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Development of Interactive Multimedia in Class V Elementary School Science and Science Subjects

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Abstract
The development of technology brings changes in the use of learning media. One of the learning media that responds to technological developments is interactive multimedia. This study aims to produce interactive multimedia that is suitable for use as a learning media in the subject of Science for Grade V Elementary School. This study is a research and development study, with the selected development design using the ADDIE model (analyze, design, development, implementation, evaluation). The media that has been developed is evaluated by material experts and media experts to determine its feasibility. Based on the findings, media experts have an average feasibility value of 4.96 (very valid) by validator I, and an average of 4.68 (very valid) by validator II, while material experts have an average feasibility value of 4.74 (very valid). In addition, the results of the student response questionnaire after the trial of using interactive multimedia showed an average value of 4.81 (very practical), and the results of the effectiveness test of the post-test scores of students consisting of 20 students with the N-gain formula obtained a value of 0.73 (high). Thus, the development of interactive multimedia in the fifth grade science subjects isdeclared very valid and can be used without the need for improvement.

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1. INTRODUCTION

Education is a crucial element in efforts to increase or develop people's cognitive or intelligence levels. To increase people's intelligence, education is very important. An effective, interesting and enjoyable learning process is the key to educational success. In the modern technological era, technology is now an important part of everyday life, including in the field of education.

Based on Republic of Indonesia Government Regulation no. 57 of 2021 concerning National Education Standards, in part four of the process standards, explains in article 12 paragraph (1) that the implementation of learning must occur in a learning environment that is interactive, inspiring, fun, challenging, and capable of motivating students to be actively involved. Apart from that, it is in accordance with students' talents, interests and physical and psychological development, thereby providing sufficient space for students' creativity, enterprise and independence.

In line with the Regulation of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia Number 16 of 2022 concerning Standards for the Early Childhood Education Process at the Basic Education Level and Secondary Education Level, article 9 paragraph (2) letter b, states that facilities are among the things that teachers need to provide in implementing learning, apart from providing role models and mentoring.

The writer concluded that education is an effort to provide knowledge, skills and habits to guide students to always actively develop their potential through guidance, teaching or training, as well as guiding all the natural strengths that exist in children, as humans and also in society to achieve the highest happiness and safety.

Improving the quality of teacher education in the 21st era requires readiness to improve competencies, especially those based on Information Communication Technology (ICT), so that they are in line with current developments and can result in improvements in the quality of education. Therefore, if they want to improve the quality of education, educational institutions must fully employ qualified, innovative and creative teachers. Technology such as cellphones, laptops and the internet have become a means of supporting learning for students. Currently, the number of internet users is increasing. Moreover, with the rapid development of gadgets, the internet is increasingly needed by society.

As expressed by, teachers have the responsibility to provid [1] e knowledge and educate students well, so that they can become smarter. The skills needed by educators in the 21st century include the ability to use technology as a means of teaching and learning. Therefore, learning media is very important in the teaching and learning process, both inside and outside the classroom, because it can overcome various problems in education.

The characteristics of elementary school age children in general are that they enjoy playing, moving, working in groups, and enjoy feeling or doing things directly. "Cognitive development in students aged 7-11 years (concrete operations stage) where at this stage students are able to think with real objects or can be seen directly [2] ." In the learning process, students learn with different learning styles.

In the context of basic education, especially in elementary schools (SD), Natural and Social Sciences (IPAS) subjects have an important role in building students' basic knowledge and skills related to natural and social phenomena around them. Purnawanto, (2022: 75-79) states that another characteristic of the Independent Curriculum is the combination of Natural Sciences (IPA) and Social Sciences (IPS) subjects into Natural and Social Sciences (IPAS) at the elementary school level. This combination is based on the consideration that elementary school age students tend to see everything as a whole and integrated. Apart from that, they are still in the concrete/simple, holistic and comprehensive but not detailed thinking stage.

The aim of the science course is to increase students' interest and curiosity, encourage active involvement, develop inquiry skills, increase understanding of oneself and the environment and develop knowledge and understanding of science concepts [3] .

Based on the results of observations made by researchers, precisely during science and science learning in class V of State Elementary School 78/III Mukai Hilir, Kerinci Regency from 18 November 2024 to 20 November 2024, when researchers observed teaching and learning activities in science and science subjects in class, the school had provided media such as projectors that teachers could use to display more interesting material, but in reality what researchers saw in the field was that teachers still tended to rely on learning media which only focused on printed books and whiteboard media.

Researchers also observed the results of the odd semester science subject exam which was held on December 13 2024 from the homeroom teacher of class V. The results showed that the average score of 20 class V students was 43.96, while the Criteria for Achievement of Learning Goals (KKTP) for science AS subjects was 75. The conclusion that can be drawn from these results is that students' understanding of science subjects is still very lacking and relatively low. The main cause of this problem is the lack of use of supporting media in the classroom learning process. Teachers have not fully integrated technology as part of learning media, which can help students better understand the material being taught. Better integration of technology in the learning process can increase

educational effectiveness and improve student understanding. The researcher then conducted an interview with the homeroom teacher of Class V at SD Negeri 78 / III

Mukai Hilir, namely Mrs. Reza Heldiastari, S.Pd, on Tuesday 19 November 2024, from the results of the interview, it appears that innovation in the development of learning media is still very limited. This causes students to experience difficulties in understanding the science and science learning material. The learning process still relies heavily on books as the main source, because teachers are not yet fully able to integrate technology as a learning medium.

Then from the results of interviews with the homeroom teacher, there were also several difficulties experienced by teachers when teaching, namely, lack of student activity, students were lazy in making assignments and did not focus when studying. This shows that there are problems in the learning process so that teachers experience difficulties when teaching. Apart from that, teachers also experience difficulties in creating interesting and effective material, especially for concepts or processes that are complex and difficult to visualize. This lack of innovation clearly has an impact on students' ability to understand the material as a whole.

Based on these results, it can be concluded that class teachers need interactive multimedia assistance in presenting material in science subjects. This assistance will make it easier for teachers to visualize the material and help students understand the material better, so that learning becomes more effective and enjoyable for all parties involved. The integration of appropriate learning media can contribute to creating a more dynamic and interactive learning atmosphere.

Supriyono, (2018: 43-48) states that with the presence of learning media in the classroom, students' interest in learning will increase. Teachers can use technology as a tool in the learning process which allows students to more easily describe or illustrate the material being studied. This is in accordance with research which states that learning media makes it easier for students to learn [4].

[5] states that one form of digital learning media that is often used is interactive multimedia. Multimedia is a combination of various types of media such as text, images, audio, video and animation created using computer or laptop software.

Learning media is considered a tool that functions as an intermediary to convey information so that students can easily absorb and understand what is taught by the teacher. The use of learning media is very influential and has an important role in learning to motivate students to build their intelligence [6] .

Based on research conducted by Paramitha, et al. (2023) application usage *Canva* in Application-Based Interactive Multimedia Development *Canva* In Respiratory System Material. This study found that interactive multimedia created with *Canva* has high validity and is able to attract students' attention, thereby motivating them to learn more actively. Additionally, use *Canva* also makes it easier for teachers to implement learning by utilizing their technology skills and creativity. With *Canva*, teachers can design learning materials more quickly and efficiently, thereby saving time, especially as teachers also have learning ID accounts that can be connected directly to *Canva*, by using learning access teacher id *Canva* become more external, both existing features become supporting elements in designing Multimedia. Besides that, *Canva* It also makes it easier for teachers to explain material to students.

One promising solution is to apply innovative learning media. The author chooses one *platform* which brings innovation to the world of education *Canva*.
Canva is a graphic design application that provides various templates and features that allow users to create visual content easily and attractively.

By using *Canva*, teachers can design interactive learning media that not only presents information visually, but also involves students in the learning process through the various interactive features available. Use *Canva* as a learning medium is also in line with the characteristics of the current generation of students who tend to be more responsive to technology and visual content. Hajar

et al. (2023: 6402-6413) argue that *Canva* can attract students' interest in learning.

Based on the background that has been described, researchers are interested in studying the importance of developing interactive multimedia assisted by applications *Canva*. In the 21st century, technology has become an inseparable part of the learning and use process *Canva* provides convenience in creating learning media. Therefore, this research is entitled "Development of Interactive Multimedia in Class V Elementary School Science Subjects

2. MATERIALS AND METHODS

Interactive multimedia is media that combines various elements, such as text, audio, video, graphics and animation, which are used to convey information or messages interactively. This media allows users to interact with the content, such as having the freedom to control the flow of multimedia. Usually, interactive multimedia is delivered via electronic devices such as computers [7].

This research uses the method *Research and Development (R&D)*, which aims to create new products that are tested for their usability. According to [8] Research and Development methods are research methods used to produce certain products. This research applies a development model *ADDIE*, is an abbreviation for five procedures in the development process, namely analysis *(analysis)*, design *(design)*, development *(development)*, implementation *(implementation)*, and evaluation *(evaluation)*. This model is a model that is easy to implement because it has a clear structure and steps during the implementation process. This ensures that the products produced are effective, creative and efficient (Siwardani, 2015:6). Model framework *ADDIE* specifically designed for multimedia-based learning [9] .

The test subjects in this research were class V students of SD Negeri 78/III Mukai Hilir, Kerinci Regency. In this research, researchers collected two types of data, namely qualitative and quantitative. Qualitative data was obtained from criticism and suggestions provided by media validators, material validators, and students. Meanwhile, quantitative data was obtained from the results of product trial assessments carried out by media experts, material experts and class V students of SD Negeri 78/III Mukai Hilir, Kerinci Regency.

The data collection instruments that researchers used in this development research were interviews, observations, validity questionnaires, practicality questionnaires and effectiveness tests. A close relationship exists between research instruments and data collection techniques, in accordance with the views of [10] . According ,the data collection technique using a questionnaire is a data collection technique carried out by researchers by giving a set of questions or written statements to respondents. According to Esterberg in, an interview is a meeting of two people to exchange information and ideas through questions and answers, so thatmeaning can be constructed in a particular topic. The validity and practicality values are calculated using the empirical average with the formula:

$$\bar{x} = \frac{\sum x}{n}$$

Information:

$\bar{x}$ = Average value

$\sum x$ = Number of values

n = Number of respondents

Source: [11]

After the validity and practicality values are obtained, the next step is to categorize them based on the level of validity and practicality.

Table 1. Score Interpretation Criteria

Mark	Scale	Criteria
5	4,1 - 5	Very Valid / Very Practical
4	3,1 - 4	Valid / Practical
3	2,1 - 3	Quite Valid / Quite Practical
2	1,1 - 2	Less Valid / Less Practical
1	0 - 1	Very No Valid / very Impractical

Source: Riduwan in (Hendri, Novrianti 2017)

After that, an effectiveness test was carried out to see the increase in students' learning abilities and achievements after using interactive multimedia through the results *Pre-test* and *Post-test*. According to Shadish, Cook & Campbel *pre-test* applied to research subjects before treatment is given. After being given treatment, a post-test will be applied with the same measurements. After getting the grades *pre-test* and post-test, a test is carried out *N-gain* to determine the effectiveness of the treatment that has been applied.

The effectiveness formula is used to calculate normality *gain* according to Meltzer in [12]

$$\boldsymbol{N\ Gain} = \frac{\boldsymbol{Spost - Spre}}{\boldsymbol{Smaks - Spre}}$$

Information:

N Gain states the normality test value

Spost states the post-test score

Spre states the score pretest

Smaks determines maximum score

The effectiveness criteria interpreted from the normality of gain are as follows:

Table 2. Classification of Normality Values *Gain*

Normality Value *Gain*	Criteria
$0{,}70 \leq n \leq 1{,}00$	High
$0{,}30 \leq n \leq 0{,}70$	Currently
$0{,}00 \leq n \leq 0{,}30$	Low

3. RESULTS

a. *Analysis* (analysis)

1) Needs Analysis

The needs analysis aims to collect information related to the development of learning media. This stage is carried out through observations and interviews with teachers and students. Based on an interview with Mrs. Reza Heldiastari, S.Pd as the homeroom teacher as well as a teacher in science subjects and several students, based on the interview grid below:

Table 3. . Teacher Interview guideline grid

No	Indicator
1.	What curriculum is used at your school?
2.	What are the difficulties and obstacles in the science and science learning process in class V?
3.	What learning resources are used in science learning activities?
4.	Has media been implemented in the implementation of science and science learning in class V? digital technology-based learning?
5.	How do students respond to science learning activities in the classroom?

Based on an interview, Mrs. Reza Heldiastari, S.Pd revealed that class V at SD Negeri 78/III Mukai Hilir uses the Merdeka Curriculum. In science learning, students have difficulty understanding abstract concepts, lack focus, are lazy about studying, and are burdened by dense material. Teachers still use conventional media such as worksheets and printed books, without using technology in the learning process.

Table 4. . Student Interview guideline grid

No	Indicator
1.	What difficulties do you experience in learning science?
2.	Have you ever used a smartphone or computer while studying?
3.	What learning resources are used in science learning activities?
4.	How do you, your teacher, convey social science learning in the classroom? class?
5.	What type of learning media can attract your attention?

Interview results show that students tend to be less active and enthusiastic in the learning process. They have difficulty focusing on dense material, so they have to memorize information. The limited learning media used also makes students less interested.

2) Curriculum Analysis

Analysis of this curriculum aims to determine the material, the content of the material, and the extent to which the material will be included in the media being developed. This interactive multimedia development uses an independent and deep curriculumTo develop this interactive multimedia, researchers first carried out an analysis of the independent curriculum.

3) Media Analysis and Learner Characteristics

Media analysis is carried out to find out what type of media is appropriate to the conditions during the implementation of learning. Apart from that, it also analyzes the characteristics of students and the learning material, namely Why We Need to Eat and Drink.

Analysis shows that students have difficulty understanding science material only through oral and written explanations, especially on the topic of Why We Need to Eat and Drink. The developed interactive multimedia is able to help by presenting text, animation, images, audio and video to visualize the process of eating and drinking in the human digestive system, as well as the types of food needed. In addition, the included quizzes make learning more interesting and fun.

b. *Design* (Design)

In this stage, the activities carried out are designing, identifying and preparing material and flow in multimedia that is under development. Apart from that, the determination of equipment and materials including software for multimedia production is also carried out. The devices used in this stage are laptops and *smartphones*, while the materials used involve *flowchart* And *storyboard* according to the lesson material to be presented.

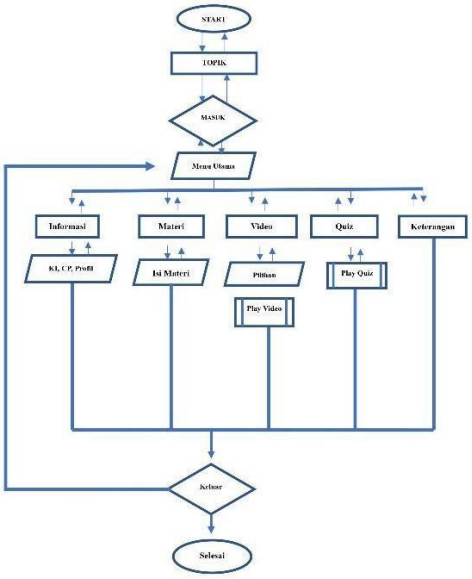

Figure 1. *Flowchart* Interactive Multimedia

c. *Development* (Development)

The development stage is carried out after the design stage, where the multimedia design that has been created is realized according to the flow *flowchart* and visual display on *storyboard*. After the product is complete, a validation test is carried out by a material and media validator. This interactive multimedia product was developed using an application *Canva* along with several other supporting applications. The results of product development can be described as follows:

1) Interactive Multimedia Development

a) The first step is to open the main program, namely the web *Canva*

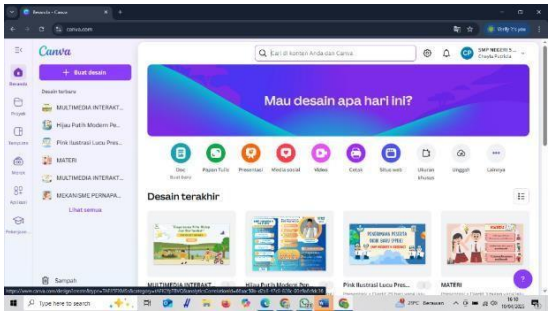

Figure 2. Initial View *Canva*

b) Home Page Creation

In creating the main page with the features in *Canva.* Such as design, elements, text, tools and applications upload.

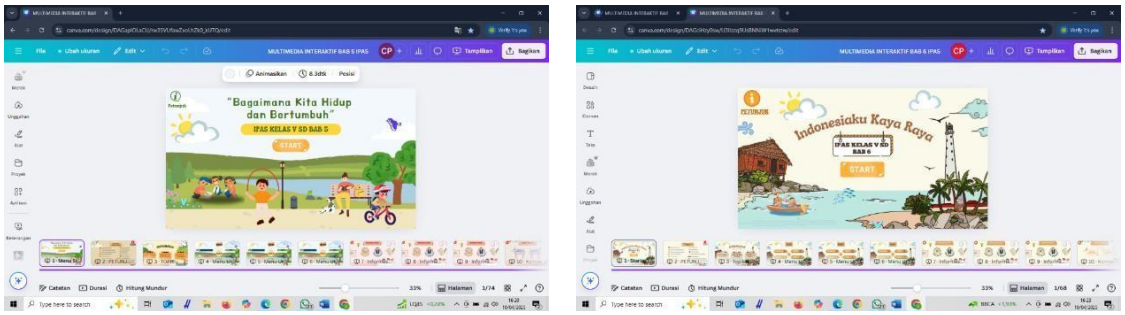

Figure 3. Initial Design of Interactive Multimedia

c) Menu Page Creation

After the opening page, a main menu is created that contains text, images, animation, audio, and navigation buttons with featured *hyperlink.*

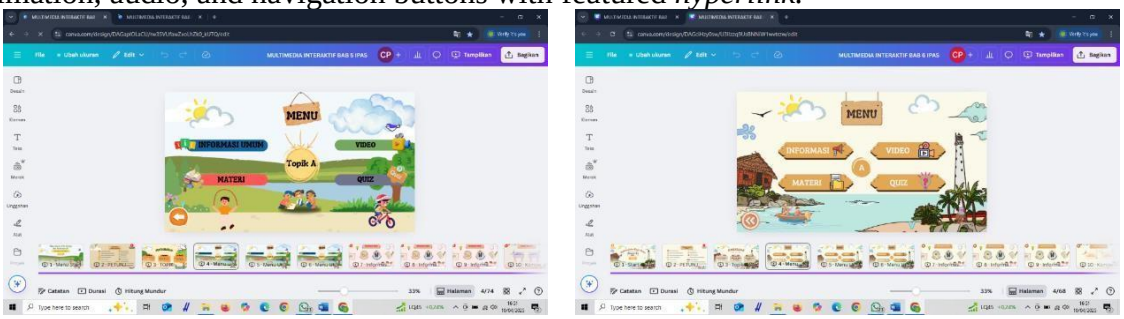

Figure 4. Interactive Multimedia Menu Page

d) Creation of Information Pages

The information menu page is designed with animation using application features, containing two options: core competency and development profile. Equipped with navigation buttons to home, previous page, and next page, which are activated using the feature *hyperlink.*

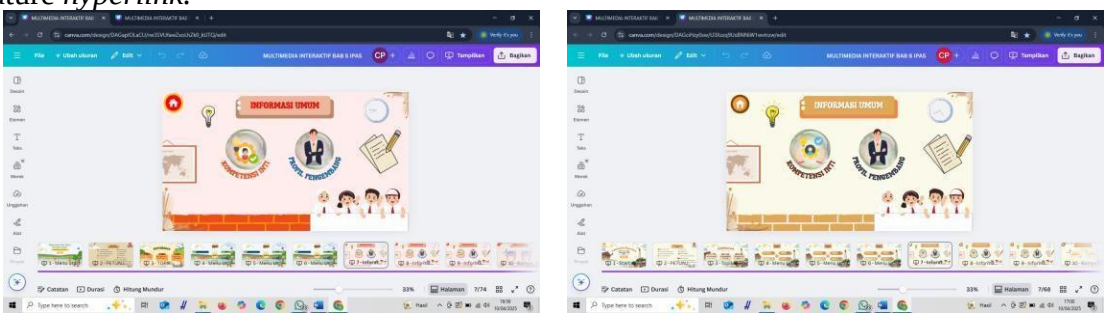

Figure 5. Interactive Multimedia Information Page

e) Creation of Material Pages

The material menu page is designed using design features, elements, text and tools, and is equipped with animation. There are navigation buttons to home, previous page, and next page.

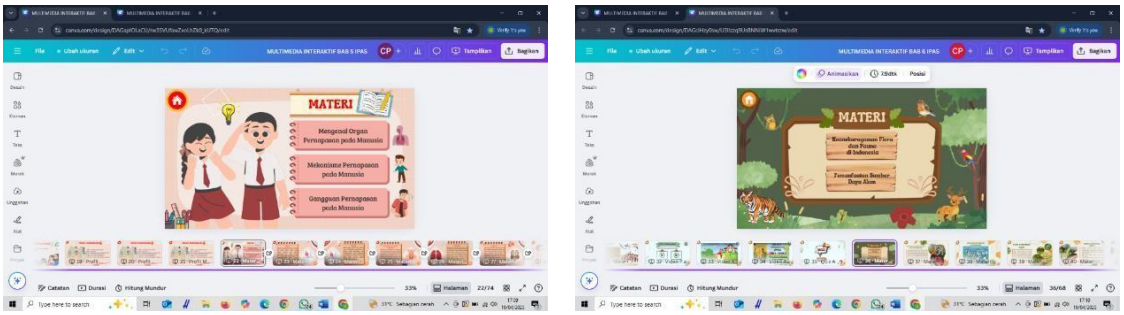

Figure 6. Interactive Multimedia Material Page

f) Video Page Creation

The video menu page is designed with animation and contains two options, namely video 1 and video 2. Equipped with a navigation button to the home page, videos can be entered using the feature *Embed* in the Applications menu *Canva*, then linked to the element via the hyperlink feature. When an element is clicked, live videos can be played on *Canva.*

Figure 7. Interactive Multimedia Video Page

g) Quiz Page Creation

Next, after all the material has been added, we can make an evaluation in the form of multiple-choice questions by linking to *Google Form.*

Figure 8. Interactive Multimedia Quiz Page

2) Interactive Multimedia Validation

a) Material Validation

Table 5. Material Validation Results

Aspect	Indicator	Assessment	Rate-Rata
Conceptual Truth	1	5	4,62
	2	5	
	3	5	
	4	5	
	5	5	
	6	4	
	7	4	
	8	4	
	1	5	
	2	5	

Presentation of Material	3	5	5
	4	5	
	5	5	
	6	5	
	7	5	
	8	5	
	9	5	
	10	5	
Evaluation	1	4	4,6
	2	5	
	3	4	
	4	5	
	5	5	
Amount			**14,22**
Rate-Rata			**4,74**

b) Media Validation

Table 6. Media Validation Results

Aspect	Indicator	Validator		Rate-Rata	
		I	II	I	II
Design and Appearance	1	5	4	4,83	4,58
	2	4	5		
	3	5	4		
	4	5	5		
	5	5	4		
	6	5	5		
	7	5	4		
	8	5	5		
	9	5	5		
	10	5	5		
	11	4	4		
	12	5	5		
Supporting Elements	1	5	5	5	4,75
	2	5	5		
	3	5	4		
	4	5	5		
Media Presentation	1	5	5	5	4,66
	2	5	5		
	3	5	4		
Media Use	1	5	5	5	4,75
	2	5	5		
	3	5	4		
	4	5	5		
Amount		**113**	**107**	**19,83**	**18,74**
Rate-Rata				**4,96**	**4,68**

3) Product Revision

Revisions made include providing instructions in the section *start*, provide complete and clear instructions, improve the developer profile, animation supporting material, improve the quiz section, provide other people's video sources.

d. *Implementation* (Implementation)

The implementation phase aims to test interactive multimedia in the field by involving 20 class V students of SD Negeri 78/III Mukai Hilir, Kerinci Regency. The assessment is carried out based on aspects of ease of use, time efficiency and product usefulness.

1) Practicality Test

Table 7. Practicality Test Results

No	Aspect	Indicator	Rate-rate	Category
1.	Media Display	1-7	4,86	Very Practical
2.	Material Systematics	1-5	4,8	Very Practical
3.	Media Interactivity	1-6	4,83	Very Practical
4.	Expediency	1-4	4,75	Very Practical
	Rate-rate		**4,81**	**Very Practical**

2) Effectiveness Test

Table 8. Effectiveness Test Results

No	Name of Participant	Pre-test value	Post test scores
1.	AN	40	70
2.	AL	50	80
3.	YEAR	30	80
4.	NOTE	40	100
5.	BEHIND	30	80
6.	AGP	40	100
7.	AHG	30	90
8.	FMS	30	90
9.	FAR	60	100
10.	HM	40	70
11.	HS	40	80
12.	NOK	10	80
13.	ALSO	50	70
14.	LAA	30	70
15.	A.J.Z.	0	70
16.	QKP	60	90
17.	NJ	10	80
18.	RP	30	70
19.	RAP	30	100
20.	ZDR	60	80
	Amount	**710**	**1650**
	Rate-rate	**35,5**	**82,5**

$\boldsymbol{N\ Gain = Spost - Spre\ \ Smaks - Spre\ N\ Gain = 82,5 - 35,5\ 100 - 35,5 N\ Gain = 47\ 64,5}$
$\boldsymbol{N\ Gain = 0,73}$

Based on the effectiveness test carried out using the N-gain formula, it can be seen that the value obtained is 0.73. Thus, the value of 0.73 in the normality gain value classification is included in the "High" criterion with a value range of $0.70 \leq n < 1.00$. Therefore, it can be concluded that the interactive multimedia developed is effectively used as a learning medium.

e. Evaluation (Evaluation)

Evaluation is the final stage of interactive multimedia development, carried out in two phases: pre-implementation, for assessment by media and material experts; and post-implementation, to assess the practicality and effectiveness of its use in learning. Final revisions were made based on practicality and effectiveness data.

The final revision based on the post-implementation evaluation process focused on improving the audio in the multimedia being developed. Audio enhancements include re-synchronizing the backsound with the narrator's voice and re-recording on several interactive multimedia pages.

4. CONCLUSION

Based on the results of research and development of Interactive Multimedia in Class V Elementary School Science Subjects, the following conclusions were obtained.

a. The stages in developing interactive multimedia are carried out by testing media validity and material validation testing. This validity test involved two media validators and one material validator. The results of the media validity test carried out obtained a score of 4.96 (very valid). validator 1 and a score of 4.68 (very valid) from validator 2, and the results of the material validity test obtained a score of 4.74 (very valid).
b. The practicality test was carried out on class V students at SD Negeri 78/III Mukai Hilir, Siulak Mukai District, Regency Kerinci numbered 20 people, whose practicality test results obtained an average score of 4.81 in the very practical category.
c. The effectiveness test obtained data in the form of pre-test and post-test learning results of class V students at SD Negeri 78/III Mukai Hilir, Siulak Mukai District, Regency Kerinci. The results of the effectiveness test carried out using the N-gain formula obtained an average value of 0.73. The value of 0.73 in the normality gain value classification is included in the "high" criteria with a value range of $0.70 \leq n < 1.00$. Therefore, it can be concluded that the interactive multimedia developed is "effective"

Based on test results validity, practicality and effectiveness, it can be concluded that interactive multimedia on the topic of why we need to eat and drink, the science and science subject for class V elementary school is "worthy" to be used in learning.

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