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Interactive Multimedia Learning Media for 3rd Grade Students: Enhancing Understanding of Alternative Energy

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ABSTRACT

This study presents a novel contribution in the field of interactive multimedia development for enhancing students' understanding of alternative energy in 3rd grade elementary school. The research employs the Research and Development method and the Borg and Gall development model, offering a renewed approach to designing effective learning materials. The study conducted small group trials, involving 6 students with diverse intelligence criteria, and large group trials with a total of 20 randomly selected students from SDN Totosan I. The inclusion of random sampling techniques in the selection of research subjects for large group trials introduces a novel element to ensure representative results. The research instruments utilized encompass a validation sheet filled by two expert validators, learning implementation sheets for practical assessment, as well as test sheets and student response questionnaires to evaluate effectiveness. The findings highlight the high validity percentage of 85%, demonstrating the rigor and credibility of the alternative energy interactive multimedia. With a practicality percentage of 95%, the research underlines the applicability and ease of implementation of the learning media. Moreover, the impressive performance results of 90% in students' comprehension tests and 92% in student response questionnaires reveal the renewed engagement and interest generated through the use of interactive multimedia in learning. These novel findings emphasize the effectiveness and impact of interactive multimedia in facilitating an improved understanding of alternative energy among 3rd grade students.

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INTRODUCTION

The advancement of science and technology in the era of the Fourth Industrial Revolution has significantly transformed various aspects of human life, including social, cultural, economic, and educational aspects. Abraham (2020) states that technological progress leads to modernity, characterized by economic growth, social mobility, and cultural expansion. Uno and Lamatenggo (2011) suggest the following trends for education in Indonesia in the future: 1) the development of open education through Distance Learning as the first strategy; 2) the transformation of libraries and educational resources (teachers, laboratories) into information sources within a sharing resource network; 3) the gradual shift from CD-ROM multimedia to television and radio in the field of educational technology. The opinions presented by Uno and Lamatenggo (2011) regarding the current trends in education have indeed occurred and rapidly evolved. Therefore, adjustments need to be made, especially for learners in schools, to ensure that education keeps pace with technological advancements. The use of current instructional media that aligns with students' needs and the surrounding environment is one factor that can be utilized to adapt to the progress of educational technology. Interactive multimedia is one

type of instructional media that can be employed in today's education. The use of interactive multimedia in education is expected to enhance students' learning outcomes by actively involving them in the learning process. The current millennial generation is exposed to rapid technological advancements, and thus individuals are required to keep up with the development of technology, including elementary school children.

Learning media refers to everything that can be used as a channel for conveying messages in order to achieve learning goals (Djamarah & Zain, 2020). Meanwhile, Fatria (2018) defines instructional media as tools used in the learning process. Rossi and Breidle (Sanjaya, 2020) argue that instructional media encompass various tools and materials, such as radio, television, books, paper, and magazines, which are tailored to achieve instructional goals. Gerlach (Sanjaya, 2020) defines instructional media as people, objects, equipment, or activities that help students acquire new skills, knowledge, and perspectives. Based on the above definitions, instructional media refers to everything utilized as a tool to achieve learning goals and assist students in acquiring knowledge, skills, and attitudes. Observations conducted at SDN Totosan I revealed that the teacher relied solely on the student textbook as the instructional media for the alternative energy subject. As a result, students were forced to think abstractly and had difficulty comprehending the material on alternative energy. This approach does not align with the developmental characteristics of elementary school children, who are in the stage of concrete operational thinking, and the students' low level of understanding.

Dale's Cone of Experience illustrates the level of learning outcomes, ranging from verbal to direct experience. Piaget (Al-Tabany, 2018) proposed stages of intellectual thinking, from concrete to abstract. Piaget classified elementary school children as being in the stage of concrete operational thinking (7-12 years old), where their thinking is based on manipulating tangible objects. Teaching elementary school children requires instructional media, as it can make abstract concepts more tangible. This idea aligns with Ruslan's perspective (Supriyono, 2018) that instructional media are used in teaching to enhance effective and efficient communication. According to the Ministry of Education and Culture (Supriyono, 2018), students will be more interested and motivated to learn when instructional media are utilized during the learning process. This approach helps students develop values, reduce verbalism, promote systematic and logical reasoning, and foster understanding. Means et al. (Sozcu & Ipek, 2018) also argue that the use of technology in education enables students to engage in higher-order thinking, such as critical thinking, analysis, conclusion-making, and problem-solving.

Observations conducted with third-grade students at SDN Totosan I indicated that students primarily use smartphones for playing games, watching TikTok videos, and other similar activities. Improper smartphone usage can negatively impact their learning development. Atikah's research suggests that one way to prevent children from becoming addicted to gaming and TikTok on gadgets is by utilizing gadgets and smartphones as learning tools, enabling them to understand how smartphones can be used for learning. Therefore, the researcher will develop multimedia-based interactive instructional media to facilitate students in mastering the alternative energy subject. The instructional media used by the researcher will consider the characteristics of the students, the environment, and the timeframe in order to motivate students to use the developed media and engage in the learning process.

The instructional media developed by the researcher differs from previous ones in the form of an APK software or software on smartphones that can be shared through URLs, Shareit, Bluetooth, and other means, making its distribution process much easier. Its usage is also considered user-friendly. Sari (2021) conducted research and found that using smartphones significantly differed from using desktop computers, as students could learn in the most comfortable places without being confined to the lab. Wulandari et al. (2018) collected data indicating an increase in student activity and motivation through the use of interactive media. This finding is consistent with the research by Sumantri and Rachmadtullah (2018), which revealed that students using interactive instructional media exhibited better understanding compared to those using conventional instructional media. This interactive multimedia is

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Android-based, allowing students to download the application on their smartphones and has its own assessment system, displaying a sad animation for incorrect answers and a happy animation for correct answers, with scores appearing automatically so that students can see their results immediately.

RESEARCH METHOD

This research uses the Research and Development (R&D) method. R&D is a research method that aims to produce a specific product and evaluate its effectiveness (Sugiyono, 2019). The development that will be conducted in this study is the development of alternative energy multimedia for third-grade elementary school students.

In creating learning media, it is necessary to use a suitable instructional design model that aligns with the characteristics of the materials to be developed. The Borg and Gall development model is the model used in this research. The researcher chose the Borg and Gall development model because it is suitable for creating learning media. Sugiyono (2019) modified the steps in the Borg and Gall development model, which are as follows: 1) problem identification, 2) information gathering, 3) product design, 4) design validation, 5) design revision, 6) product testing, 7) product revision, 8) field testing, 9) product revision, and 10) large-scale production. However, in this study, the researcher did not conduct large-scale production due to time constraints.

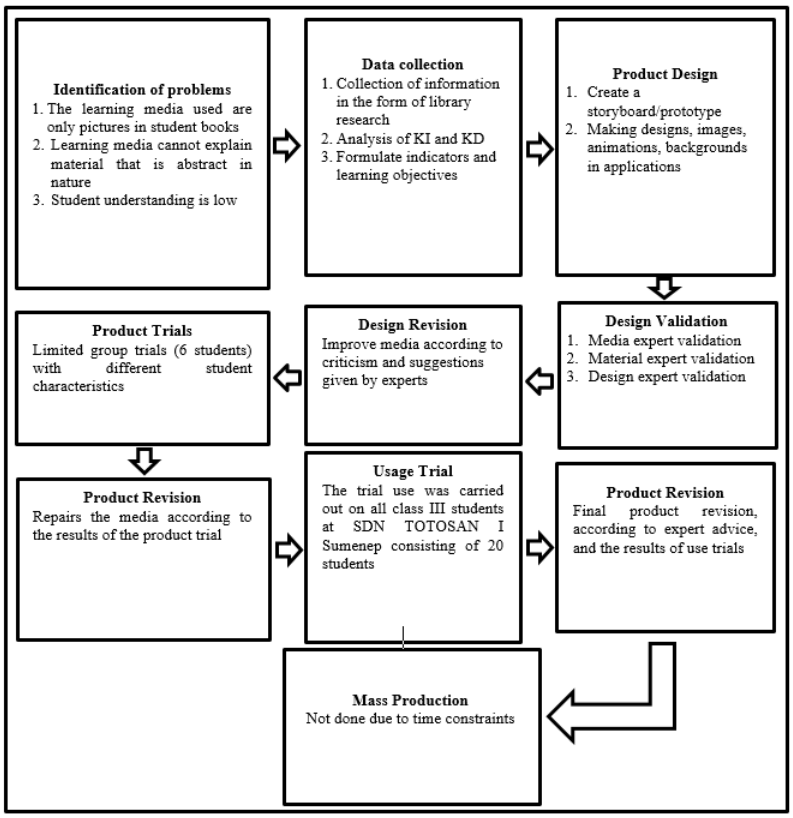

Figure 1. Flow chart research

RESULTS AND DISCUSSION

Presentation of the results of research on the development of interactive multimedia on alternative energy materials is contained in this chapter. The development model in this study uses the B & G (Borg and Gall) model. The tryout was carried out in 2 stages, namely a small group tryout and a large group tryout. The data obtained in this study were obtained from the results of validity, practicality, and effectiveness. Validity is reviewed from the questionnaire sheet of the results of the experts' assessment. Practicality is seen from the results of the observation results of the implementation of learning. Effectiveness is seen from the student understanding test result sheets and student response questionnaires.

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A small-scale trial was conducted after the interactive multimedia was validated by media experts and subject matter experts. The small-scale trial was conducted to assess the practicality and effectiveness of the interactive multimedia learning media before implementing it on a larger group. This trial involved 6 participants from the third grade of SDN Totosan I, consisting of two students with low ability, two students with moderate ability, and two students with high ability. Small-scale trials produce data from observations of the implementation of learning in Table 1.

Table 1. Results of the observation on the implementation of learning during the small-scale trial.

Implementation Stage	Obtained Score
Introduction	4
Core Activities	10
Closing	4
Total	18
Percentage	90%
Criteria	Practical

During the small-group trial, a student comprehension test was conducted to assess the effectiveness of the interactive multimedia. The obtained data is presented in the Table 2.

Table 2. Student comprehension test results for grade III students of SDN Totosan I

No	Name	Score
1	BN	100
2	RP	100
3	FS	100
4	IC	90
5	ZN	70
6	FN	70
Total Number of Students who Passed		6

The data is then processed using the classical completeness formula as follows:

P = (Number of students who passed)/(Total number of students) x 100
P = 6/6 x 100
P = 100%

In addition to conducting the student comprehension test, the effectiveness is also assessed based on the student response questionnaire. The results of the student response questionnaire in the small group trial are shown in Table 3.

Table 3. Attractiveness based on student response questionnaire in small group trial

Student	∑ Score	Obtained Maximum	Score Percentage	Criteria
1	48	50	96%	Very Attractive
2	45	50	90%	Very Attractive
3	48	50	96%	Very Attractive
4	47	50	94%	Very Attractive
5	48	50	96%	Very Attractive
6	48	50	96%	Very Attractive
	Total		568%	
	Average		95%	Very Attractive

Based on the attractiveness percentage in Table 3 through a student response questionnaire, an attractiveness percentage of 95% was obtained and was described in very attractive criteria.

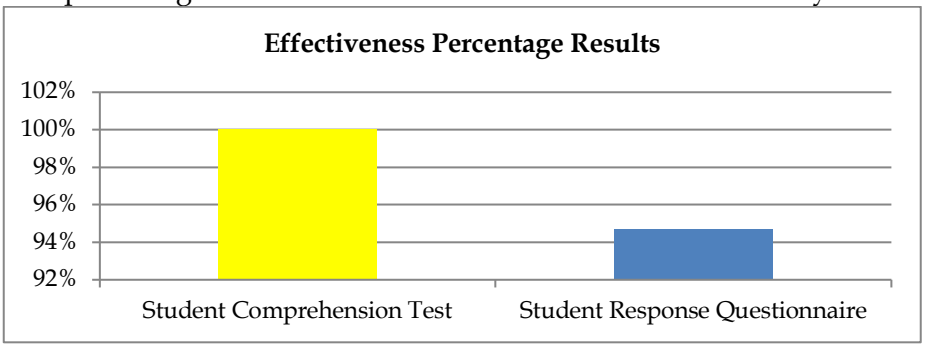

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Figure 2. Diagram of the results of the percentage of effectiveness in small group trials

Based on the results of the percentage of effectiveness in Figure 2, a classical completeness percentage of 100% was obtained and the average attractiveness percentage based on the student response questionnaire was 95%. So that it can be said that alternative energy interactive interactive multimedia is effective.

Large group testing is conducted after the product has been deemed practical and effective in the small group testing. The large group testing is carried out with all 20 third-grade students of SDN Totosan I. The students who participated in the small group testing are not involved in the large group testing. The obtained data on practicality from the large group testing are shown in Table 4.

Table 4. Results of the practicality of the interactive multimedia for alternative energy in the large group testing

Implementation Stage	Score Obtained
Introduction	5
Core Activity	10
Closing	4
Total	19
Percentage	95%
Criteria	Practical

Based on Table 4, the alternative energy interactive multimedia is categorized as practical with a score of 95%. In the large-scale trial, a student comprehension test was also conducted, and the data obtained are shown in Table 5.

Table 5. Student comprehension test

No	Name	Score
1	El	80
2	UY	80
3	RN	100
4	NP	70
5	HZ	100
6	FT	90
7	AB	80
8	AR	100
9	AG	100
10	NB	90
11	NR	70
12	IR	90
13	RO	80
14	ED	70
15	RF	70
16	RS	80
17	WL	100
18	DV	60
19	RZ	80
20	AY	60
Number of students who passed		18

The data was then processed using the classical completeness formula as follows:

P = (Number of students who passed)/(Total number of students) x 100
P = 18/20 x 100
P = 90%

In addition to conducting student comprehension tests, the effectiveness was also assessed based on student response questionnaires. The following are the results of the student response questionnaires in the large group trial.

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Table 6. Attractiveness based on student response questionnaires in the large group trial

Student No	∑Average Score	Maximum Score	Percentage	Criteria
1	45	50	90%	Very attractive
2	47	50	94%	Very attractive
3	48	50	96%	Very attractive
4	46	50	92%	Very attractive
5	44	50	88%	Very attractive
6	45	50	90%	Very attractive
7	47	50	94%	Very attractive
8	42	50	84%	Very attractive
9	49	50	98%	Very attractive
10	45	50	90%	Very attractive
11	41	50	82%	Very attractive
12	45	50	90%	Very attractive
13	48	50	96%	Very attractive
14	48	50	96%	Very attractive
15	47	50	94%	Very attractive
16	49	50	98%	Very attractive
17	44	50	88%	Very attractive
18	45	50	90%	Very attractive
19	46	50	92%	Very attractive
20	49	50	98%	Very attractive
	Total		1840%	
	Average		92%	Very attractive

The developed media is interactive multimedia for alternative energy material to enhance the understanding of third-grade students. The obtained data consist of validity, practicality, and effectiveness, which are discussed in the research below.

Discussion

Validity

Validation was conducted to obtain data on the feasibility of the "Interactive Multimedia for Alternative Energy" learning media. The validity score of the learning media was obtained from three experts: learning media expert, subject matter expert, and instructional design expert. Table 7 is an explanation of the names of the validators for the interactive multimedia learning media on alternative energy.

Table 7. Learning media validators

Expert Names
1. Dr. Binar Kurnia Prahani, S.Pd., M.Pd
2. Farida Istianah, S.Pd., M.Pd

Based on these validator names, evaluations were obtained for the "Interactive Multimedia for Alternative Energy" learning media. These evaluations served as guidelines to measure the validity of the developed product. The researcher provides an explanation of the evaluations from each expert before conducting the field test.

a) Learning Media Validation
   The developed interactive multimedia received an evaluation from the media expert validator with an average score of 88%, indicating high validity.
b) Content Validation
   The developed interactive multimedia received an evaluation from the subject matter expert validator with an average score of 85%, indicating high validity.
c) Instructional Design Validation
   The developed interactive multimedia received an evaluation from the instructional design expert validator with an average score of 86%, indicating high validity.

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Practicality

The ease of use of learning media determines the practicality of interactive multimedia (Masruroh, 2019). The practicality of the media in this research is determined based on the observation sheet of learning implementation. The observation sheet is filled out by an observer during two class sessions. The observation results for small group testing obtained a score of 90% with a practical category, while for large group testing, it obtained a score of 95% with a practical category. Practicality refers to the ease of use of the developed interactive multimedia. According to Fadila (2019), practicality considers ease and understanding during implementation. Based on the observation of the implementation of interactive multimedia for alternative energy, it can be considered practical.

Effectiveness

The effectiveness of a media indicates the level of success and achievement of learning objectives using that media (Fadilah, 2019). The effectiveness of learning media can be observed based on students' comprehension test scores after using the media (Wahab, 2011). In the small group testing, the classical mastery percentage obtained was 100%. In the large group testing, the classical mastery percentage obtained was 90%. Effectiveness is also assessed based on attractiveness using a student response questionnaire. In the small group testing, an attractiveness score of 95% with a highly attractive category was obtained. In the large group testing, an attractiveness score of 92% with a highly attractive category was obtained. The interactive multimedia can be considered effective if it meets the following indicators:

a) Student response results can be considered effective if, descriptively, the calculation from the student response sheet falls within the attractive category.
b) Student learning outcomes can be considered effective if the scores obtained by students exceed the minimum passing grade (KKM) set by SDN Totosan I, which is ≥70, and the classical mastery percentage of students is ≤85%.
c) The interactive multimedia cannot be considered effective if either of these two points is not met.

Based on the students' comprehension test scores, classical mastery percentage, and attractiveness through the student response questionnaire, it can be concluded that the interactive multimedia for alternative energy is effective for learning purposes.

CONCLUSION

The development of interactive multimedia learning media for 3rd grade students aimed at enhancing their understanding of alternative energy has yielded positive results. The study utilized the Research and Development method and the Borg and Gall development model to assess the validity, practicality, and effectiveness of the learning media. Small group and large group trials were conducted, and the research instruments included validation sheets, learning implementation sheets, test sheets, and student response questionnaires.

The findings indicate that the interactive multimedia learning media on alternative energy is highly valid, practical, and effective in improving students' comprehension. This implies that incorporating interactive elements such as videos, animations, and interactive quizzes can engage students and facilitate their understanding of complex concepts like alternative energy sources. The practicality of the learning media suggests its feasibility for implementation in real classroom settings. However, the study's limitation lies in the sample size, as it was conducted with a specific group of students from a single school. Therefore, caution should be exercised when generalizing the results to a broader population.

Future research can build upon this study by addressing the limitations and expanding the scope. Conducting the study with a larger and more diverse sample from multiple schools would provide a more comprehensive understanding of the effectiveness of interactive multimedia learning media on alternative energy. Additionally, investigating the long-term impact of the learning media on students' retention and application of knowledge could further strengthen the evidence of its efficacy. Exploring different instructional strategies and assessing

their effectiveness in conjunction with the interactive multimedia could also be a valuable avenue for future research.

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