Enhancing Elementary Students' Interest in Physical Geography: The Development of BENAPRO PBL-Based Interactive E-Module

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Abstract: The challenge in teaching Natural and Social Sciences (IPAS) in elementary schools often lies in the difficulty of visualizing abstract concepts, particularly regarding landscape diversity and its relationship to community professions. Preliminary observations at Dadaprejo 01 Public Elementary School revealed a critical issue: fourth-grade students exhibited low engagement, characterized by a lack of focus and visible boredom during conventional lessons that relied heavily on static worksheets. Consequently, this study aims to develop the "BENAPRO" (*Bentang Alam dan Profesi*) e-module, designed to meet the criteria of validity, practicality, and effectiveness, specifically to increase students' interest in learning. This research employs a Research and Development (R&D) approach based on the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The subjects in the field trial were 18 fourth-grade students. Data collection instruments included expert validation sheets, teacher and student response questionnaires using a Likert scale, and pre-test/post-test questionnaires to measure learning interest. The data were analyzed both descriptively and quantitatively. The results show that the e-module is "highly valid," with material experts providing an average score of 86% and product experts rating it at 96%. Practicality tests demonstrated excellent reception, with educators rating the module at 97.9% and students at 98.6%, citing the module's interactive features and ease of use. Crucially, the effectiveness test showed a significant surge in student interest, indicated by an N-Gain score of 0.82, which falls into the "High" category. It is concluded that the BENAPRO e-module is a valid, practical, and effective tool. By integrating Problem-Based Learning syntax with contextual visualization, this innovation effectively transforms passive learning into active engagement, making it a suitable alternative to the Independent Curriculum.

Keywords: e-modules, natural and social sciences, diversity of landscapes and community professions, learning interests.

◼ INTRODUCTION

In the age of globalization and rapid technological progress, 21st-century education is crucial. 21st-century learning is characterized by a shift from teacher-centered to student-centered learning, in which students are expected to possess 21st-century skills (Bhardwaj et al., 2025; Selamat, 2023). This education focuses on equipping students with 21st-century competencies, namely problem-solving skills, improved collaboration, honed creativity, and strengthened communication and critical thinking skills, so that students are ready to face the challenges of the digital age. 21st-century skills are known as the 4Cs, namely Critical Thinking, Communication, Collaboration, and Creativity (Laar et al., 2020; Supena et al., 2021; Thornhill-Miller et al., 2023). In addition, 21st-century education requires a transformation of learning that focuses not only on content mastery but also on critical thinking and digital literacy skills. Consequently, incorporating technology into the educational process is essential for fostering an engaged and significant learning experience. This

aligns with the statement by Wekerle et al. (2022) and Yayuk et al. (2025) that technological developments can create opportunities to facilitate more interactive and enjoyable learning. The independent curriculum is a response to overcome the challenges of education in the 21st century, which demands the development of 4C skills in students. The independent curriculum emphasizes the use of digital technology in the learning process, with a student-centered approach (Amiruddin et al., 2023; Fitriyah & Wardani, 2022). Nonetheless, digital change in the education sector, particularly at the elementary school level, faces significant obstacles.

Natural and social sciences, or IPAS, constitute local material integrated into the independent curriculum delivered in elementary schools. Learning in the natural and social sciences is designed to equip students to recognize, understand, and relate to various natural and social phenomena in their environment (Jadallah & Ballard, 2021; Pertiwi et al., 2023). Through this learning, students are expected to think critically and to be concerned about the relationship between humans and their environment. One of the essential subjects in natural and social sciences is the subject of various landscapes and their relationship with community professions. This subject plays a necessary role in helping students understand why each region has different geographical characteristics and how these conditions affect the types of work its inhabitants perform. However, in practice, the learning process for this material is still often conducted conventionally, relying on textbooks and student worksheets. This method tends to be one-sided, providing little space for students to explore and visualize geographical concepts in concrete terms. The main challenge today is integrating technology into learning to bridge abstract ideas into concrete learning experiences that spark students' interest.

Although technological integration is required, observations at Dadaprejo 01 Public Elementary School reveal a persistent reliance on static resources such as worksheets (LKS) and textbooks. However, the problem of abstract physical geography lies in the cognitive difficulty of connecting it to social life outside of the medium. As a consequence, much of the text requires extensive thought and learning on the part of fourth graders, hampering their ability to develop mental models that show the direct relationship between geography and community professions. This misunderstanding serves as a barrier to engagement, as students struggle to relate to abstract descriptions of objects. The BENAPRO e-module is thus presented not simply as an electronic alternative but as a specific pedagogical strategy based on PBL with contextual presentation. Unlike generic interactive media, BENAPRO is designed to bridge the gap between 'physical observation' and 'social analysis,' transforming passive reading into active, visual problem-solving that stimulates both cognitive curiosity and affective engagement.

Learning interest is a psychological drive that encourages students to learn, characterized by increased attention, concentration, and positive feelings, which enables them to be happily engaged in the process (Guo & An, 2025; Li et al., 2024). Learning interest plays a fundamental role as the energy that drives students to actively engage in the learning process. By actively participating in activities, learning interest is applied. If students are interested in something, they tend to pay more attention to it and follow the lesson more happily (Verdeflor et al., 2024). Indicators of interest in learning, which include feelings, intense attention, and active involvement, are absolute prerequisites for successful knowledge transfer (Sulyanah et al., 2021; Werang & Radja Leba, 2022). Therefore, if learning fails to generate interest, students will feel bored, which in turn results in a low interest in learning.

The problem of low interest in learning requires an alternative solution: developing

innovative teaching materials that combine contextual material with digital interactivity. To address this problem, innovation is needed in how teaching materials are presented so that learning becomes more interactive, contextual, and aligned with students' learning characteristics. One alternative is the development of digital teaching materials in the form of interactive e-modules. E-modules are digital learning tools systematically arranged for independent learning. E-modules are also beneficial for students because they include clear learning objectives and learning materials packaged in an engaging way (Sintawati & Margunayasa, 2021; Uslima et al., 2023). Interactive e-modules present material in a multimodal way, combining text, images, videos, audio, and quizzes that provide immediate, automatic feedback, enabling students to learn in a more meaningful and enjoyable way (Herawati & Muhtadi, 2018; Yorganci, 2022). The use of innovative digital technologies, such as e-modules, can be an effective way to overcome these limitations by providing an engaging, contextually relevant learning experience aligned with the needs of the 21st century. In line with the statement by Budiarto et al. (2024) and Haryanti et al. (2025) that e-modules are capable of addressing the challenges of 21st-century learning, which demand flexibility, interactivity, and personalization in the teaching and learning process. E-modules are also considered effective teaching materials that can increase students' interest in learning (Delita & Berutu, 2022; Neppala et al., 2018).

Various relevant studies have examined the development of digital teaching materials, in the form of e-modules, in elementary schools to overcome the limitations of conventional learning media. Research conducted by Rusmini et al (2023) developed STEAM-based digital teaching modules for IPAS subjects in the fourth grade of elementary school. The study found that digital modules were highly valid and practical,

with a classical mastery level of 90% among students, demonstrating that integrating technology at the elementary school level has a significant positive impact. In line with this, Johar et al. (2025) also found that the use of e-modules as independent teaching materials effectively improved student learning outcomes and understanding of concepts. Beyond the elementary school level, the success of interactive e-modules is also evident at higher education levels and in abstract materials. Zhafira et al. (2025) developed E-VIRA (E-Module Virus), an Augmented Reality (AR)- integrated module for high school students, which proved highly valid and practical for visualizing the abstract concept of viruses. Similarly, Arifin et al. (2024) developed an interactive physics e-module based on Problem-Based Learning (PBL), which successfully improved students' creative thinking skills and demonstrated high effectiveness. This is reinforced by a needs study conducted by Haryanti et al. (2025), which confirms that teachers and students in elementary schools are in dire need of interactive, multimedia-rich (video, animation) digital teaching modules to support project-based learning, given that current learning resources remain limited.

While previous studies have demonstrated the utility of e-modules for improving outcomes and critical thinking, only limited research in the affective domain, specifically, student interest, is currently being conducted, particularly in physical geography linked to community industries. The literature on these topics tends to be grouped, and the teaching methods are mostly traditional. As a result, this study uses PBL syntax in the BENAPRO e-module to contextualize landscape diversity across local professions. This approach seeks to visualize broader concepts in order to encourage involvement. To guide this investigation, this study poses the following research questions: (1) How valid is the developed BENAPRO e-module? (2) How practical is the

e-module for use in fourth-grade learning? Moreover, (3) How effective is this e-module in increasing students' interest in learning natural sciences and social sciences on the subject of geographical diversity?

■ METHOD

Participants

The research location was Dadaprejo 01 Public Elementary School. One fourth-grade teacher and nine students from the small-group trial, and 18 students from the field trial participated. The field trial population included eight males and 10 females from middle- to lower-income families. This grade level was chosen not only for their developmental stage of learning landscape diversity, but also to maximize access to support devices. Regarding the educators, the participating teachers have at least 5 years of classroom teaching experience and intermediate-to advanced-level digital literacy skills, demonstrating their ability to effectively assess the utility of the e-module within the Independent Curriculum.

Research Design and Procedure

This study used the R&D (research and development) method, which aims to develop new products and evaluate them. Research and development is a method for producing and testing the effectiveness of a product (Halaskova et al., 2020; Herdianto et al., 2020; Miles, 2007). In developing the BENAPRO (landscape and profession) e-module on landscape diversity and its relationship to the professions of fourth-grade elementary school students, this study applied the ADDIE model. The ADDIE model comprises five stages: Analysis, Design, Development, Implementation, and Evaluation (Branch, 2009; Spatioti et al., 2022). This model was chosen because the ADDIE model supports the systematic development of a product through a trial-and-error process to validate its feasibility (Barokah Sutikno, 2025; Roisatulkusna, 2024).

The analysis stage is the initial stage in the learning product development process, during which an analysis is conducted to develop learning products that support learning activities in line with the school's needs. The analysis stage began with the analysis of school selection, student conditions and needs, student characteristics, and the objectives and selection criteria for the material. To determine the current learning conditions, initial observations and interviews were conducted at Dadaprejo 01 Public Elementary School as part of a comprehensive needs analysis. From initial observations and interviews, it was found that the learning process often relied on conventional media, with teaching materials limited to textbooks and worksheets. In addition, the analysis of student characteristics showed that many considered natural and social sciences challenging subjects, and the use of teaching materials limited to textbooks and worksheets often made the delivery of material less engaging and less interactive, leading students to be less interested in learning. The results of this needs analysis emphasized the importance of creating engaging and creative digital learning materials.

The second stage is design, which involves planning the e-module to be developed, including the e-module design, determining the Learning Outcomes (CP), Learning Objectives (TP), and learning objective indicators to be achieved in accordance with the independent curriculum, as well as determining the learning materials based on the learning objective achievement indicators. At the same time, assessment instruments for the e-module were prepared, including validation instruments by experts on the feasibility of the material and products, questionnaires for educators and students, and questionnaires on learning interest before and after the e-module were delivered to measure its effectiveness.

The next stage is the development stage. This stage involved developing a BENAPRO e-module on natural and social science learning, covering various landscapes and their

relationships to the professions of fourth-grade elementary school students. The development stage included creating an attractive initial display by adding illustrative images and arranging the layout appropriately in the e-module. The e-module was designed in Canva and uploaded to the Heyzine website to create an attractive, easily accessible digital book display. During the development stage, the e-module underwent material and product validation and was subsequently revised based on expert feedback. The purpose of product validation is to refine a developed product to meet field needs.

After the development stage, the implementation stage follows, involving the direct application of teaching materials developed and validated by experts in field tests. The implementation stage of this development includes small-group trials and field tests. The small group trial was conducted with nine fourth-grade students selected at random. The purpose of the small-group trial was to determine the practicality and suitability of e-module learning based on questionnaires completed by educators and students. After the product was revised based on suggestions and input from educators and students during the small-group trial, a field test was conducted by administering a pretest and posttest to a large group of 18 fourth-grade students at Dadaprejo 01 Public Elementary School. The effectiveness of the developed product was tested to increase students' interest in learning natural and social sciences, particularly landscape diversity and its relevance to community professions.

The final stage in the ADDIE model is the evaluation stage, which assesses the learning product development. The evaluation stage was carried out by analyzing data obtained from trials, which were then processed to determine the validity, practicality, and effectiveness of the development product. The evaluation was carried out to identify the strengths and weaknesses of the e-module development implemented during the field test.

Instruments

The study employed non-test instruments, comprising observation sheets, interview guides, and questionnaires, to assess validity, practicality, and effectiveness: product validity and practicality instruments. The validity instrument uses a closed-questionnaire format and is assessed by material and product experts. To measure practicality, the instruments were adapted from Rahayu et al. (2022) and customized to the specific topic of this research. Two instruments were employed: the Educator Response Questionnaire (10 items) and the Student Response Questionnaire (8 items). The three components of the educator instrument include: (a) Attractiveness (points 1-4), (b) Ease of Use (points 5-7), and (c) Clarity (8-10). The student instrument also includes (a) Attractiveness (Items 1-3), (b) Ease of Use (Items 4-6), and (c) Clarity (Items 7-8).

Effectiveness or Learning Interest Instrument. Effectiveness was assessed using the Learning Interest Questionnaire as a pre- and post-test measure. The learning interest indicators in Slameto's (Putri et al., 2019) study were then adapted to reflect the BENAPRO e-module. It consists of 10 statement items using a 4-point Likert scale, distributed across four indicators: (1) Feelings of Happiness, (2) Student Attention, (3) Student Engagement, and (4) Interest in Material. Detailed grid is presented in Table 1.

Table 1. Learning interest questionnaire instrument grid

Variable	Indicators	Item Numbers	Example Item
Learning Interest	Feelings of Happiness	1,2	I feel happy participating in the IPAS on Landscape Diversity and Community Professions.

Student Attention	3,4,5	I pay attention to the teacher's explanation when using the e-module.
Student Engagement	6,7	I actively ask questions when I do not understand material in the e-module.
Interest/ Curiosity	8,9,10	I am interested in trying the exercises/quizzes provided in the e-module

Validity and reliability of the Instrument. Before field implementation, the instruments were psychometrically tested. Content validity was determined with expert judgement based on three specific criteria: 81%-100% (Very Valid/No Revision), 61%-80% (Valid), 41%-60% (Valid Enough/Minor Revision), 21%-40% (Less Valid/ Major Revision), and 0%-20% (Invalid) (Aldresti et al., 2023). The expert validation results yielded a score of 92.5% for the practicality instrument and 90% for the learning interest instrument. Based on the established criteria, both instruments fall into the "Very Valid" category and were declared suitable for use without revision.

Furthermore, reliability testing was conducted using Cronbach's alpha to assess internal consistency. The statistical analysis yielded a Cronbach's Alpha coefficient of 0.67986. Based on the reliability criteria (0.60-0.80), this value is categorized as "High/Reliable." This empirical evidence confirms that the instrument is statistically consistent and reliable for measuring students' learning interest in this study.

Data Analysis

The data generated from the distribution of the questionnaire instrument are then analyzed to obtain specific categories, so that the learning product can be declared valid, practical, and effective, or not, in the learning process. The data analysis techniques in this research and development consisted of qualitative descriptive analysis, based on expert validation test results and responses from educators and students in small-group trials, which could then serve as a basis for improvement before conducting field tests. Then there was quantitative analysis based on the compilation of Likert-scale questionnaire scores and N-Gain tests.

Product validity analysis is produced through the assessment of material validation tests and product validation tests to determine the feasibility of learning materials before testing. The data collection technique used was a closed- and open-ended questionnaire using a 1-4 Likert scale, where a score of 4 indicates a "highly valid" product, 3 "valid," 2 "sufficiently valid, and 1 "invalid." To determine the validity level, the data were analyzed by calculating the percentage of the total empirical score relative to the maximum expected score, following the method by Al-Maroof & Al-Emran (2018).

Meanwhile, the determination of the product's validity level refers to the interval criteria established by Riduwan, as cited in Aldresti et al. (2023). These criteria categorize the calculated percentage scores into five validity levels to determine whether the product is suitable for testing, as presented in Table 2.

Table 2. Product validity interval criteria adapted from Riduwan, as cited in Aldresti et al. (2023)

Interval Percentage	Interpretation
81% - 100%	Very Valid
61% - 80%	Valid
41% - 60%	Valid Enough
21% - 40%	Less Valid
0% - 20%	Invalid

The practicality of the e-module was analyzed using educator and student response questionnaires to assess its feasibility before field testing. The practicality value was determined by calculating the percentage of the total score obtained relative to the maximum possible score, in accordance with the calculation method by Khairani et al. (2025). After obtaining the questionnaire percentage results, the questionnaire results will be classified according to the practicality interval, as follows:

To analyze the distribution of students' learning interests in detail, the raw questionnaire scores were converted to percentages. These

Table 3. Practicality interval

Percentage Interval	Criteria
80% - 100%	Very Practical
60% - 80%	Practical
40% - 60%	Quite Practical
20% - 40%	Less Practical
0% - 20%	Not Practical

percentages were then classified into five specific categories to determine the level of student interest for each indicator. The categorization criteria are presented in Table 4.

To measure the effectiveness of the BENAPRO e-module in increasing students' interest in learning natural and social sciences, the Normalized Gain (N-Gain) test was employed. This analysis calculates the improvement between pretest and posttest scores relative to the maximum possible improvement, referring to the standard calculation and criteria established by Hake (1999). The analysis results wre interpreted using the gain index shown in Table 5.

Table 4. Categorization of learning interest scores

Percentage Interval	Category
81%-100%	Very High
61%-80%	High
41%-60%	Medium
21%-40%	Low
0%-20%	Very Low

Table 5. Standard gain value criteria

N-Gain	Interpretation
N-Gain > 0.70	High
$0.30 \leq$ N-Gain ≤ 0.70	Moderate
N-Gain < 0.30	Low

■ RESULT AND DISCUSSION

The results of this study are in the form of a BENAPRO e-module on natural and social science learning materials covering various landscapes and their relationship to community professions, which aims to determine the validity, practicality, and effectiveness in increasing learning interest. The e-module was developed in accordance with the ADDIE development procedure, with te results of each stage as follows.

Analysis

The analysis stage consisted of school selection analysis, analysis of student conditions and needs, and material needs analysis. The analysis of student needs was conducted through observation and interviews with fourth-grade teachers at Dadaprejo 01 Public Elementary School. Based on the interview results, fourth-grade students showed low interest in learning natural and social sciences. This was due to educators' limitations in providing varied learning resources. In one fourth-grade class, there were 18 students, most of whom appeared unfocused and unenthusiastic, and who tended to feel bored with the material, which was delivered only through lectures focused on textbooks and the provided workbooks. Therefore, learning resources were needed that could accommodate students who tended to have an audio-visual learning style and felt hungry for digitalization, thereby improving learning quality in the learning process. The material analysis in this research and development is aligned with the Learning Outcomes of the independent curriculum implemented at SD Negeri Dadaprejo 01. The material in the e-module is a variety of landscapes and their relationship to the professions of the community in the natural and social sciences subjects in grade VI.

Design

The result of the design stage is the blueprint of the BENAPRO e-module for natural and social science lessons. The process began with preparing instruments based on product requirements, followed by designing the learning components, ranging from the cover to the author profile. The e-module prototype was visualized using Canva for graphic design and finalized on the Heyzine platform to create a realistic flipbook experience; the accessible e-module can be viewed at https://heyzine.com/flip-book/872f3a5e39.html.

Crucially, the application of Problem-Based Learning (PBL) syntax in this design was specifically tailored to trigger indicators of learning interest rather than just cognitive skills. (1) Student orientation to the problem presents context issues about local professions that would prompt curiosity and interest immediately. The steps of (2) Organizing Students' Work and (3) Conducting Investigations use the interactive features of the e-module to help participation and prevent boredom. Lastly, (4) Gathering data and (5) Evaluation foster a sense of achievement that instills positive attitudes regarding the lesson. The PBL syntax is thus a means for switching passive reading into active, engaged inquiry. On a similar note, assessment tests were developed, including expert-validated questionnaires and sheets, to assess interest.

Development

The development stage consists of material expert validation tests and development product expert validation tests. The data obtained consists of qualitative data containing suggestions and criticisms useful for improving the learning products developed, and quantitative data from the completion of development product assessment questionnaires.

The e-module material validation test indicated that the product was a "Very Valid" product. In particular, Validator 1 tested the Content Suitability factor with a score of 16/16, and Validator 2 tested the Accuracy of Material aspect with scores of 14/16 and 12/16, resulting in an average percentage of 88%. Finally, the presentation of material received scores of 17/20 from valuer 1 and 16/20 from valuer 2, for a total of 83%. Based on these findings, the Overall Average Validity for the material aspect was 86%, indicating a "Very Valid" status per the interval validation criteria. These results support the conclusion that BENAPRO e-module material is viable fr the next phase of the research process.
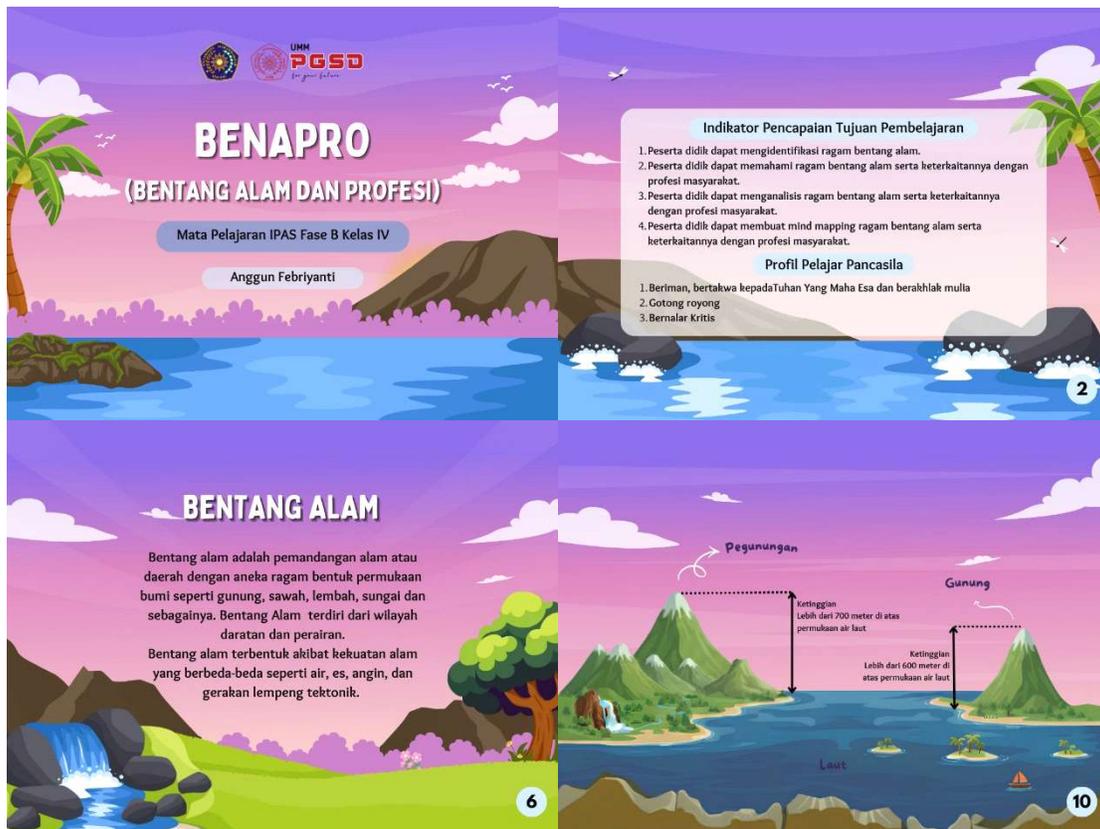
Figure 1. Design e-modul

After validating the material, the next step is to validate the developed product. The product expert validation stage includes notes on criticisms and suggestions that serve as reference material for revisions to improve the product's suitability for implementation in schools. After the product is revised, it is revalidated.

Following material validation, the product was assessed at three main levels by 15 assessors. They found a rating of 'highly valid' and a mean rating of 96%. In particular, the 'E-Module Cover Design' factor scored 94% (15 out of 16) while 'E-Module Completeness' was 93% (26 out of 28). A notably positive note was also given to the aspect 'E-Module Display' with a score of 100% (16 out of 16). This is supported by the validator's qualitative feedback, which indicates that no major revisions were required for the visual components. The designer specifically highlighted the already optimal text reading and consistent

layout, which met all design criteria without further improvement. This is consistent with Melinia et al. (2024), which states that the product is indeed valid and ready to enter the trial phase.

Implementation

The implementation stage included a small-group trial with nine randomly selected students and a field trial with 18 fourth-grade students. The small-group trial was conducted on a limited basis, involving nine students and one fourth-grade teacher. This trial was conducted to assess the practicality of the developed e-module by distributing a questionnaire with three assessment aspects: Attractiveness, Ease of Use, and Clarity.

A small-group trial included a single educator and nine students to evaluate the practicality of the developed e-module. The educator scored the e-module on a mean score of 97.9%, with an average rating of Very

Practical. More specifically, Attractiveness scored 93.8%, while Ease of Use and Clarity of Teaching Materials scored 100% each. Regarding the educator response, particularly the 100% 'Ease of Use' score, this study acknowledges the possibility of a ceiling effect or positive response bias due to the limited number of educator respondents. However, this result aligns closely with the students' high assessment score (98%) and qualitative feedback, which consistently highlighted the module's clear navigation and user-friendly layout as key strengths. These high scores reflect the teacher's belief that the module's navigation buttons were intuitive and that the content flow was sequential, and thus that instructional time should be spent in the classroom, less likely to be wasted. The student responses, on average, were in line with this positive reception. In particular, Attractiveness was rated as 99%, indicating a high preference for the e-module over conventional textbooks. On top of that, scores for Ease of Use (98%) and Clarity (96%) indicate that students could handle the application independently and understand the content explanations easily.

The high score in the attractiveness aspect indicates that the developed e-module attracted users' interest and attention. Meanwhile, the maximum score in the ease of use aspect for educators indicates that the process of using the e-module did not encounter any significant obstacles and that students were also able to access and utilize the available features very easily, in line with research conducted by (Pratiwi et al., 2025; Tondeur et al., 2017) that an easy-to-use e-module display and design can increase user comfort. The clarity achievement supports the finding that the instructions and module content are presented clearly and easily understood by both educators and students. These practicality scores are in line with previous research that practicality testing can help identify aspects that need improvement before implementation in the next stage, namely, field testing (Jakeman et al., 2006; Pratiwi et al., 2025).

Based on the results of the small-group trial, the developed BENAPRO e-module is overall very practical, with average scores of 97.9% and 98.6%. This high level of practicality indicates that the developed BENAPRO e-module has an attractive design and appearance, clear and easy-to-understand instructions and materials, and is effective in supporting the learning process of natural and social sciences, especially material on various landscapes and their relationship to community professions. This is supported by previous research by El-Sabagh (2021), which shows that e-modules have a positive influence in bridging gaps in the learning process through innovative and interactive approaches.

Field trials were conducted by distributing questionnaires to measure students' interest in learning before implementation and after implementation using the BENAPRO e-module development product. This trial involved 18 fourth-grade students at Dadaprejo 01 Public Elementary School. The patterns of percentage differences were analyzed using four main themes: Feelings of Happiness, Interest in Material, Student Attention, and Student Engagement. The distribution of student interest is compared in Figure 2.

Figure 2 shows that students' pre-test scores indicate that student interest was mostly in the "High" range, and that "Feelings of Happiness" was 89%. However, students still had a notable proportion in the 'Low' and 'Medium' levels, including in the 'Interest in Material' category (39% Medium) and in 'Student Attention' (11% Low, 17% Medium). This indicates that students were generally good, but there was much room for improvement in engagement and focus.

The post-test results were well above the "Very High" range, driven by the introduction of the BENAPRO e-module. In particular, the scores for 'Feelings of Happiness' and 'Student Engagement' were both 100%, indicating that all students felt motivated to learn and were engaged.
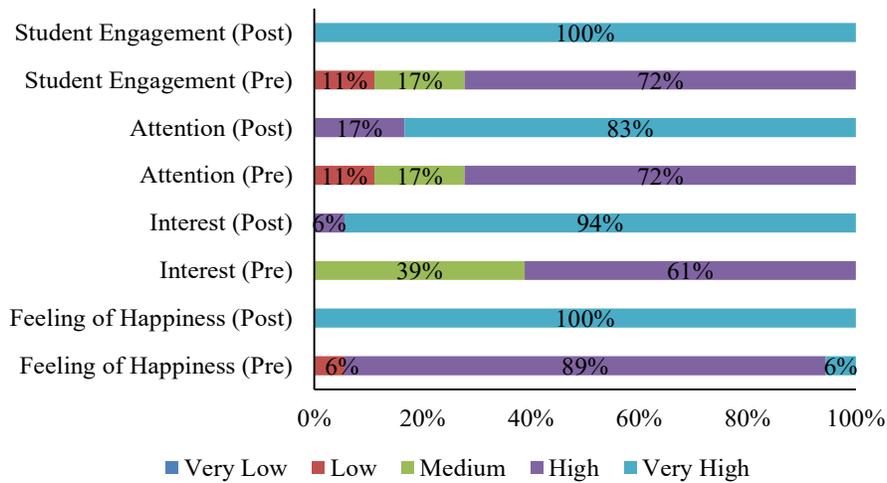
Figure 2. Comparison of student learning interest distribution between pre-test and post-test

Similar growth to 'Interest in Material' was 94% higher in the "Very High" category, and 'Student Attention' improved significantly, with 83% students in the "Very High" category.

This consistent upward trend is directly attributable to the distinct advantages of the BENAPRO e-module. Unlike conventional static materials, BENAPRO integrates interactive multimedia elements, such as videos and visual illustrations of various professions, which successfully capture students' attention and foster a sense of pleasure. Furthermore, the infusion of Problem-Based Learning (PBL) syntax within the module encourages active participation by presenting real-world career challenges. This approach transforms students from passive listeners into active problem-solvers, thereby naturally maximizing their involvement and curiosity about the material. Although initial interest was already relatively high, the e-module succeeded in maximizing potential and eliminating the 'Low/Medium' gaps, ensuring equitable learning interest for all students.

While the distribution analysis indicates a general upward trend, a deeper examination was conducted to observe the variation in individual student responses. Figure 3 presents a scatter plot of pre-test versus post-test scores for each of the 18 students.
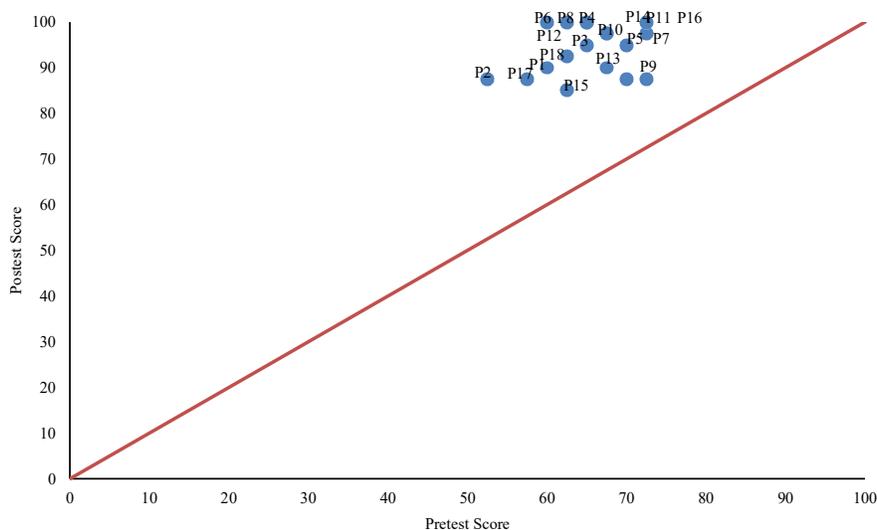

Figure 3. Scatter plot of individual student pretest and posttest scores

As shown in Figure 3, every data point lies significantly above the diagonal reference line (x = y), indicating that all students, without exception, experienced a marked increase in their scores. The pre-test scores ranged from 52.5 to 72.5, whereas the post-test scores ranged from 85 to 100. The distribution of points clusters densely in the upper-right corner, confirming that even students with lower initial knowledge achieved high mastery after using the module. This visualization confirms that the improvement was uniform across the entire class, reinforcing the effectiveness of the e-module for students of varying initial abilities.

To determine the overall effect of the BENAPRO e-module, the average N-Gain for each indicator was calculated, along with the mean. Figure 4 plots the N-Gain achievement across the four measured items relative to the total score.

Figure 4 shows that the e-module was effective in all dimensions with scores consistently exceeding 0.70. Both 'Feeling of Happiness' and 'Student Engagement' scored with an N-Gain of 0.85 and were the most effective. This demonstrates that the multimedia and PBL content created an engaging learning environment. 'Interest' followed closely with 0.84, while 'Attention' comes in at 0.74, but still ranks highly effective.

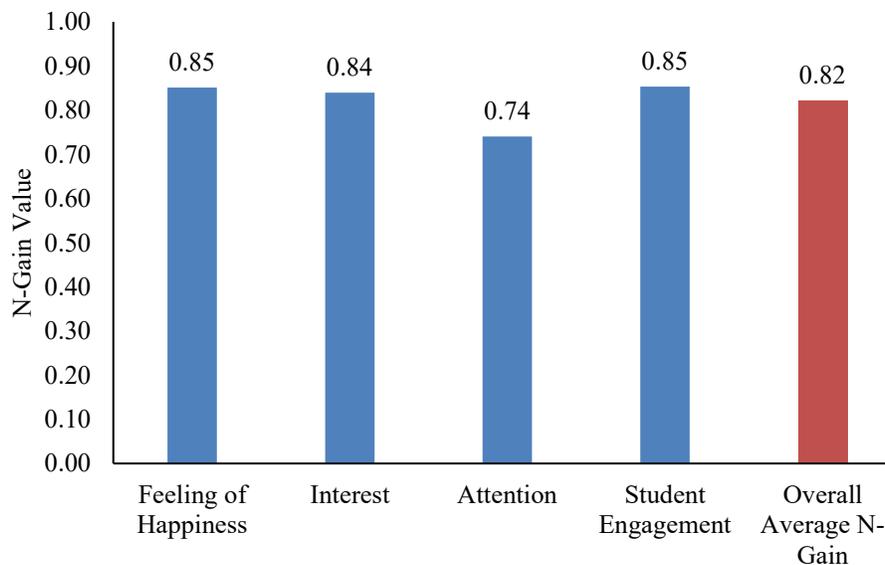The N-Gain value of 0.82 is in the high range, indicating that the BENAPRO e-module

Figure 4. N-Gain scores per indicator and the overall average

is very effective at engaging students. This high score is not one of arbitrary merit, but is directly influenced by specific features of the product being developed. This year's spike in the 'Interest' (0.84) and 'Feeling of Happiness' (0.85) indicators was driven by the addition of videos on landscapes and community professions. Unlike static textbooks, multimedia components offer an accurate picture of the professions and help elicit students' interest in the content and their emotional connections. Furthermore, the peak score in 'Student Engagement' (0.85) is directly attributable to the Problem-Based Learning (PBL) syntax embedded in the e-module. The interactive quizzes and case studies required students to engage actively in the learning process and solve problems, thereby shifting their role from passive listeners to active participants. These results reinforce the view that interactive digital media can optimize motivation by bridging

the gap between abstract concepts and real-world visualization (Asbah et al., 2025; Wang et al., 2023).

To validate the statistical results, qualitative data were collected through classroom observations and brief interviews with randomly selected students. During the deployment, observational recordings showed a significant change in how the classroom worked. Students seemed very excited and engaged, often asking questions and paying close attention to the audio-visual explanations in the e-module. The interview answers also showed three main strengths of the BENAPRO module. First, students liked how the multimedia elements made abstract geographic ideas clearer. One student said, "The pictures of the different types of landscapes were great, and the video helped me see the different types of landscapes clearly." This shows that the multimedia features did a better job of showing the variety of landscapes than static text. Second, in terms of usability, students thought the interface was very easy to use. A student said, "The buttons were very easy to click, which made it easy to get to the specific material page I wanted." Finally, regarding emotional engagement, the e-module changed how they thought about the issue. A student said, "Science usually bores me, but this time I felt like I was playing a game." I didn't know that time had passed. These qualitative observations give the quantitative statistics a lot of context, showing that the e-module really did make the learning environment more interactive and fun.

Evaluation

The final stage of the ADDIE model is the evaluation stage. This stage aims to determine the validity, practicality, and effectiveness of the development product in relation to students' learning interests during the development and implementation stages. The evaluation results are obtained through expert validation to determine the validity of the material and the development product. After the product has been developed, validated, and declared suitable for testing, it can be tested on a small group to determine its practicality by distributing questionnaires to educators and some students.

After the practicality results are obtained and the development product is declared practical, the product can be implemented in a field trial to determine its effectiveness in student learning interest. The effectiveness of the e-module is measured through pre-tests and post-tests. Assessment is conducted by analyzing pre- and post-test results using the N-Gain test. In developing the BENAPRO e-module, there are certainly advantages and limitations. The product's advantages are evident in its attractive visual appearance and its contextual theme of natural landscapes and community professions, which make it easier for students to understand the material and relate it to their daily lives. In addition, the material in the e-module is presented systematically, complete with exercises and interactive features that can attract students' interest in learning. On the other hand, the use of the BENAPRO e-module remains highly dependent on the availability of supporting devices and technologies. Internet limitations can also be an obstacle, especially when students or teachers want to access additional content, such as videos, whether in class or while studying independently at home. Despite positive results, the study acknowledges two methodological limitations: a small sample size (N=18) and a single-school context. Therefore, the results should not be taken as a generalization of all elementary schools but as a preliminary case study. Future studies will likely need to target a larger, more diverse population to further validate the BENAPRO e-module's utility.

Considering these advantages and limitations, the development of the BENAPRO e-module continues to make a positive contribution to the learning process of natural and social sciences in elementary schools. This e-

module can be an engaging, interactive, and relevant learning resource that encourages students' independence and interest in learning, while also aligning with their real lives. In the future, it is hoped that the use of the BENAPRO e-module will continue to improve as facilities and technological literacy advance, supporting more creative, enjoyable, and meaningful learning for students.

■ CONCLUSION

Therefore, these findings indicate that the BENAPRO electronic module is effective in overcoming students' low interest in landscape diversity and community professions. This high effectiveness score is directly attributable to the synergy between the innovative components: the use of community professions allows for contextual relevance, making abstract geographical concepts more concrete, while the PBL syntax, especially in the exploration stage, shifts the learning perspective from passive listening to active inquiry. This is a successful way to spark students' curiosity and engagement. Furthermore, the e-BENAPRO module has been proven valid, useful, and effective for this study, as well as a useful reference for developing online instruction based on the Merdeka Curriculum. However, given the small sample size, it is necessary to expand the study to include more schools and to collaborate with teachers to refine the e-BENAPRO module's flexibility.

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