



Development of a science e-module based on contextual teaching and learning for primary school students

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ABSTRACT

The limited learning resources and the lack of attractiveness of the available learning resources are why students do not have a high enough interest in learning. The development of E-Modules to increase learning interest is carried out to overcome the problem of limited learning resources for students with illustrations and images that can attract their attention and be accessed anytime and anywhere. This study aims to produce a product in the form of an E-module of Science based on Contextual Teaching and Learning (CTL) for grade V Elementary School students that is feasible, practical and effective. The research method used is the Research on the Development of E-Modules of Science. The ADDIE development model comprises five stages: Analysis, Design, Development, Implementation and Evaluation (ADDIE). The feasibility test, practicality test and effectiveness test were carried out at Elementary School 105289 Kolam, Percut Sei Tuan District, Deli Serdang Regency, North Sumatra Province, with research subjects of grade V.A and V.B students of Elementary School 105289 Kolam, with data collection techniques in the form of observation, questionnaires and tests. The results of the study indicate that 1) the developed E-module of Science is declared feasible to be applied in the learning process; 2) The developed IPAS e-module is stated as practical by teachers with a very practical category and by students with a very practical category; and 3) The developed IPAS e-module is stated as effective. So, it is concluded that the developed IPAS e-module is feasible, practical and effective in improving learning outcomes.

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ABSTRAK

Keterbatasan sumber belajar dan kurangnya menariknya sumber belajar yang tersedia menjadi alasan peserta didik tidak memiliki minat belajar yang cukup tinggi. Pengembangan E-Modul untuk meningkatkan minat belajar dilakukan untuk mengatasi masalah terbatasnya sumber belajar bagi peserta didik dengan ilustrasi dan gambar yang dapat menarik perhatian mereka serta dapat diakses kapan dan di mana saja. Penelitian ini bertujuan untuk menghasilkan produk berupa E-modul IPAS berbasis Contextual Teaching and Learning (CTL) untuk peserta didik kelas V Sekolah Dasar yang layak, praktis dan efektif. Metode penelitian yang digunakan adalah Penelitian Pengembangan E-Modul IPAS dengan model pengembangan ADDIE yang terdiri dari lima tahapan dimulai dari Analysis, Design, Development, Implementation and Evaluation (ADDIE). Uji kelayakan, uji kepraktisan dan keefektifan dilakukan di Sekolah Dasar 105289 Kolam Kecamatan Percut Sei Tuan Kabupaten Deli Serdang Provinsi Sumatera Utara dengan subjek penelitian peserta didik kelas V.A dan V.B Sekolah Dasar 105289 Kolam dengan Teknik pengumpulan data berupa observasi, angket dan tes. Hasil penelitian menunjukkan bahwa 1) E-modul IPAS yang dikembangkan dinyatakan layak untuk diterapkan dalam proses pembelajaran; 2) E-modul IPAS yang dikembangkan dinyatakan praktis oleh guru dengan kategori sangat praktis dan oleh peserta didik dengan kategori sangat praktis; dan 3) E-modul IPAS yang dikembangkan dinyatakan efektif. Sehingga disimpulkan E-Modul IPAS yang dikembangkan dinyatakan layak, praktis dan efektif untuk meningkatkan hasil belajar.

Kata Kunci: contextual teaching and learning; CTL; e-modul; hasil belajar

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INTRODUCTION

Ilmu Pengetahuan Alam dan Sosial (IPAS) is one of the eight learning areas that must be mastered at the elementary education level. IPAS learning is oriented towards the outcomes of the process (Afandi, 2019). The learning process of IPS in elementary school does not only focus on critical thinking skills (Zainudin *et al.*, 2021). IPAS learning must be developed to be student-centered, where students strengthen their problem-solving skills and enhance their curiosity in every learning process (Astuti, 2013). The teacher plays a crucial role in creating student-centered education and equipping students to be capable of solving problems. An active learning process centered around the teacher will shape students into active learners with a high level of curiosity and a strong interest in learning.

The Programme for International Student Assessment (PISA) study results indicate that Indonesia ranks 68th out of 81 countries with a science score of 398, which shows a decline. Therefore, interest is closely related to motivation, as interest serves as an internal drive or a factor that generates selective attention, leading to the choice of a beneficial and enjoyable object or activity, ultimately resulting in satisfaction. Consequently, an activity's drive, attention, and enjoyment are interconnected with the factors that create interest in it. Harefa *et al.*'s book "*Buku Ajar: Teori Belajar dan Pembelajaran*" states that if the factors that generate interest in an activity are low, it can lead to a diminished interest in that activity.

In the learning process, two factors influence learning outcomes: internal factors and external factors. Internal factors include those within individuals, such as their physical and mental condition. In contrast, external factors consist of aspects outside individuals, including the environment in which they live (Maghfiroh & Hanafi, 2023). The same thing is also expressed by Abdurrahman *et al.* in "*Buku Ajar Teori Pembelajaran*," that in the learning process, there are two factors that influence it: the factors that exist within the learners themselves, such as the health of the learners, intelligence, interests, talents, and the readiness of the learners to learn; and the factors that come from outside the learners, such as parenting methods, home atmosphere, family economic conditions, school facilities and infrastructure, the teaching methods used, and also school hours.

Based on the results of interviews with the fifth-grade teachers at 105289 Kolam Elementary School, it was found that the fifth-grade students have a low interest in learning IPAS. This is due to several factors, including the fact that students rely solely on a single textbook published by the Kemendikbud, which means they lack supplementary materials that could facilitate their learning. The textbook also has some shortcomings; students are less interested in learning from it because much of the content lacks engaging images that relate to the material, making it difficult for students to understand what they are learning. Consequently, the learning process does not stimulate students to study. Classroom learning is conducted traditionally. For some subjects, students' teaching approaches are not varied, leading to passivity among students and dulling the learning experience.

In addition, the low level of students' interest in learning is significantly influenced by teachers' teaching approach, which often does not align with the material being taught. One of the contributing factors is that the approach has not been integrated with the Contextual Teaching and Learning (CTL) model. A contextual approach refers to a method that helps teachers establish meaningful connections between learning materials and students' real-life experiences. It also encourages students to link their existing knowledge with its practical application in everyday life, enhancing the learning process's relevance and engagement (Zakiyah, 2019).

Students often struggle to understand the material in the modules, particularly when required to study independently. This affects their low academic performance. Academic performance is a measure of success in the learning process at school (Apriliani *et al.*, 2023). Therefore, the students' learning outcomes must be considered, as the learning process is considered successful if the students' learning

outcomes meet the established minimum competency criteria (KKM) for each subject. From the observations made in the IPAS subject in Grade V at 105289 Kolam Elementary School, it was found that the students' learning outcomes remain low. This assessment is based on the IPAS learning outcome data obtained from the Data Kumpulan Nilai (DKN) for grade V students in the odd semester of the 2023/2024 academic year, which is 65.

The e-module with a contextual approach is an electronic teaching material that presents contextual examples of science topics, particularly focusing on single substances and mixtures in the form of texts, images, graphics, music, animations, and videos, systematically organized based on contextual principles (Asmiyunda, 2018). This research is supported by several previous studies, which have reported that integrating contextual concepts in teaching materials can help teachers effectively deliver content to students, thereby contributing to creating a conducive and effective learning environment (Pasaribu, 2019). Meanwhile, another study reveals that CTL-based e-modules are flexible and practical, as they can be carried anywhere, are durable, and are not prone to deterioration over time, being provided online in file format and equipped with video links and images that capture students' interest in learning (Susianti, 2023). This research aims to produce e-modules that are suitable, practical, and effective. Based on these issues, students' interest and learning outcomes can be enhanced through engaging learning materials in the form of CTL-based e-modules.

LITERATURE REVIEW

E-Module

One of the key supporting elements in the learning process is using teaching materials. According to Lestari, in her book "*Pengembangan Bahan Ajar Berbasis Kompetensi*," teaching materials are defined as a set of subject matter that refers to the curriculum used to achieve the predetermined competency standards and basic competencies. In addition, Widodo's book "*Panduan Menyusun Bahan Ajar Berbasis Kompetensi*" explains that teaching materials are a set of resources containing learning content, methods, limitations, and evaluation techniques. These materials are designed systematically and presented attractively to facilitate the achievement of learning objectives, which include mastering competencies and sub-competencies along with their associated levels of complexity. Teaching materials are available in several formats, including the electronic module, commonly called the e-module.

The e-module is an electronic learning module accessed via various electronic devices, including computers, smartphones, and tablets. The e-module, or electronic module, is a digital-format module that consists of textual content, images, or a combination of both, containing instructional material on digital electronics. It is also supplemented with interactive simulations that are both feasible and appropriate for use in the learning process. These simulations help students understand and visualize the learning material's interconnections between facts, concepts, procedures, and principles. By offering these features, the e-module aims to provide students with new and engaging learning experiences that enhance their comprehension and involvement in the subject matter (Dewanty & Farisya, 2023). Electronic modules can help learners enhance their cognitive competencies and understanding, and make it easier for them to study the content within the e-modules, since they are portable and accessible at any time. (Limatahu, 2017).

The e-module is considered more innovative because it comprehensively presents material, especially since students nowadays often prefer mobile phones to books (Herawati, 2018). Integrated electronic modules into technology that can process and explain information in various forms of images, videos, texts, and audio, which enables learners to enhance and improve their ability to study independently. Electronic modules can be used anytime and anywhere according to the guidelines, displaying information

sequentially and structured, and providing an engaging and interactive impression (Dismarianti, 2020; Setiyani *et al.*, 2020).

The benefits of using e-modules as a learning resource in the learning process include enhancing and expanding the offerings available in the classroom, stimulating students' thinking, and promoting positive attitudes and development. The materials developed are supplementary, allowing students to broaden their perspectives by studying additional content in the module. A review of several topics covered in class is also provided (Usmiarti, 2018). The e-module has several advantages, including being more engaging, reducing students' boredom levels, and being accessible anytime and anywhere through a computer or mobile phone, making it easier for students to access. The e-module also has the potential to enhance understanding of concepts in a learning context (Liana, 2022).

The e-module possesses several potentials (Yazid *et al.*, 2023): 1) A product that can be operated based on the Internet of Things (IoT); 2) It can serve as an alternative for virtual learning; 3) It can be used anywhere and anytime; 4) It can be utilized for a personalized learning approach; and 5) It can encourage responsibility regarding the use of technology. These potentials can serve as the foundation for the future development of the e-module, making it an alternative to address issues related to the limitations of educational resource availability.

IPAS

Ilmu Pengetahuan Alam dan Sosial (IPAS) is an interdisciplinary field of knowledge that explores both living organisms and non-living matter within the universe, along with the interactions that occur between them. In addition, IPAS examines human life, not only as individuals but also as social beings who continuously interact with their environment. As an integrated subject within the educational curriculum, IPAS aims to develop students' critical thinking skills through a holistic understanding of natural and social phenomena. Consistent with other scholarly perspectives, the integration of IPAS is designed to bridge the natural and social environments through the development of attitudes, the application of concepts, and the understanding of processes. This comprehensive approach helps to ensure that learning becomes more meaningful, contextual, and relevant to students' everyday experiences (Kisworo, 2023). However, in practice, the teaching of IPAS in elementary schools (SD/MI) has not been fully content-integrated, even though the material for Science (IPA) and Social Studies (IPS) is in one book, the teaching of IPA is still carried out separately from IPS (Wijayanti, 2023). IPAS is a subject that integrates natural sciences and social sciences, although the content remains separate, with the primary objective of honing critical thinking skills and character building in students. With the introduction of the IPAS subject, it is hoped that teachers can create an enjoyable learning atmosphere and stay current with global developments while remaining relevant to the local environment.

The material used in developing this e-module is "Harmony in the Ecosystem" for fifth-grade elementary school students. Several topics related to harmony in the ecosystem include: predation, the process by which living organisms obtain energy in an ecosystem, drawing food chains, food webs, the process of energy transfer in food webs, food pyramids, harmonious ecosystems, causes of ecosystem damage, ecosystem balance, causes of ecosystem imbalance, and the impacts of ecosystem imbalance.

Flipbook

According to Hanan *et al.* in the book "*Inovasi Media Pembelajaran Bahasa Indonesia*," a flipbook is an interactive instructional material that integrates visual elements such as images, audio components, and textual information in an appealing and dynamic format. This engaging presentation is designed to capture students' attention and stimulate their interest in reading the flipbook, thanks to its visually appealing

appearance. When students become more interested and enthusiastic about the learning process, their comprehension of the learning material improves, positively influencing their academic performance. As a form of electronic media, a flipbook can present interactive simulations by combining various multimedia elements, including animations, text, videos, images, audio, and diverse navigation features. These features enable users to quickly and intuitively flip through pages, fostering a more interactive and immersive learning experience. As a result, using flipbooks contributes to making the learning process more engaging, enjoyable, and effective.

This innovative flipbook-based learning media was developed using the Heyzine Flipbook software. Heyzine Flipbook is a professional-grade page-turning application that converts PDF files into interactive digital publications with flip-page functionality. The software offers a variety of customizable templates and features, such as background themes, control buttons, and hint bars, all of which contribute to the flipbook's visual appeal and enhance its interactivity. These interactive elements simulate the experience of reading a physical book, as the page-flipping animation closely resembles turning pages in a printed book. This effect provides an engaging reading experience and increases user immersion and interest in the learning content (Fauziyah & Wulandari, 2022). As a learning medium, a flipbook can serve as an alternative to enhance students' interest in studying the material presented.

Contextual Teaching and Learning (CTL)

Contextual Teaching and Learning (CTL) is an instructional strategy that emphasizes students' active and holistic engagement in exploring learning materials by connecting them to real-life contexts within their immediate environment. This approach encourages learners to make meaningful connections between academic content and their personal experiences, ultimately fostering the application of knowledge in daily life. Rather than relying solely on passive methods such as listening and note-taking, CTL involves students in experiential learning activities. Through this dynamic process, students develop their cognitive abilities and enhance their affective and psychomotor domains, resulting in more comprehensive and meaningful learning outcomes (Astiati, 2023). A contextual approach connects knowledge from various subjects to daily life, facilitating effective problem-solving.

As an alternative instructional method, the contextual learning approach can help teachers create an enjoyable and engaging learning environment. It makes learning more meaningful, as it goes beyond understanding abstract concepts. Students are presented with clearly structured learning activities that are concrete and directly related to their surrounding environment. As supported by other perspectives, the CTL approach enables students to apply and experience the material being taught by referring to real-world issues, thereby enhancing the relevance and enjoyment of the learning process (Nurdyasyah, 2016). Contextual learning occurs when students apply knowledge and skills gained from real-life experiences related to their roles in family, community, education, and society. Linking classroom learning to real-world situations helps students internalize material and understand its relevance to their daily lives (Murtono, 2019). Therefore, contextual learning can occur across various life settings, including formal environments such as schools, informal spaces like the home, and broader community contexts. Learning becomes more dynamic, relevant, and closely connected to the learners' daily experiences by occurring in diverse environments.

Sanjaya states in his book "Process-Oriented Education Standards Learning Strategies" that the aim of this contextual learning is 1) It aims to motivate students to understand the meaning of the subject matter they are learning by relating it to the context of their daily lives; 2) contextual learning ensures that students do not simply memorize the material but also comprehend it deeply; 3) it emphasizes the development of students' interests and experiences, helping them to think critically and become skilled in processing knowledge; 4) enables them to create something valuable for themselves and others; 5) the learning

experienced by the students is more meaningful; 6) contextual learning seeks to make the learning experience more meaningful for students by engaging them in activities that relate academic content to real-life situations.

There are several advantages of the CTL model as stated by Nurhadi in the book "*Pembelajaran Kontekstual dan Penerapannya dalam KBK*" as follows:

1. Learning becomes more meaningful and tangible, meaning that students are required to understand and actively apply the relationship between the knowledge and experiences they gain at school to their real-life situations. This connection is vital because when students can effectively correlate the material with real-life applications, the material will not only serve its functional purpose but also become deeply ingrained in their memory, making it easier for them to recall and apply it in the future.
2. The CTL (Contextual Teaching and Learning) method makes learning more productive and fosters a deeper understanding of concepts for students. It aligns with the constructivist approach, emphasizing that learners should be actively involved in discovering and constructing their knowledge. According to constructivism's philosophical foundation, students are expected to learn not merely by memorizing information but by engaging with and experiencing the material, which enhances their understanding and retention.
3. Contextual learning emphasizes the full engagement of learners, both physically and mentally.
4. In the context of contextual learning, the classroom is not a place to acquire information but to test the data gathered from their field findings.
5. The learning materials can be found by the students themselves, rather than being provided by the teacher.
6. The application of contextual learning can create a meaningful learning environment.

Learning Outcomes

According to Husamah in the book "*Belajar dan Pembelajaran*," learning outcomes are essentially changes in behavior resulting from the learning process. These changes manifest as knowledge, understanding, skills, and attitudes, typically encompassing cognitive, affective, and psychomotor learning domains. Learning is not only about mastering the concepts of academic subjects; Rusman, in the book "*Belajar & Pembelajaran: Berorientasi Standar Proses Pendidikan*," argues that learning also involves the mastery of habits, perceptions, enjoyment, interests, talents, social adjustment, types of skills, ideals, desires, and hopes.

According to Dimiyati in the book "*Belajar dan Pembelajaran*," learning outcomes can also be defined as an interaction between teaching and learning actions. From the teacher's perspective, teaching actions conclude with evaluating learning outcomes. From the students' perspective, learning outcomes signify the culmination and peak of the learning process. Therefore, it is crucial to focus on students' learning outcomes. Several factors influence students' learning outcomes, including internal and external factors. Internal factors refer to those originating from the students themselves, such as physical health, level of intelligence, experiences, motivation to learn, interests, and abilities to understand a problem. Meanwhile, external factors refer to those that originate from outside the student, such as family, school, and community factors (Arrosyad *et al.*, 2023). On the other hand, another opinion also states that one important point affecting students' learning outcomes is the learning facilities, such as the educational tools used (Nasir & Jamiludin, 2023). The better the learning tools used, the more students can actively engage in learning, resulting in improved learning outcomes.

Based on the above opinion, it can be understood that what is meant by learning outcomes refers to students' achievements after participating in learning activities. The outcomes students achieve can take the form of abilities, encompassing aspects of knowledge, attitudes, and skills they possess after receiving

learning experiences. Learning outcomes will be evident in various aspects, as Surya (2020) noted: 1) Habits, such as language learners practicing repeatedly, help prevent incorrect word use and grammar. With sustained repetition and exposure, they become accustomed to using the language accurately and appropriately contexts; 2) Skills; for instance, activities such as writing and exercising—although motoric—require precise coordination of movements as well as a high level of awareness and mental engagement to be performed effectively; 3) Observation involves receiving, interpreting, and assigning meaning to sensory stimuli objectively. This process helps learners achieve a correct and comprehensive understanding of their environment; 4) Associative thinking is the cognitive process that links ideas or information through memory and prior experiences, enabling deeper understanding problem-solving; 5) Rational and critical thinking involves using basic comprehension principles to answer analytical questions like “how” and “why.” It includes evaluating evidence, reasoning logically, and forming well-founded conclusions; 6) Attitude; defined as a relatively stable predisposition to respond positively or negatively toward specific individuals, objects, or situations, based on one’s knowledge, beliefs, and personal experiences; 7) Inhibition involves consciously avoiding wasteful or counterproductive behaviors and cultivating self-discipline for efficient learning decision-making; 8) Appreciation; the ability to recognize and value quality in art, literature, or other creative products, fostering a sense of cultural and intellectual respect; 9) Affective behavior includes emotional responses and actions related to feelings like fear, anger, sadness, happiness, disappointment, joy, hatred, and anxiety, all of which can affect learning and social interaction.

Based on the opinions above, it can be understood that the factors influencing students' learning outcomes are generally affected by two key factors: those that originate within the students (internal) and those that come from outside the students (external). One of the internal factors that also influences learning outcomes is learning motivation. This suggests that learning motivation is crucial in students' learning activities.

METHODS

The research conducted used a quantitative method within the framework of development research. According to Trianto in the book “*Mendesain Model Pembelajaran Inovatif-Progresif: Konsep, Landasan dan Implementasinya pada Kurikulum KTSP*,” that development research is research with a series of processes that must be carried out systematically in order to obtain a product that can be used. The research product to be produced is teaching materials in the form of an e-module for IPAS, which will later assist students in the learning process to understand the learning material. The subjects of this research are students from classes V.A and V.B of State Elementary School 105289 Kolam, located in Percut Sei Tuan, with a sample size of 52 people using the total sampling technique.

In development research, various development models are used to create a product. In this study, the researcher adopts the ADDIE development model. The ADDIE model comprises five stages: Analysis, Design, Development, Implementation, and Evaluation. The Analysis stage identifies learners' specific needs for the product through interviews with learners and teachers to gather necessary data. The second stage is Design, where the researcher outlines essential components of the e-module, including determining content, selecting relevant images, and designing assessment questions to evaluate learners' understanding and outcomes. The development stage follows, where the e-module is created based on the previous design framework. A feasibility test involving subject matter experts assesses the module's quality and alignment with learning objectives. Next is the Implementation stage, which entails implementing the developed e-module in a real learning setting. At this stage, practicality and effectiveness tests are conducted at the end of the learning process to determine how well the module functions in actual use. The final stage, Evaluation, involves assessing all previous stages to identify strengths and areas for

improvement. This stage ensures that each part of the development process contributes effectively to the overall quality of the product. Several data collection techniques are utilized to collect the necessary data: questionnaires, tests, observations, and interviews. Questionnaires assess the feasibility and practicality of the developed e-module; tests are administered to evaluate its effectiveness, while observations and interviews are primarily employed during the analysis stage to gather qualitative data.

RESULTS AND DISCUSSION

E-Module Development Process

The research followed the ADDIE model research procedure, starting from the Analysis stage. The researcher conducted several analyses during the data collection stage to gather the necessary data. The analyses included a curriculum analysis to understand the curriculum and assess the materials included in the e-module being developed, ensuring alignment with the applied curriculum. Adapting the e-module to the curriculum is crucial to ensure that the topics presented are relevant to the developments in knowledge occurring in society (Abdalla, 2020). The next step is a needs analysis, which is conducted to determine the type of teaching materials that are suitable and engaging for learners, so that the developed materials can effectively assist them in understanding the content and achieving the set learning objectives. Finally, the analysis of the learners is conducted. The three analyses found that learners primarily use one teaching material, a book published by the Ministry of Education and Culture. This book has several shortcomings; for instance, some topics lack supporting images, which can lead to a lack of interest in learning. Elementary school students generally enjoy teaching materials that include colorful and engaging images. Therefore, learners need an e-module that contains colorful and interesting images to facilitate their understanding of the learning materials, as some learners require visual aids to aid their comprehension. Learners also need technology-based teaching materials, as it is hoped that learning can utilize technology in this rapidly advancing era. Moreover, teaching materials should ideally incorporate varied teaching models to ensure that learning is not monotonous and more diverse, considering that learners progress through different stages of the teaching model.

The second stage is the design phase, during which the researcher develops a comprehensive plan for creating the e-module. Several key activities are carried out at this stage. These include identifying and selecting appropriate sources to support the content presentation within the e-module, choosing relevant and illustrative images to incorporate, and designing a questionnaire to evaluate the feasibility and practicality of the e-module. Additionally, the researcher develops a test consisting of multiple-choice questions designed to assess the initial (pre-test) and final (post-test) understanding of students following the implementation of the e-module. Beyond these tasks, the researcher also designs the front cover of the e-module and analyzes its components to ensure that they align with the instructional goals and learner needs.

The third stage, development, involves creating the e-module based on the previous design framework. During this stage, the researcher develops detailed research instruments like questionnaires and tests outlined earlier. These instruments are essential for measuring the module's feasibility, practicality, and effectiveness. Once the e-module has been completed, a feasibility test is conducted to assess its overall appropriateness in learning. A feasibility questionnaire is distributed to three experts, all lecturers, each evaluating the module from a different perspective: content accuracy, language clarity, and design quality. In addition to expert validation, two classroom teachers, who act as practitioners, are involved in the feasibility testing by filling out the same questionnaire based on their practical teaching experience. This

dual validation approach, involving experts and practitioners, ensures a more comprehensive assessment. After the feedback is analyzed and the e-module is deemed feasible, it is considered ready for implementation in the actual learning environment to evaluate its practicality and effectiveness further.

The fourth stage is the implementation stage. At this stage, the ready e-module is tested on students in classes V.A and V.B without the e-module being applied. The learning process using the e-module makes learning more engaging, as students are more interested in studying because the e-module captures their attention with appealing features, such as colorful and attractive images that help students better understand the material. Additionally, the learning becomes more active through group study activities, which students enjoy, as they can discuss and become accustomed to thinking critically while accepting others' opinions. The developed e-module also contains language that is easy for students to understand. Meanwhile, students in class V.B learn only with teaching materials published by the Ministry of Education and Culture, which sometimes do not include images, thereby reducing students' interest in learning. At the beginning of the lesson, students are given a pretest to measure their initial capabilities. At the end of the lesson, a posttest is administered to assess students' learning outcomes after implementing one teaching material in the class learning with the e-module. Additionally, at the end of the lesson, students who use the e-module are given a questionnaire to assess their response to it and measure the practicality of the developed e-module. A separate questionnaire is also provided for teachers to evaluate the e-module from their perspective.

The fifth stage is the evaluation stage, which is conducted starting from the first stage, where each stage that has been performed is evaluated.

E-Module Qualification

The e-module, which has been developed by the design team and fulfills the required components, must undergo a feasibility test before being implemented by learners. This feasibility test ensures that the e-module is truly suitable and appropriate for use in the learning process. The feasibility test is performed by having validators complete a feasibility questionnaire prepared by the researchers. The resulting percentage data obtained from this assessment is presented in **Table 1** below.

Table 1. E-Module Qualification Percentage

No	Validator	Percentage (%)	Kategori
1	Material Expert	88,3	Highly Qualified
2	Linguist	92,7	Highly Qualified
3	Designer	94,5	Highly Qualified
4	Teacher of Class V.A	85,3	Highly Qualified
5	Teacher of Class V.B	82,6	Highly Qualified

Source: Research, 2024

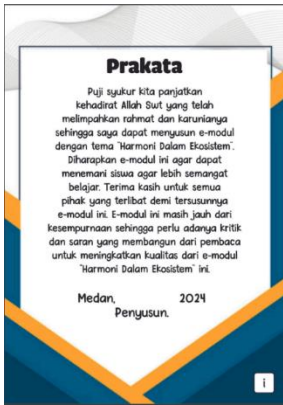
Based on the feasibility test, the developed e-module was suitable for use, as indicated by the percentage scores obtained in each evaluation aspect. The module received a score of 88.3% for the material aspect, 92.7% for the language aspect, and 94.5% for the design aspect. Additionally, the evaluations provided by two teachers as practitioners yielded scores of 85.3% and 82.6%, respectively. These percentages fall into the "highly feasible" category, indicating that the module meets the required standards and, therefore, the feasibility test was conducted only once. In addition to the quantitative data, qualitative feedback in the form of critiques and suggestions for improvement was also obtained from the validators, contributing to refining the e-module.

Based on the validation results, the revised and improved aspects aim to explore several relevant factors in the product development process. The components of the e-module received an excellent percentage

from all validators. Subject matter expert validators had a percentage of 83.33% categorized as highly valid, language experts with a percentage of 92.7% categorized as highly valid, resulting in good learning material, with a particular emphasis on interactivity and language appropriateness, and design experts had a percentage of 94.5% categorized as highly valid. In comparison, teachers 1 and 2 had percentages of 85.3% and 82%, respectively. Based on these percentage results, it can be stated that the developed e-module is deemed highly feasible and has met the design standards according to the indicators offered. This aligns with Nieveen's opinion in the book *"Prototyping to Reach Product Quality,"* which states that validity is the first quality criterion in producing a viable product. Other research outlines the stages involved in creating a product that can be tested in the field, which includes the validation stage. (Dewi & Diansah, 2022; Firdaus & Wilujeng, 2018).

In addition to providing numerical data on the e-module, the validator also offers suggestions and critiques for improving the developed e-module. The suggestions from the validator are displayed in Table 2 as follows.

Table 2. Recommendations from the Validator for the E-Module

Before Revision	After Revision
 	 
	

Source: Research, 2024

The enhancement of the e-module follows recommendations from subject matter, language, and design experts to ensure its effectiveness for students in the learning process. After adjustments based on the validators' feedback, the e-module will be ready for implementation to aid students' comprehension of the material. A feasibility test is conducted to confirm that the e-module aligns with the curriculum requirements. An e-module with thorough content will help students grasp the subject matter.

In addition to conducting feasibility tests on the e-module, several tests were performed on the research instruments. The tests were conducted to measure the initial and final abilities of students in class V.A, who received treatment in the form of the developed e-module, and class V.B, which followed the regular learning process without using the e-module. The tests conducted included feasibility testing, reliability testing, difficulty level testing, discrimination power testing, and distractor power testing, with the results of these tests presented in Table 3 as follows.

Table 3. Data Results of Instrument Test

Feasibility Test	Reliability Testing	Difficulty Level Test	Capability of Variation	Deception Ability Test
Valid question; 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 24, 25, 26, 27, and 28. Invalid question; 19 dan 23	The reliability of the test is 0.756.	Questions of the difficult category: 4, 5, and 25; questions of the moderate category: 1-3, 6-15, 17, 18, 20-24, and 26; questions of the easy category: 16.	Eleven questions were categorized as good, nine as satisfactory, two as insufficient, two as poor, and four as very poor.	20 questions with acceptable answer options and eight questions with rejected answer options.

Source: Research 2024

Based on tests of the research instrument in the form of an exam, 26 out of 28 questions were deemed suitable, indicating that the test can be used in the learning process to measure students' learning outcomes. Conversely, two questions were found unsuitable for use in the learning process. After the feasibility test, a reliability test was conducted to determine the consistency of the test in measuring students' learning outcomes across various difficulty levels, including hard, medium, and easy. The discrimination test categorized the questions as good, adequate, poor, bad, and very poor. Based on the distractor test, questions with acceptable and rejected answer alternatives were identified. It can be concluded from the testing of the research instrument, which took the form of a test, that 20 questions were used to measure students' learning outcomes.

Practicality of E-Module

The practicality of the e-module is assessed through response questionnaires administered to students and teachers during the learning process after its implementation. The practicality of the e-module is necessary to determine how easily students can apply it. Based on the practicality test conducted with students, a practicality percentage of 82% was obtained, categorized as "very practical." Additionally, a practicality percentage of 89.5% from teachers was obtained, also categorized as "very practical." The e-module used by students should be practical teaching materials, meaning it is easy for students to use so that the developed teaching materials can genuinely help students understand the learning material, as good teaching materials are those that facilitate students in comprehending the learning content, thus achieving the predetermined learning objectives (Amini et al., 2024).

Based on the acquisition of the questionnaire given to students, the developed e-module can be accessed by students anywhere and anytime, as it is compatible with the gadgets that students now possess. This

is a new experience for students, as they have traditionally only learned using printed teaching materials, which can sometimes be boring. The development of this technology-based teaching material also trains students to utilize technological advancements, enabling them to become technologically literate.

Effectiveness of E-Module

Effectiveness refers to the extent to which the experiences and outcomes of an intervention align with its intended objectives. Based on the effectiveness test of the e-module product using the effectiveness calculation formula, the processing and research conducted showed an improvement in critical thinking skills during field trials. This data suggests that using CTL-based e-modules is more effective in enhancing student learning outcomes.

Based on data processing, it was found that there is a difference in learning outcomes between the experimental class and the control class. The two classes had different learning outcomes, where the experimental class achieved an average score of 77.3 on the posttest, while the control class, which did not use the e-modules, had an average score of 70.8 on the final posttest. The results significantly improved in the experimental class. The average score was subjected to analysis through normality tests, homogeneity tests, and hypothesis tests as prerequisites for analyzing the research data. The normality test results for learning outcomes in the experimental class indicated that the significance value of the pretest learning outcomes was greater than 0.05 ($0.175 > 0.05$). The significance value of the posttest learning outcomes in the experimental class was also greater than 0.05 ($0.063 > 0.05$), concluding that the research data is usually distributed. Subsequently, the homogeneity test results indicated a significance value for the homogeneity test on the posttest data of 0.276, which is greater than 0.05, and on the pretest data of 0.741, which is also greater than 0.05. Therefore, it can be concluded that the data is homogeneous. Finally, the hypothesis test yielded a two-tailed t-test result of 3.152. Referring to the decision-making criteria, this means that $3.152 < 0.05$ or H_0 is rejected and H_1 is accepted. The class that used the CTL-based e-module achieved higher learning outcomes than those that did not use the developed e-module. This finding is also consistent with previous research, which suggests that applying the CTL model can improve students' learning outcomes, as it encourages students to learn actively (Lestari et al., 2023). Moreover, previous research has also indicated that the application of the CTL model can enhance students' interest in learning since, during the learning process, students do not feel bored as the stages of the CTL model are engaging and students are actively involved with a student-centered learning process (Hamsia et al., 2023).

According to Harefa et al. in the book "*Buku Ajar: Teori Belajar dan Pembelajaran*," several learning theories support research on learning outcomes. These theories include 1) Constructivism Theory: This theory emphasizes a student-centered learning process and supports independent learning; 2) Behavioral Theory: This theory emphasizes that students will be more motivated in the learning process if they know they will achieve good results. Teachers inform students of their learning outcomes, correct mistakes made by students, and provide motivation. 3) Cognitive Theory: This theory states that learning is a change in perception or understanding. This theory prioritizes the learning process over the results.

Discussion

One of the essential supports in the learning process is using teaching materials. Teaching materials encompass a wide range of resources that contain learning content to help students understand the subject matter. Therefore, paying attention to the teaching materials the students use is essential. However, in reality, several challenges still exist in the learning process, one is the low interest in learning among students, resulting in poor learning outcomes. Based on the analysis, it is evident that students'

interest in learning, particularly in the subject of IPAS, is influenced by the scarcity of available materials and the lack of engagement with these materials, resulting in passive learning and, consequently, low academic achievement.

Developing engaging teaching materials aligned with students' needs can make learning active, engaging, and relevant to current times. The teaching materials learners use should be engaging to attract them to study actively. (Dewanty & Farisya, 2023; Nisaa *et al.*, 2024; Susianti, 2023). The benefits of this research are to increase the options for teaching materials used by students and teachers in the learning process, thereby making the learning process less focused on a single teaching material and providing students with supplementary learning resources. Furthermore, the developed e-module can assist students in learning anywhere and anytime, as it can be accessed using gadgets, and it also helps teachers deliver learning content because the e-module contains comprehensive material and includes engaging images that can attract students' interest in learning. This is vital because the most essential aspect of the learning process is the presence of students' interest and motivation to learn, and teachers must be able to stimulate students' interest in learning (Maylitha *et al.*, 2023).

Engaging teaching materials in IPAS learning have a positive impact on students. With the e-module, students are more interested and achieve maximum results in the learning process. The accessibility provided by the e-module enables students to review the material repeatedly until they reach the expected understanding. The e-module can serve as an alternative to address the limitations of learning resources in the IPAS subject, especially in elementary schools.

CONCLUSION

The Ilmu Pengetahuan Alam & Sosial (IPAS) e-module is based on the Contextual Teaching and Learning (CTL) model, which has been developed and is highly feasible, making it suitable for implementation in the classroom. Furthermore, the e-module demonstrates a high level of practicality and efficiency. This is supported by the learning outcomes of students in Class A, who studied using the e-module, showing higher achievement than those in Class B, who did not use the e-module. The CTL-based e-module is designed according to the stages of the CTL model, which fosters an active and engaging learning environment. It employs language that is clear and accessible, enabling students to easily understand the material and access it anytime, anywhere, thereby enhancing their learning outcomes. As a recommendation for future research, it is suggested that other researchers consider developing teaching materials for different Integrated Science topics and other subjects by leveraging technology and incorporating diverse instructional models. This approach is expected to make learning more dynamic, interactive, and enjoyable.

AUTHOR'S NOTE

The authors declare that there are no conflicts of interest related to the publication of this article. The authors affirm that the data and content of the article are free from plagiarism.

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