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E-BOOK TEACHING MATERIALS IMPROVE IPAS LEARNING OUTCOMES OF GRADE IV ELEMENTARY SCHOOL STUDENTS

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Abstract

This study is driven by the use of less creative and dynamic teaching methods, which lead to inferior learning results by making pupils easily bored and struggling to comprehend the subject matter. The purpose of this project is to create Heyzine-assisted e-book instructional materials and to assess their viability and efficacy in improving fourth-grade students' learning outcomes. Research and development (R&D) using the ADDIE model is the methodology. Data-gathering procedures include observation, interviews, questionnaires, documentation, and pretests and posttests. The results of the assessment by experts, teachers and students show that the instructional materials are highly practical. The improvement in student learning results demonstrates the efficacy of the instructional materials. The pretest and posttest have normal distributions and indicate a substantial difference, with an N-Gain value of 0.7123 in the high category. The developed e-book can serve as an alternative interactive instructional medium to enhance student engagement in IPAS learning at SDN Bendan Ngisor, Semarang City.

Keywords: E-book-based teaching materials, learning approaches, learning outcomes

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INTRODUCTION

Every human being's identity is shaped in large part by their education. Education is undoubtedly necessary for human life and sustainability. According to (BP et al., 2022), education is a purposeful endeavour intended to establish an environment and a learning process that enables students to be more actively involved in developing their skills. Education has a significant influence on shaping human nature, both positively and negatively. In addition, education is a means of advancing a nation.

The National Education Standards stipulated in Government Regulation No. 4 of 2022, amending Government Regulation No. 57 of 2021, state that achieving quality education in Indonesia aims to educate the community, build character, and improve the nation's and the state's welfare. Education plays a very important role in shaping a young generation that is intelligent, creative, and competitive, and can enable them to develop in a better direction (Ramadhani & Andriani, 2024).

Decree Number 33, published in 2022 by the head of the Ministry of Education and Culture's Education Standards, Curriculum, and Assessment Agency, established goals for attaining the Natural and Social Sciences (IPAS) at the primary school level. This decree relates to rational considerations in the development of IPAS learning that are difficult to resolve. In IPAS learning, educators are expected to understand the IPAS learning process and continually develop teaching procedures that are grounded in learning principles to support students in developing their understanding through more meaningful and lasting methods.

Teaching materials are the most important element in teaching and learning activities. Students' learning outcomes will improve with instructional resources customised to their characteristics (Musyaffa & Isdaryanti, 2024). IPAS learning in elementary schools is also carried out with students' cognitive development in mind. According to Vygotsky's constructivist learning theory, knowledge is built through social interaction with the surrounding environment. Therefore, learning should provide opportunities for students to discuss, collaborate, and obtain scaffolding from teachers and peers, so that the concepts being learned can be understood more easily and meaningfully (Nurlina et al., 2021).

According to the Minister of National Education's Regulation No. 41 of 2007 on Process Standards, learning must be interactive, captivating, inspiring, and demanding in order to encourage students to actively participate and give them enough freedom to express their creativity and independence in accordance with their interests and talents, as well as their physical and psychological development. When technology is incorporated into educational activities, students' interest and motivation to learn may increase compared to when it is not used. Technology-based learning aims to make education more professional to develop high-quality students (Aspi & Syahrani, 2023).

As time passes in this era of globalisation, marked by rapid technological developments in modern learning endeavours, the creation of technology that can organise, package, present, and communicate learning information visually and non-visually will improve the quality of education. Digital-based teaching resources are among the innovations educators need to create. Students' boredom can be decreased by creating electronic instructional materials with technology (Millati & Setyasto, 2023).

Based on observations, conversations, and document reviews conducted by researchers with fourth-grade teachers at SDN Bendan Ngisor in Semarang, it was found that there are still obstacles to implementing IPAS learning. In the implementation of IPAS learning, the teaching materials used, such as teachers' and students' books, are sourced solely from the Ministry of Education and Culture and are not technology-based. Learning activities are dominated by teachers and short question-and-answer sessions. A lack of skills and knowledge among teachers who haven't yet integrated the latest learning models is one reason students become less active in teaching and learning activities. As a result, students lack the knowledge and skills to comprehend key concepts and tend to give up easily when faced with challenging problems. Students' concentration and academic performance are impacted by this issue, which deviates greatly from the typical Learning Objective Achievement Criteria (KKTP). For science courses, the KKTP is fixed at 70. Science subject score data are related to student learning outcomes, namely examining the types of natural resources and landscapes, along with their potential (My Area is Rich in Resources), with an incompleteness rate of 50% among 27 students. This encourages the researchers to develop e-book-based science learning tools to enhance fourth-grade students' science achievement.

A number of earlier research projects have effectively created instructional materials to enhance student learning outcomes. Research by (Wardani et al., 2021) argues that, conceptually, the construction of teaching materials can more effectively promote student learning and encourage their involvement, thereby increasing students' engagement and motivation to learn science. Previous research in line with (APRILIANA et al., 2024) which explains that teaching materials can be

assessed as highly appropriate and this has proven effective in the teaching and learning process, supported by research findings (Harahap & Marta, 2025) explains that teaching materials can be considered very suitable and have been proven to be effective in the learning and teaching process, supported by the results of research (Harahap & Marta, 2025) which explains that science teaching materials oriented to problem-based learning in IV grade elementary schools have met validity standards and are very suitable for application in the educational process. Research findings (Suci Nur Hafifah, 2024) state that digital-based teaching materials can improve students' skills during the learning process. Other research by (Wibisari & Mulyani, 2023) indicates that creating E-Book-based IPAS teaching materials is feasible for implementation in IPAS learning activities.

According to earlier research, the material is still focused only on the potential of natural landscapes without explaining natural resources, this study is unusual in that the researchers created e-book-based instructional materials on the topic of 'My Region is Rich in Resources' in IPAS learning for fourth-grade students at SDN Bendan Ngisor in Semarang City, with assistance from Heyzine. They also applied the Merdeka Curriculum and the Deep Learning Approach, and adapted the materials for the revised fourth-grade IPAS textbook for elementary schools (Fitri & dkk, 2023). The novelty of this E-Book-based IPAS teaching material lies in its Problem-Based Learning (PBL) learning model, which emphasises student activity through problem-solving to enable students to discover ideas on their own and increase their interest and drive in education.

This study also introduced new approaches, including incorporating videos into learning, using educational interactive games for assessments, and assigning creative tasks. Furthermore, the researchers provided students with songs to help them remember the information. It is anticipated that grade IV students' learning outcomes will improve as a result of researchers' development of e-book-based scientific and natural science teaching materials, especially for the “My Region is Rich in Resources” material, which can later be applied by teachers and students in the teaching and learning process. This study aims to develop teaching materials in the form of e-books that are suitable for use in IPAS learning and to test their feasibility and effectiveness in improving the learning outcomes of fourth-grade elementary school students.

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METHOD

This study employed the ADDIE development model in conjunction with the Research and Development (R&D) approach. The R&D method is a research technique used to develop new products, which are subsequently tested for usability and validity (Sugiyono, 2013).

In this study, before being used for data collection in class IVA students, the test instrument was first piloted with class VA students at SDN Bendan Ngisor, Semarang City. The trial was conducted on 50 test items to determine the quality of the instrument to be used in the research.

The validity test aimed to determine the feasibility of each test item in measuring students’ learning outcomes. Table 1 presents the results of the instrument validity from the trial test.

Table 1. Results of the validity of the question trial

Criteria	Question Number	Amount
Valid	1, 2, 6, 9, 10, 11, 12, 14, 15, 18, 22, 24, 28, 29, 31, 32, 35, 36, 45, 47	20 questions
Invalid	3, 4, 5, 7, 8, 13, 16, 17, 19, 20, 21, 23, 25, 26, 27, 30, 33, 34, 37, 38, 39, 40, 41, 42, 43, 44, 46, 48, 49, 50	30 questions

Based on the analysis, several items were declared valid because their correlation met the criteria, while items that did not meet the criteria were not used in the study. Therefore, only 20 valid items were used in the data collection stage. Next, a reliability test was conducted to determine the level of instrument consistency.

Table 2. Results of the trial question reliability test

Cornbach’s Alpha	N of Items
0.871	50

It can be concluded that the reliability test above shows a Cronbach's Alpha value of >0.70, or 0.871, indicating that the test data is considered "Reliable" with a "High" correlation and a "Good" interpretation. The reliability test results indicate that the instrument has a high level of reliability, providing stable and reliable measurement results. This indicates that the test instrument is suitable for measuring student learning outcomes in science.

Research Design

Dicky and Carey's ADDIE development approach is used to create e-book-based science teaching resources. This paradigm consists of sequential stages: analysis, design, development, implementation, and evaluation (Sugiyono, 2013).

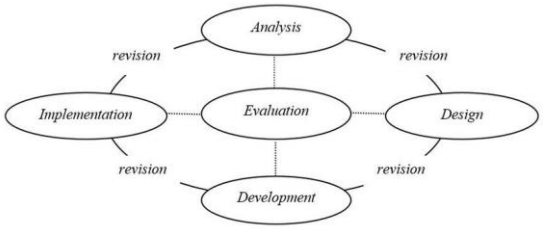

Figure 1. Stages of the ADDIE model research design

After the initial analysis stage, which focuses on determining learning challenges and priorities, the process moves to design and subsequent stages. To support the analysis, researchers conducted a needs analysis questionnaire and interviews with fourth-grade teachers at SDN Bendan Ngisor in Semarang.

The second stage is design, in which the researcher designs the initial structure and look of the E-Book based on the results of the needs analysis, which involves preparing the content, colours/visuals, graphics, audio, and video, as well as font and layout selection.

The third stage is development, during which the researcher develops an E-Book product, which is then validated by media and subject matter experts. The validation results serve as the basis for further iterations until a viable product is available.

The results of the validation were then analyzed and calculated according to predetermined eligibility criteria (Purwanto, 2018). Table 3 below shows the feasibility test criteria.

Table 3. Feasibility test criteria

Percentage	Criteria
76% - 100%	Very Suitable
51% - 75%	Suitable
26% - 50%	Fairly Suitable
0% - 25%	Less Suitable

Implementation is the fourth phase. This phase entails employing e-books in class IVA at SDN Bendan Ngisor in Semarang City. Students took a pretest before using the e-books and a posttest after the lecture during this period. Teachers and students were also given a feedback questionnaire to evaluate the product's efficacy.

The fifth stage is the evaluation stage. By comparing pre- and post-test scores, this step examines the validator's evaluation findings, as well as the teacher's and students' responses. The Shapiro-Wilk test was used to verify that the data were normal, and the t-test and N-Gain computation were used to evaluate the efficacy of creating e-book-based science teaching resources.

Research Objectives

The study subjects were 27 IVA pupils from SDN Bendan Ngisor in Semarang City. They were split into two groups: a large-group test with 21 students and a small-group test with 6 students.

This research has obtained permission from the school and the approval of the class teacher. The study was conducted in the second/even semester of the 2025/2026 academic year. The study location was SDN Bendan Ngisor in Semarang City.

Data Collection Techniques

This study applies data collection techniques in the form of tests and non-tests to obtain data regarding the feasibility and effectiveness of E-Book-based science teaching materials

Non-testing procedures include observation, interviews, questionnaires, and recordkeeping. Observation is used to observe IPAS learning activities in class IVA. Interviews are conducted with the IVA class teacher to identify needs and challenges in the teaching and learning process, while questionnaires are used to collect validation data from media and subject-matter experts, as well as feedback from teachers and students. Documentation is used to collect supporting data on learning.

The testing technique involved administering pretest and posttest questions to students in grade IVA at SDN Bendan Ngisor in Semarang City to measure the effectiveness of E-Book-based IPAS teaching materials. The data obtained was analysed for feasibility and product effectiveness. The effectiveness analysis was conducted by calculating the N-Gain using SPSS Statistics version 24 to assess improvements in student learning outcomes ((Lestari & Yudhanegara, 2017). Table 4 showed the criteria for the N-gain test.

Table 4. N-gain test criteria

Coefficient Interval	Criteria
N-gain < 0.03	Low
0.03 ≤ N-gain < 0.7	Medium
N-gain ≥ 0.7	High

RESULTS AND DISCUSSION

Based on current theory, this study was conducted in class IV A at SDN Bendan Ngisor in Semarang City, using IPAS learning in five stages include analysis, design, development, implementation, and evaluation

The first stage is analysis. Researchers, based on observations and discussions with IV A teachers at SDN Bendan Ngisor in Semarang, identified issues with the IPAS learning process. Low student interest in science contributes to daily test scores that are still below optimal, with many students scoring lower than expected, indicating insufficient comprehension. Teachers typically use books from the Ministry of Education and Culture, specifically teacher's and student books, as the primary source of information for learning activities, and they primarily use the lecture technique to teach the subject. Students quickly become disinterested and less engaged in their education as a result of this lack of methodological variation (Suprapmanto & Zakiyah, 2024).

In addition, teachers have not yet made optimal use of information technology in the classroom because they face limitations in both their abilities and the time they have to develop digital teaching materials. This situation makes the learning process less interesting and fails to utilize the potential of digital teaching materials, which can actually help improve student understanding. Success in classroom learning can be achieved when supported by appropriate and efficient teaching materials. In this way, the quality of learning can improve, students will become more motivated, and their understanding will be better (Listianah et al., 2024).

In the second stage, namely design, the researcher determined the learning objectives, detailed the material, designed the learning tools, and prepared instruments such as questionnaires or surveys for the needs of teachers and students in class IV A of SDN Bendan Ngisor in Semarang, as well as questionnaires for validation by media and material experts. All of these instruments were then incorporated into the initial draft of the E-Book-based IPAS teaching materials.

Teachers typically use Ministry of Education and Culture books, specifically teachers' and students' books, as the primary source of information for learning activities, and they primarily use the lecture method to teach the subject. Students quickly become disinterested and less engaged in their education due to this lack of methodological variation (Salsabila et al., 2023).

The Canva software was used as the primary platform to create the e-book. Visual design was the following stage. Because Canva offers a variety of graphic capabilities to facilitate e-book creation, the researchers used it (Solihah et al., 2025). The e-book uses visuals relevant to students' lives, making it easier to understand. To increase the e-book's attractiveness and pique pupils' interest in reading, the graphics are placed in an eye-catching way. The page structure is developed as needed, including a cover, foreword, table of contents, instructions for use, activity information, concept maps, learning outcomes, materials, a collection of student activities, Quizziz game-based evaluation questions, material summaries, a glossary, developer profiles, and a bibliography. The researcher developed the following media concept (Solihah et al., 2025). The e-book uses images relevant to students' lives, making it easy to understand. The illustrations are arranged attractively to make the e-book more appealing and to stimulate students' interest in reading. The page structure is developed as needed, including a cover, foreword, table of contents, instructions for use, activity information, concept maps, learning outcomes, materials, a collection of student activities, Quizziz game-based evaluation questions, material summaries, a glossary, developer profiles, and a bibliography. The media concept created by the researcher is as follows.

Figure 2. Cover, table of contents, instructions for using e-book-based IPAS teaching materials

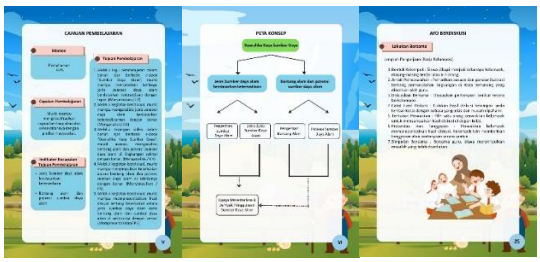

Figure 3. Learning outcomes, concept map, discussion activities in e-book-based teaching materials

Figure 4. Materials, quizizz educational evaluation questions, material summary, and glossary

The final product is presented in a digital Flipbook format via Heyzine and can be accessed on a computer, laptop, or mobile phone. Presentation in digital format allows students to read E-Books more flexibly, both at school and at home (Damayanti et al., 2023). With an attractive, easier-to-understand design, it is hoped that this teaching material will make the learning process more enjoyable and, at the same time, increase students' understanding of IPAS material, especially on the topic of "My Region is Rich in Resources."

To evaluate the feasibility of the learning materials as e-books, researchers further processed and developed them during the third phase, the development phase. During this stage, validation tests were conducted by experts, including media and materials experts. After that, the researchers made improvements based on input and suggestions from the validators, making the product very suitable for testing. Data from the validators' assessments was used to measure the extent to which open materials are suitable for use. To determine suitability, scores for each aspect were calculated. The following are the results of the validator test conducted by media experts and subject matter experts.

Table 5. Expert validation summary

Assessment Aspects	Percentage V1	Criteria	Assessment Aspects	Percentage V2	Criteria
Appearance	94.23 %	Very suitable	Appropriateness of material presentation	90 %	Very suitable
Teaching material design			Learning steps		
Usage			Assessment		

Note: V1=Media Validator; V2=Material Validator

Table 5 shows the overall average validation results. In terms of assessment, the E-Book-based IPAS teaching materials were placed in the "Highly Suitable" category, with a score of 94.23% (Nafingah & Suciptaningsih, 2024). Meanwhile, in terms of material assessment, the E-Book was also rated as "Highly Recommended" with a score of 90% (Kemendikbud, 2025).

Based on these two evaluations, this e-book is rated "very good" and can be utilised in the learning and teaching process. The e-book was developed and refined based on a range of expert validators' opinions and recommendations. The following is a draft of the e-book, which has undergone validation and review in accordance with the advice of material experts and media experts, and is ready for use in the next stage.

Figure 5. E-Book Display from the Outside

Figure 6. E-book display in terms of content
Source : https://heyzine.com/flip-book/eef6723648.html

Figures 5 and 6 show the revised IPAS teaching materials, based on E-Books and updated in line with the validators' input and suggestions.

After the validation process was completed, the next step in the fourth stage was implementation, namely testing the E-Book-based IPAS teaching materials on 27 students in class IV A of SDN Bendan Ngisor in Semarang. The researchers conducted trials in two stages: small-group and large-group trials.

The small-scale trial involved six students. At this stage, the researchers administered pre- and post-tests to assess the effectiveness of the teaching materials, as well as a feedback questionnaire to evaluate the suitability of the E-Book teaching materials. After the small-scale trial, the researcher conducted a large-scale trial involving 21 students and provided response questionnaires to assess the extent to which E-Book teaching materials are suitable for use.

Table 6. Responses to the use of e-book-based IPAS teaching materials

Response	Total Score	Percentage (%)	Criteria
Small Scale Test	213	88.75%	Very suitable
Large Scale Testing	762	90.71%	Very suitable
Teacher	38	95%	Very suitable

Table 6 demonstrates that, with percentages of 88.75% from a small-scale test, 90.71% from a large-scale test, and 95% from teachers, the replies produced when using IPAS e-book-based teaching materials were classified as extremely practical. Therefore, IPAS instructional resources in the form of E-Books can be employed in learning activities (Nafingah & Suciptaningsih, 2024).

The final stage is the evaluation stage. At this step, testing is conducted to assess the product's effectiveness. After being deemed well qualified by media and material specialists, the developed e-book-based IPAS teaching materials were used with students in class IV A at SDN Bendan Ngisor in Semarang. The application was tested in two phases: small groups of six students and big groups of twenty-one students.

Before utilising the E-Book-based IPAS teaching materials, students first complete a prepared pretest. After completing the pretest, the E-Book-based IPAS learning materials are used in the learning and teaching process to achieve the predetermined learning objectives. After the learning session, students complete the provided post-test. T-tests, N-Gain tests, and normality tests are then used to evaluate the pre-test and post-test outcomes. This study aims to assess the impact of e-book scientific teaching materials on increasing learning achievement among IVA students at SDN Bendan Ngisor in Semarang. SPSS version 24 was used to process the data. The Shapiro-Wilk test was used in this investigation to determine the normality of the data. The test results for both small and large groups are shown in the following table.

Table 7. Normality test for small scale and large scale

Scale	Types of Tests	Statistic	df	Sig.
Small Scale Test	Pretest	0.888	6	0.308
	Posttest	0.908	6	0.421
Large Scale Testing	Pretest	0.924	21	0.105
	Posttest	0.939	21	0.210

Referring to Table 7, the data show that, when evaluating in small groups, the Shapiro-Wilk normality test produced a significant value for the pretest (0.308) and the posttest (0.421). The significance value for the small group is> 0.05. This means that the data obtained from small groups has a normal distribution.

Meanwhile, in the large-group analysis, the Shapiro-Wilk test yielded p-values of 0.105 for the pretest and 0.210 for the posttest. These significant values also indicate a figure > 0.05. This indicates that the data from the large group is also normally distributed.

The next step is to conduct a parametric T-test. A paired-samples t-test was used to evaluate the impact of E-Book-based IPAS teaching materials on the learning capacities of IVA students at SDN Bendan Ngisor, Semarang City. The findings are shown in the following table.

Table 8. T-test for small scale and large scale

Scale	*Mean*	t	df	Sig. (2-tailed)
Small scale test	-30.833	-6.290	5	0.001

Large Scale Testing	-32.381	-17.244	20	0.000

Based on Table 8, significant values (2-tailed) were obtained for both the small and large groups, with sig. values (2-tailed) of 0.001 and 0.000. This indicates a significant difference, as the p-values are 0.001 and 0.000, which are < 0.05. In other words, the null hypothesis (H0) is rejected. Therefore, this shows that treatment has a very significant effect on each variable.

The next step is to conduct an N-Gain test to observe changes before and after using E-Book-based IPAS teaching materials. To determine this difference, the researcher conducted an N-Gain test, as shown in the following table.

Table 9. Small scale and large scale N-Gain test

Scale	Minimum	Maximum	*Mean*
Small Scale Test	0.43	0.83	0.6817
Large Scale Testing	0.43	1.00	0.7123

Table 9 shows that an N-Gain value of 0.6817 was obtained from the investigation's observation findings using a small-scale test. This number falls within the range 0.3 > g < 0.70, indicating a moderate level of efficacy when using IPAS e-book-based learning materials for small-group instruction. Meanwhile, large-scale analysis of the test shows that the N-Gain value is 0.7123. This value is> 0.70, indicating that E-Book-based IPAS teaching materials are highly effective when used on a large scale.

This study demonstrates the effectiveness of e-book-based IPAS teaching materials for IVA students at SDN Bendan Ngisor in Semarang, especially for the IPAS course on "My Region is Rich in Resources." These E-Books provide learning options that can reduce student boredom caused by the excessive use of lecture methods by teachers (Salsabila et al., 2023).

According to Vygotsky's constructivist theory, learning is an active process in which students construct knowledge through experiences and social interactions that are relevant to their degree of cognitive development (SALSABILA & MUQOWIM, 2024). Thus, with E-Books as teaching materials, students can understand the material more clearly and systematically. The presentation of material in E-Book form visualises natural resources and landscapes, along with their potential, so that teaching materials are better understood and more relevant.

The use of IPAS E-Book-based teaching materials in Grade IV A at SDN Bendan Ngisor in Semarang has positively contributed to students' learning. The systematic presentation of material, complete with illustrations, contextual examples, and interactive features in E-Books, has fostered students' interest in learning, strengthened their understanding of the concepts being studied, and helped them remember the information they have learned. This shows that digital teaching materials designed to be engaging and tailored to students' characteristics can create a more effective learning experience (Dewi, 2025).

The use of technology-based learning pertinent to advancing students' digital literacy is also supported by e-book-based IPAS teaching resources. Digital teaching materials allow students to learn in a more flexible, independent, innovative, and interactive manner. Through E-books, abstract IPAS concepts can be presented visually and contextually, making them easier to understand. In the material being studied, E-Books help students understand the connection between concepts, phenomena, and their use in daily activities. In addition to improving cognitive aspects, the use of E-Book-based IPAS teaching materials enhances students' active involvement in learning. Students do not only receive information passively, but are also encouraged to explore the material, connect knowledge with experience, and reflect on learning outcomes (Alif & Raharjo, 2025). This aligns with a learning approach that emphasises students' active role in building understanding through meaningful thinking and learning experiences.

This research aligns with research by (Wardani et al., 2021) which argues that, in terms of concept, the development of learning media can aid understanding and increase engagement, making students more enthusiastic and motivated to learn IPAS material. Previous research by (APRILIANA et al., 2024) indicates that this teaching material is well-suited and has been proven valid in the teaching and learning process. Strengthened by research findings by (Harahap & Marta, 2025), which show that IPAS teaching materials that use a problem-based learning method in fourth-grade primary schools have satisfied

legitimate requirements and are acceptable for application in teaching and learning activities. Research results (Suci Nur Hafifah, 2024) state that digital teaching materials can improve students' learning abilities. Other research by (Wibisari & Mulyani, 2023) explains that the development of E-Book-based IPAS teaching materials is considered appropriate for application in IPAS learning activities.

The results of this study are consistent with several other studies demonstrating the effectiveness of digital teaching resources in improving primary school students' learning outcomes. The creation of IPAS teaching materials based on e-books has demonstrated the ability to deliver content in a more engaging, interactive, and easy-to-understand way. The difference between pretest and posttest scores, as well as students' favourable reactions to e-book-based IPAS learning resources in the classroom, demonstrates improvements in learning outcomes. The results of this study demonstrate that e-book-based teaching resources foster students' interest and independence in the learning process, while also making subjects easier for them to understand.

This research is creative in developing IPAS teaching materials based on E-Books, compiled in digital format and presented in a way relevant to students' daily lives. The material is presented through narrative, illustrations, videos, and audio, as well as examples relevant to students' experiences, such as activities at home and at school. In addition, the E-Book-based IPAS teaching materials include multimedia features and educational games, namely Quizziz, that support independent learning. The integration of visual elements, text, and interactivity makes these teaching materials more innovative than conventional ones, thereby improving the quality of IPAS learning for fourth-grade students.

The study's findings demonstrate that creating scientific teaching materials based on e-books is highly effective in improving IPAS learning outcomes for IVA students at SDN Bendan Ngisor in Semarang. This improvement in learning outcomes is evident in comparisons of student scores before and after using E-Book-based IPAS teaching materials, both in small- and large-scale trials. Data analysis shows an increase in student learning achievement in the moderate-to-high categories. This suggests that students' comprehension of the content "My Region is Rich in Natural Resources" has improved as a result of the creation of e-book-based science teaching resources. The structured, contextually presented material, supported by illustrations and practice questions in the E-Book, helps students understand the concepts of natural resources and regional potential more easily and meaningfully. E-book-based IPAS teaching materials offer an alternative learning method that can reduce student boredom resulting from the dominance of lecture-based instruction (Salsabila et al., 2023).

Thus, the manufacture of IPAS learning materials based on E-Books produced utilising the ADDIE paradigm can be considered very feasible and effective for use in the IPAS learning process for fourth-grade students. The existence of these E-Books not only improves student learning outcomes but also supports more interactive learning that is suited to the characteristics of elementary school students, especially for the subject matter “My Region is Rich in Resources”.

This study has several limitations that require consideration. First, the implementation of e-book learning materials still relies on the availability of an internet connection, so learning can be disrupted if the connection is unstable. Second, the study only involved one class as subjects, so the generalizability of the results is still limited to similar contexts and student characteristics.

Based on these limitations, future research is recommended to involve a larger sample size and draw samples from several different classes or schools to obtain more representative results. Furthermore, media development could also be directed towards the use of more flexible systems, such as offline access modes, so that the effectiveness of the learning materials can be tested in a wider variety of learning conditions.

CONCLUSION AND RECOMMENDATION

Conclusion

The development of E-Book based learning materials on the subject of “My Region is Rich in Resources” using the Research and Development (R&D) type of research with the ADDIE model has proven to be very feasible and quite effective for use in the IPAS learning process for IV elementary school students. The E-Book was found to be highly effective based on students' learning outcomes, as indicated by a significant increase in posttest scores. Thus, the E-Book teaching materials were successfully developed, are well-suited for implementation, and are highly effective in improving IVA students' learning achievement at SDN Bendan Ngisor in Semarang City.

Recommendation

Based on the study's results, it is recommended that teachers make optimal use of the developed E-Book teaching materials as an alternative medium for IPAS learning to enhance learning, making it more creative, efficient, and diverse. Schools are expected to support the application of digital learning materials by

providing adequate facilities and infrastructure, especially network access and learning devices. Researchers are further advised to develop E-Book teaching materials and/or develop concretely made teaching materials with more innovative and interactive features and to test them across different materials and grade levels to obtain broader, more comprehensive results, while overcoming the limitations of the research conducted.

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