the course (Sailah, 2014). E-module Ethno pedagogy can help increase active student participation while facilitating students with various learning experiences needed to achieve competencies. The study's results stated that students with a visual style need images and colors, and students with an auditory style focus more on activities that produce sound. In contrast, kinesthetic students prefer activities with physical activity (Yogica & Rahmadhani, 2016). Images and colors are presented in the e-module material and activities that produce a sound focus on materials contained in video form. In contrast, activities that involve physical activity appear in student worksheets. The implications of implementing ethnopedagogy e-modules include: 1) ethnopedagogy e-modules can be adapted for the development of digital teaching materials in other courses or study programs with similar characteristics; and 2) the integration of cultural values in digital learning has proven effective and can be expanded in its implementation. Some recommendations for further development include 1) adding interactive online collaboration and discussion features; 2) developing more comprehensive kinesthetic content; and 3) adding more interactive Ethno pedagogy e-module features, such as online discussion features, and so on.

## CONCLUSION

The development of Ethnopedagogy e-modules for students has proven effective in accommodating a variety of student learning styles. The percentage of student learning styles is 45% visual, 30% auditory, and 25% kinesthetic. The product validation results show an excellent feasibility level, with a score from material experts of 3.75 (93.75%) and media experts of 3.65 (91.25%). After revision, the average validation score increased to 3.80 (95%), indicating good product quality. E-module Ethno pedagogy has proven effective in improving student learning outcomes with varying increases based on learning styles. Students with visual learning styles showed the highest increase of 32.5%, followed by auditory learning styles at 28.7% and kinesthetic at 27.6%, with an average total increase reaching 29.6%. Student responses to the implementation of e-modules were also very positive, with an average of 92.4%, covering aspects of content interest, understanding of the material, suitability of learning styles, relevance of cultural values, and learning motivation. Based on the results of the study, there are several suggestions for product development, namely: 1) development of more comprehensive kinesthetic learning content; 2) expansion of the scope of ethnopedagogical values from various regions, and 3) training needed for lecturers to optimize the use of e-modules.

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