



Interactive Visual Auditory Kinesthetic-Based E-Module to Enhance Elementary School Students' Learning Outcomes

I Gede Suriantara*, Putu Sanjaya, Ni Nyoman Lisna Handayani

Institut Agama Hindu Negeri Mpu Kuturan, Singaraja, Indonesia

*igedesuriantara1811031287@gmail.com

Abstract

This study aims to design an e-module that integrates visual auditory and kinesthetic approaches to teaching sixth-grade elementary school students about the properties of magnets in everyday life, using criteria that are valid, practical and effective in improving learning achievement. This study uses Thiagarajan's 4D model, which consists of four stages Define, Design, Develop and Disseminate. Data were collected through questionnaires and multiple-choice tests. Data analysis included quantitative and qualitative descriptive approaches, as well as inferential statistical analysis using the t-test. The validity of the module was evaluated using Gregory's formula, practicality was calculated using the mean value, while effectiveness was tested using an independent sample t-test. The results of the study indicate that the e-module is highly valid (Aiken's $V = 1.00$), highly practical (average practicality score = 67.6), and effective in improving student learning outcomes ($t = 3.797$; $p < 0.05$; effect size = 1.39). This visual-auditory-kinesthetic-based e-module is suitable for use as a learning medium to improve the learning outcomes of sixth-grade elementary school students.

Keywords: E-module; Learning Outcomes; Visual Auditory Kinesthetic

Abstrak

Penelitian ini memiliki tujuan untuk merancang e-modul yang mengintegrasikan pendekatan visual, auditori dan kinestetik pada materi sifat-sifat magnet dalam kehidupan sehari-hari bagi siswa kelas VI SD dengan kriteria valid, praktis, serta efektif dalam meningkatkan prestasi belajar. Penelitian ini menggunakan model 4D menurut Thiagarajan yang terdiri 4 tahapan yaitu Define, Design, Develop, dan Disseminate. Data dikumpulkan melalui metode kuesioner dan tes pilihan ganda. Analisis data meliputi pendekatan deskriptif secara kuantitatif dan kualitatif, serta analisis statistik inferensial menggunakan uji-t. Validitas modul dievaluasi dengan rumus Gregory, kepraktisan dihitung menggunakan nilai rata-rata (mean), sedangkan efektivitas diuji dengan independent sample t-test. Hasil penelitian menunjukkan bahwa e-modul dinyatakan sangat valid (Aiken's $V = 1,00$), sangat praktis (rata-rata skor kepraktisan = 67,6) dan efektif dalam meningkatkan hasil belajar siswa ($t = 3,797$; $p < 0,05$; effect size = 1,39). E-modul berbasis visual auditori kinestetik ini layak digunakan sebagai media pembelajaran untuk meningkatkan hasil belajar siswa kelas VI SD.

Kata Kunci: E-Modul; Hasil Belajar; Visual Auditori Kinestetik

Introduction

Education is a pillar that plays an important role in influencing all aspects that support the progress of the nation and state. Education can be defined as a dynamic ability that greatly influences a person's development, including spiritual, social, physical and moral development. Education is a programmed and continuous activity. Education is not only about activities, but also includes the teaching and learning process (Hasbullah et

al., 2019). The improvement in competence and development experienced by students cannot be separated from the continuous learning process. The advancement of information and communication technology continues to bring significant changes in various aspects of life, including education. According to Kamus Besar Bahasa Indonesia (KBBI), transformation refers to a change in form, nature, or function. In the context of education, this transformation shapes how learning is delivered and experienced. Nugraha et al., (2021) explain that transformation is an ongoing process that happens continuously and gradually, leading to improvements from previous conditions.

As a result, educational institutions are encouraged to adapt to these positive, technology-based changes to support both teachers and students more effectively. The world of education is inseparable from transformation and educational transformation occurs to improve the effectiveness of existing aspects of education. It is hoped that educational transformation can bring about changes in improving the quality of human life, enabling people to take control of themselves. This includes securing decent employment, living in a good environment, expanding human knowledge and thinking and being able to distinguish between good and bad actions. The presence of transformation is expected to develop the potential inherent in each individual (Hasibuan et al., 2021).

The education sector is certainly open to everyone. In education, there is a process called the learning process, which essentially involves creating an environment that encourages growth in the learning process. Learning should also enable educators to provide guidance and support to students in carrying out the learning process. Learning is also known as the process of gathering new information and knowledge about things that were previously unknown. Learning is expected to bring about change in everyone who engages in it.

One of the subjects taught in elementary school is Natural Sciences (IPAS), which focuses on mastering facts and concepts, also on developing discovery skills through scientific investigation. This helps students better understand themselves and their environment. However, IPAS learning still relies heavily on standard school textbooks, which are often too text-heavy and monotonous then reducing student motivation and interest. The wide scope of material combined with limited classroom time makes it difficult for students to fully grasp the content, necessitating independent study at home.

Therefore, there is an urgent need for engaging, practical and student-friendly instructional materials that align with students' learning characteristics. One promising solution is the use of e-modules based on visual auditory kinesthetic (VAK) learning styles. E-modules represent an innovation in learning media by integrating conventional teaching materials with digital technology to create more interactive and engaging content. As Setiawan (2018) states, information and communication technology serves as a medium to deliver knowledge and skills more efficiently. With the rise of digital tools in education, modules that were once only available in print can now be accessed electronically, making learning more flexible and accessible (Karnando et al., 2021).

The use of e-modules is expected to increase student participation, particularly in primary education by offering materials that are visually appealing, easy to use and supportive of independent study. Beyond that, e-modules can help direct students' digital habits towards educational purposes with teachers playing a role in guiding students to explore positive and meaningful content through their devices. Based on the above explanation, the researcher endeavors to develop e-module learning media for the IPAS subject in sixth grade.

Based on the findings of a researcher who also works as a teacher at SD Negeri 2 Banyuatis, it is known that the school does not yet have IPAS e-modules that can be used to support the learning process. So far, learning has relied on conventional teaching materials such as Merdeka Curriculum textbooks and other supporting books available in the library. With the experience of online learning during the COVID-19 pandemic and the implementation of digital literacy at the school, the majority of students (approximately 95%) are already accustomed to using smartphones. In fact, around 50% of them are already familiar with and able to access learning through educational technology-based applications.

Student learning outcomes in IPAS subjects are still relatively low. Data shows that around 73.69% of students have not yet achieved the Minimum Passing Criteria (KKM). This low achievement can be attributed to several factors, such as the complexity of IPAS material, limited learning time at school and low student interest in reading conventional books, which are considered too text-heavy and uninteresting. Material that is not presented interactively also makes students less interested in delving deeper into the subject. Therefore, the development of e-modules based on visual auditory and kinesthetic (VAK) approaches is needed to enhance both student motivation and learning outcomes. These e-modules are expected to provide a more engaging learning experience, be easily accessible both at school and at home and support the use of technology in the educational process. Learning can be defined as effective if the learning process actively involves students in the learning process (Bulkini and Nurachadijat, 2023). It also utilizes all sensory functions to support meaningful learning for students, so that what has been learned can be well understood and maximum learning outcomes can be achieved. The learning model that supports this research is the visual auditory kinesthetic learning model.

According to Setiawan and Alimah (2019) learning using the visual auditory kinesthetic model is learning that uses three modalities in learning, which include seeing, hearing and moving. The visual auditory kinesthetic model is a learning model that maximizes the three modalities that humans already have so that students can learn optimally and comfortably. This learning model can provide students with a different learning experience because they can learn directly by engaging in activities such as seeing (visualization), hearing (auditory) and moving (kinesthetic). The use of e-modules in IPAS learning in elementary schools is highly recommended because it supports the use of technology and can also be a means of improving teacher competence (Febrianti, 2021). Especially for the fairly extensive IPAS material for sixth grade, the e-module is expected to help students understand the material more concisely and clearly. Its attractive, colorful design, complete with educational games, can foster a spirit of learning. In addition, the e-module allows students to study independently at home with the support of visual, auditory, and kinesthetic approaches, making the learning process more effective and enjoyable. This medium is believed to significantly increase student motivation and learning outcome. This study was conducted with the aim of developing a valid, practical and effective e-module based on visual auditory and kinesthetic learning for magnet-related material to enhance IPAS learning outcomes among sixth-grade elementary school students.

Method

This study is a research and development (R&D) that uses the 4D development model proposed by Thiagarajan, which consists of four main stages Define, Design, Develop and Disseminate. The research was conducted at SD Negeri 2 Banyuatis, with the research population consisting of all 30 sixth-grade students in the 2024/2025

academic year. The subjects of this study include two groups. The first group consists of experts, including two subject matter experts and two media experts who evaluated the validity of the e-module. The second group comprises the users of the e-module, namely the teachers and 30 sixth-grade students at SD Negeri 2 Banyuatis, who exhibit diverse characteristics. The instruments used in this study included expert validation sheets, practicality questionnaires, multiple-choice test questions to measure student learning outcomes and student learning outcome documents. Data collection techniques were carried out through the distribution of questionnaires and the implementation of tests. The product trial design was conducted on a large scale using a quasi-experimental approach in the form of a Non-Equivalent Pretest and Posttest Control Group Design. A total of 30 students were randomly divided into two groups using a lottery technique, namely the experimental group and the control group, each consisting of 15 students. The experimental group participated in learning using visual auditory and kinesthetic-based e-modules, while the control group received conventional learning. Before learning, both groups were given a pretest to determine their initial abilities and an equivalence test was conducted. After the intervention, a posttest was administered to measure learning outcomes. Data analysis was conducted using descriptive quantitative and qualitative techniques. The validation sheets and questionnaires were reviewed by experts to determine content validity using Gregory's formula. The reliability of the multiple-choice test instrument was analyzed using Cronbach's Alpha to ensure internal consistency. Prior to hypothesis testing, assumptions of normality and homogeneity were tested to ensure the appropriateness of parametric analysis. Practicality was calculated through the average questionnaire score and effectiveness was analyzed using an independent sample t-test and effect size calculations to assess differences and the strength of influence between groups. All data were analyzed using SPSS and Microsoft Excel 2019 software.

Results and Discussion

1. Define Stage

The define stage was carried out in four stages of analysis, including (1) Curriculum analysis, which was carried out by reviewing the Basic Competencies of IPAS in the 2013 Curriculum for Grade VI in Theme 5. The main focus was on the ability to identify the characteristics of magnets in everyday life. The results were described in five indicators identifying, explaining, analyzing, concluding and comparing the characteristics of magnets. These indicators are used as the basis for formulating learning objectives, as well as selecting appropriate learning media and strategies, (2) Learning objective analysis, where objectives are formulated based on the indicators that have been compiled and adapted to the characteristics of sixth-grade students and the visual auditory and kinesthetic learning style approaches. These objectives include students are able to identify, explain, analyze, conclude and compare the properties of magnets through interactive e-modules, (3) Analysis of student characteristics, where students are at the concrete operational stage and tend to understand material more easily through real and contextual media. Based on interviews, students showed a high interest in using digital media such as smartphones and laptops in learning. This trend is supported by the availability of devices and students' habits in accessing technology in their daily lives, and (4) Analysis of the material, where the material was developed based on relevant topics from the 2013 Curriculum and learning needs in the classroom, with input from sixth-grade teachers. The material is sourced from textbooks, teacher teaching materials and other relevant references, then systematically reorganized to align with the principles of the VAK learning style. The material focuses on the basic concepts of magnetic properties and is broken down into subtopics, indicators and learning objectives.

2. Design Stage

a. Constructing Criterion-Referenced Test

In the stage of constructing criterion-referenced tests, researchers develop evaluation instruments designed to measure the achievement of specific learning objectives in accordance with the basic competencies that have been established. To ensure the validity and appropriateness of the content, the instruments that have been developed are then validated by experts before being used in data collection. These experts consist of two subject matter experts and two media experts.

b. Media Selection

Selection of learning media that are appropriate for visual auditory and kinesthetic (VAK) learning styles. At this stage, media selection is carried out by considering the characteristics of sixth-grade elementary school students and the material requirements for the IPAS subject. The media used in the development of e-modules are designed to accommodate the three main learning styles, namely visual auditory and kinesthetic, with the aim of improving learning outcomes and helping students understand the material more optimally. Visual media is selected in the form of illustrative images, concept diagrams and attractive e-module interface displays. This media aims to support visual learning styles and help students visualize abstract concepts in IPAS material. Auditory media is presented in the form of voice narration that explains the content of the material. This narration is played automatically or manually according to user needs. The presence of auditory media allows learners to learn by listening, which is particularly beneficial for students with an auditory learning style. Kinesthetic media is presented through interactive activities such as practice exercises with immediate feedback and simple simulations that learners can perform directly using the devices they are using. These activities are designed to stimulate active engagement and provide hands-on learning experiences aligned with the kinesthetic learning style.

c. Format Selection

Determining the structure and appearance of e-modules so that they are attractive, interactive and easy to use. At the format selection stage, researchers chose e-module presentation formats that are visually appealing, easy to understand and suitable for students' characteristics. Canva was chosen as the e-module creation platform because it is considered practical and flexible. Through the Canva application, researchers can freely customize the appearance and easily insert various multimedia elements such as images, videos and animations. The e-module display is designed in portrait format with A4 size so that it can be easily opened on various devices and printed if needed. The content of the e-module is structured and arranged in sequence, covering important sections such as the cover, introduction, table of contents, instructions for use, basic competencies, learning objectives, main material, learning activities, exercises, evaluation and bibliography. The number of pages in the developed e-module is 16 pages. Each page is formatted with a consistent and neat layout to ensure students can use it independently without difficulty and remain comfortable throughout the learning process.

d. Initial Design

The initial design of the e-module includes the content, presentation and other supporting elements for learning. During the initial design stage, a basic framework for the e-module is developed, which serves as the groundwork for creating learning materials tailored to visual auditory and kinesthetic learning styles. This process includes organizing the content structure, designing an attractive interface, selecting language appropriate to students' comprehension levels and arranging page layouts to support learning comfort for sixth-grade elementary school students. The appearance of the e-module product can be observed in Figures 1, 2, 3, 4, 5 and 6.



Figure 1. E-Modul Cover



Figure 2. User Guide



Figure 3. Presentation of Material



Figure 4. Presentation of Video



Figure 5. Evaluation Questions



Figure 6. Summary and Glossary

3. Develop Stage

a. Expert Appraisal

This stage aims to obtain input and assessment of the e-module in terms of content and media. The assessment is carried out by two experts, namely a content expert and a media expert. The content expert assesses the suitability of the content with the basic competencies as well as the accuracy and completeness of the material. Meanwhile, the media expert assesses the visual aspects, interactivity and ease of use of the e-module. The evaluation results are analyzed using Aiken's V coefficient to measure the level of agreement among experts regarding the relevance of the items. The closer the value is to 1, the higher the validity of the module's content is deemed to be. The test results can be examined in table 1.

Table 1. Validity Test Results

No	Description	Aiken's V Value	Category
1	Evaluation from content expert I and II	1,00	Very high
2	Evaluation from media expert I and II	1,00	Very high

Source: Data Research, 2025

During the development of e-modules, ensuring content validity is a very important step because it is directly related to the suitability of the material, its alignment with the curriculum and its compatibility with the characteristics of the learners. In this study, the validity of e-modules based on visual auditory and kinesthetic (VAK) learning

styles was assessed through a validation test by two judges. The judges are lecturers with expertise in IPAS education at the elementary school level. Their task is to evaluate the content of the material. The judges are also experts in digital learning who have experience in designing interactive multimedia and play a role in evaluating the media aspects of the developed e-module.

Content experts assessed five main components or aspects, namely curriculum alignment, completeness and accuracy of content, visualization of content, use of communicative language and suitability of evaluation instruments. Based on the calculations, all items on the validation sheet assessed by content experts received an Aiken's V score of 1.00, indicating that all aspects of the e-module content were rated as excellent and relevant for use in learning. The average Aiken's V score of 1.00 indicates a very high level of content validity according to experts, so it can be concluded that the content of the e-module meets the criteria for content validity and is suitable for use.

Media experts assessed the e-module from both design and technical perspectives, covering aspects such as overall appearance, text readability, image quality, color selection and page layout. Based on the calculations, all items obtained an Aiken's V score of 1.00, indicating that the media aspects of the e-module are highly valid and relevant for use in learning. This average Aiken's V score of 1.00 also reflects a very high level of media validity. It shows that visually and technically, the e-module has met quality standards that support students' learning comfort.

Based on the evaluations from subject matter experts and media experts, the alignment of the e-module content with the 2013 Curriculum is a crucial aspect to consider, as it determines whether the learning material is consistent with the core competencies, learning outcomes and curriculum elements applicable at the elementary school level. If the content is not developed in accordance with the curriculum, there is a risk that the learning process will become unfocused and students may fail to achieve the expected competencies (Purwowododo and Zaini, 2023).

A mismatch between the learning material and the curriculum can lead to inaccurate assessment of learning outcomes, as it may measure competencies that are not aligned with those students are actually expected to achieve (Bahri, 2023). Ensuring that the e-module is developed based on the 2013 Curriculum is not merely a matter of administrative compliance, but also a reflection of pedagogical responsibility. Such alignment helps make the learning process not only more engaging and interactive, but also structured, relevant and aligned with the goals of national education.

In the development of e-modules, good visualization not only makes the module more visually appealing but also facilitates students' cognitive processes in absorbing and retaining information. This is in line with the principles of multimedia learning, which state that the integration of text and images can enhance learning effectiveness, especially for elementary school children who are still in the concrete operational stage of cognitive development (Qomara et al., 2024). The results of this study are in line with the results of research from Fitriya et al., (2024) who stated that the use of interactive visualization in learning media significantly enhances students' memory and conceptual understanding. With the support of appropriate images and animations, students can more easily connect theoretical concepts to real-life situations, making the learning process more meaningful and enjoyable.

b. Developmental Testing

At this developmental testing stage, the practicality of the visual auditory and kinesthetic-based e-module was evaluated by involving teachers as the main respondents or practitioners. Teachers were selected due to their crucial role in implementing the e-module within real classroom settings. The purpose of this testing was to determine the

extent to which the e-module is user-friendly, understandable and supportive of the learning process at SD Negeri 2 Banyuatis. The results of the practicality test can be seen in Table 2 and the practicality category is presented in Table 3.

Table 2. Results of the Practicality Test of the E-Module

Description	Total Score	Average
Respondents 1	69	4,60
Respondents 2	67	4,47
Respondents 3	69	4,60
Respondents 4	65	4,33
Respondents 5	68	4,53
Total	338	22,53
Average	67,6	4,51
Mi	45	
SDi	10,05	

Source: Data Research, 2025

Table 3. Practicality Category of the E-Module

No	Formula	Category
1	$\bar{X} > (Mi + 1,8 SDi) = 45 + 1,8 \times 10,05 = 45 + 18,09 = 63,09$	Very practical
2	$45 + 0,6 \times 10,05 < \bar{X} \leq 63,09 = 51,03 < \bar{X} \leq 63,09$	Practical
3	$45 - 0,6 \times 10,05 < \bar{X} \leq 51,03 = 38,97 < \bar{X} \leq 51,03$	Quite practical
4	$45 - 1,8 \times 10,05 < \bar{X} \leq 38,97 = 26,91 < \bar{X} \leq 38,97$	Less practical
5	$\bar{X} \leq 26,91$	Not practical

Source: Data Research, 2025

The results of the practicality test conducted by five teachers, as shown in Table 2, indicate that the average overall score of all assessed aspects was 67.6. This score was then converted using the practicality assessment criteria in Table 3, showing that it exceeded the threshold for the 'Very Practical' category, which is 63.09. Therefore, the e-module is classified as Very Practical, meaning this media is considered highly suitable for use in sixth-grade social science learning at the elementary school level. Teachers evaluated the module as easy to access, with clear user instructions, visually appealing and age-appropriate design and interactive activities that effectively support visual auditory and kinesthetic learning styles in a balanced manner.

The results of this study are in line with the findings of Atikah et al., (2021) which emphasize that ease of access and clear usage instructions are essential for teachers to effectively utilize learning media without facing technical difficulties. An attractive visual design that is appropriate for the students' age plays a significant role in maintaining learners' interest and attention throughout the learning process. Interactive activities designed to accommodate visual auditory and kinesthetic learning styles in a balanced manner provide opportunities for all types of learners to actively engage, making the learning process more effective and enjoyable (Ulinuha, 2024). A practical and user-friendly e-module like this strongly supports teachers in delivering social science material innovatively while also improving student learning outcomes.

4. Disseminate Stage

a. Validation Testing

This stage aims to test the effectiveness of the e-module based on visual auditory and kinesthetic (VAK) learning styles in improving student learning outcomes. The design used in this stage is a quasi-experimental design with a Non-Equivalent Pretest and Posttest Control Group Design model. The study was conducted at SD Negeri 2

Banyuatis, involving 30 sixth-grade students as subjects. The experimental and control groups were determined through random sampling using a lottery method. From the lottery, 15 students were assigned to the experimental group and 15 to the control group.

After group formation, a pretest was administered to both groups to measure initial abilities. The pretest results were then analyzed using an equivalence test to ensure that both groups were comparable at the baseline. Normality tests on the pretest data were conducted before proceeding to the equivalence test as a prerequisite to ensure that the data to be analyzed met the assumption of normal distribution. Similarly, normality tests on the posttest data were performed prior to the next stage of analysis to confirm that the data met the normality assumption. These tests were carried out using the Kolmogorov-Smirnov test with the assistance of SPSS 23 and the results are presented in Table 4.

Table 4. The Results of Normality Test

Test	Group	Sig Value Kolmogorov-Smirnov	Sig Value Shapiro- Wilk
Pretest	Experiment	0,200	0,115
	Control	0,107	0,202
Posttest	Experiment	0,200	0,115
	Control	0,107	0,202

Source: Data Research, 2025

Based on the test results in Table 4, the significance values for both groups (experimental and control) were greater than 0.05. This indicates that the pretest and posttest data for both groups are normally distributed. After confirming normal distribution, a homogeneity of variance test was conducted. This test aims to determine whether the data from both groups have equal variances. The test was performed using Levene's Test with the assistance of SPSS 23 and the analysis results are presented in Table 5 below.

Table 5. The Results of Homogeneity of Variances Test

Test	Levene Statistic	Sig.
Pretest	0,178	0,676
Posttest	1,513	0,229

Source: Data Research, 2025

Based on the test results in Table 5, the significance value for the pretest category was 0.676, which is greater than 0.05. This indicates that the variance of the pretest data from the experimental and control groups is homogeneous or equal. Similarly, the significance value for the posttest category was 0.229, also greater than 0.05, indicating that the variance of the posttest data from both groups is homogeneous or equal. Therefore, the analysis can proceed to the effectiveness test or hypothesis testing. Before administering the treatment, an equivalence test of initial abilities between the experimental and control groups was conducted to ensure both groups had comparable baseline skills. This step was necessary to confirm that any differences in learning outcomes after the treatment were truly caused by the intervention, rather than initial differences between the groups. The test was performed by comparing pretest scores using an independent two-sample t-test with the assistance of SPSS 23 and the results are presented in Table 6.

Table 6. The Result of t-Test for Equality of Means

	Statistics	Sig. (2-tailed)
Nilai Pretest	Equal variances assumed	0,351
	Equal variances not assumed	0,351

Source: Data Research, 2025

Based on the test results in Table 6, the significance value obtained was 0.351, which is greater than 0.05. This indicates that there is no significant difference in the initial abilities between the experimental and control groups before the treatment was administered. It can be concluded that both groups had equivalent baseline abilities, making them suitable for comparison in testing the effectiveness of the treatment provided. The hypothesis test was conducted using the one-sample t-test method processed through SPSS 23. The test results can be observed in table 7.

Table 7. The Result of One Sample t-Test

Statistics		F	Sig.	t	df	Sig.
Nilai Posttes t	Equal variances assumed	1,51	0,22	3,797	28	0,001
	Equal variances not assumed	3	9	3,797	25,8	0,001

Source: Data Research, 2025

Based on the test results, the t_{count} was 3.797, which is greater than the critical t_{table} of 1.701. The significance value (2-tailed) obtained was 0.001, which is less than the significance level of 0.05, leading to the rejection of the zero hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). Therefore, it can be concluded that there is a significant difference in student learning outcomes between the group using the visual auditory and kinesthetic-based e-module and the group following conventional learning methods in the social science subject on the properties of magnets in the sixth grade at SD Negeri 2 Banyuatis. To determine the magnitude of this effect or its effectiveness, the effect size will be calculated. The effect size calculation for the t-test was conducted using Cohen's formula (Tela, Yulian, & Budianingsih, 2019) as follows:

$$d = \frac{\bar{x}_1 - \bar{x}_2}{S_{gab}}$$

The formula for calculating the S_{gab} as explained by Becker in Tela et al., (2019) is:

$$\begin{aligned}
 S_{gab} &= \sqrt{\frac{(n_1 - 1)S_1^2 + ((n_2 - 1)S_2^2}{n_1 + n_2 - 2}} \\
 S_{gab} &= \sqrt{\frac{(15 - 1)(5,64)^2 + ((15 - 1)(7,59)^2}{15 + 15 - 2}} \\
 S_{gab} &= \sqrt{\frac{445,54 + 804,84}{28}} \\
 S_{gab} &= \sqrt{44,77} = 6,69 \\
 d &= \frac{92,67 - 83,40}{6,69} = 1,39
 \end{aligned}$$

Based on the calculation results, the effect size value obtained was 1.39. Compared to the established criteria, this value is above 0.8, indicating a large effect size. Therefore, it can be concluded that this interactive e-module is effective in improving student learning outcomes. An e-module is considered effective if it can facilitate students in achieving learning objectives optimally, help them better understand the material and encourage active participation throughout the learning process (Syafa et al., 2022). A well-designed e-module also serves as a supportive tool for teachers in delivering material more systematically and variably, making the learning experience more enjoyable and

meaningful (Puspitasari, 2019). Generally, effective e-modules are developed by considering learning principles aligned with students' cognitive development and integrating various supporting media such as text, images, audio and interactive activities. This approach aims to ensure that the material is not only easy to comprehend but also caters to diverse learning styles, including visual auditory and kinesthetic. An e-module that integrates visual auditory and kinesthetic approaches offers distinct advantages in enhancing learning outcomes. By delivering material through multiple sensory pathways, students are able to grasp concepts more comprehensively as their individual learning styles are accommodated (Asmayan et al., 2024).

This approach brings learning to life and makes it more enjoyable, while also strengthening students' retention and comprehension by simultaneously engaging their thinking, emotions and physical movement. An interactive e-module design allows students to learn at their own pace and according to their individual needs. They can revisit the material as many times as necessary until full understanding is achieved, without the time pressure typically found in classroom settings. This flexibility is especially beneficial for elementary school students who are still in the concrete operational stage of cognitive development and require real, contextual learning experiences suited to their developmental level.

The results of this study are in line with the findings of Linda (2021) which indicate that interactive e-modules have proven effective in improving student learning outcomes due to their ability to present material in an engaging, easy-to-understand manner while also providing interactive features that encourage active student participation in the learning process. The study by Fitriya et al., (2024) revealed that interactive e-modules can transform students' learning into a more dynamic and meaningful experience, stimulating curiosity and active involvement, which in turn enhances academic performance.

The study by Mahardika et al., (2021) emphasized that e-modules are designed to assist students who struggle with learning while also offering opportunities for self-directed learning. Through the use of e-modules, students can independently assess their understanding of the material. The effectiveness of e-modules is not only evident in improved learning outcomes but is also clearly reflected in students' enthusiasm during lessons. The high level of interest and active participation observed when students use interactive e-modules tailored to their learning styles demonstrates that this medium successfully fosters motivation and curiosity.

The effectiveness of the visual auditory and kinesthetic-based e-module in significantly improving student learning outcomes, particularly in the IPAS subject for sixth-grade students at SD Negeri 2 Banyuatis, can be explained through its connection with constructivist theory, in which students build understanding through meaningful learning experiences. The e-module designed to be interactive and contextual, provides space for students to explore, observe and relate concepts to real-life experiences in accordance with the main principles of constructivist theory (Amelia et al., 2024). The use of images, sound and motion in the e-module aligns with the cognitive theory of multimedia learning, which emphasizes that learning becomes more effective when information is presented through a combination of visual and auditory channels (Fibrianti et al., 2025).

Understanding is strengthened when the delivery of material goes beyond text and is supported by visual and auditory elements that engage multiple senses in receiving information. This approach helps students process and retain the material more effectively, making learning easier to comprehend and longer-lasting. From the perspective of Bloom's Taxonomy, the improvement in learning outcomes also

encompasses the cognitive, affective and psychomotor domains. This e-module not only encourages students to recall and understand concepts (cognitive domain), but also fosters interest and motivation to learn (affective domain) and involves motor activities through kinesthetic tasks designed to align with the material. Therefore, the development of a VAK-based learning style e-module has proven effective in integrating these three theoretical frameworks into concrete and effective learning practices.

b. Packaging

Packaging is a crucial step in the final stage of developing the IPAS e-module based on visual auditory and kinesthetic learning styles before its broader implementation. In this study, the e-module was developed using the Canva platform to allow for a practical design process tailored to the characteristics of elementary school students. The content of the module focuses on the theme *Sifat-sifat Magnet dalam Kehidupan Sehari-hari*. The design of the e-module utilizes Canva's visual features such as illustrations of magnets, animations of attraction and repulsion forces and interactive diagrams to show objects that can be attracted by magnets.

To support visual learners, each explanation is paired with real-life images, such as the use of magnets on refrigerator doors, toys and electronic devices. For students who tend to have an auditory learning style, the module includes audio narration links that explain key concepts in a structured manner. These narrations were recorded by the researcher using child-friendly and communicative language. The kinesthetic element is incorporated through exploratory activities, such as encouraging students to test household items to determine whether they are magnetic or non-magnetic. All activities and instructions are presented in a neat and engaging layout using icons, chapter markers and navigation buttons that are easy for sixth-grade students to understand.

This e-module is not downloaded as a file but is instead shared directly via a Canva link, making it easy for both students and teachers to access it anytime and from any device without requiring large storage space. The ease of content updates and integration with other interactive media makes the module packaging flexible and adaptable to changing learning needs. With this packaging approach, the e-module effectively addresses the contextual learning needs of IPAS at SD Negeri 2 Banyuatis, particularly in introducing the concepts of magnetism in everyday life in an enjoyable and meaningful way.

c. Diffusion and Adoption

In this study, the e-module was distributed via a Canva link that had been shared with the IPAS subject teacher and students as the primary users. The link provided was bit.ly/emodulmagnet. The teacher received a brief orientation and training on how to access, use and integrate the e-module into daily learning activities. Students were guided to use the e-module both independently and with teacher assistance during the learning process. This approach allows flexible use of the module according to students' needs while making it easier for teachers to monitor and support the learning process. Distribution through a digital link facilitates accessibility without technical barriers, thereby accelerating the adoption of the e-module within the school environment.

Conclusion

The interactive learning e-module based on visual auditory and kinesthetic approaches for the magnet material that was developed is declared valid, practical and effective in improving the IPAS learning outcomes of sixth-grade elementary school students. The validity of the e-module is demonstrated through expert evaluations stating that the content aligns with the basic competencies, learning objectives and characteristics of the students. The practicality of the e-module is evident from its ease of use, attractive

appearance and support for various student learning styles. Meanwhile, its effectiveness is reflected in data analysis results showing a significant increase in students' learning scores after using the e-module during the learning process. In other words, this e-module is not only suitable as a learning media but also capable of positively impacting students' conceptual understanding and learning motivation in the IPAS subject.

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