

The Effectiveness of Interactive Multimedia to Improve Cognitive Skill on Elementary School Students

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Abstract

This study aims to develop interactive multimedia to support thematic learning in elementary schools. The main results of the study are interactive multimedia products that are expected to be learning media to support the improvement of students' cognitive skills. This study was a Research and Development (R & D) study. The subject of this study was elementary school students. The data collection included: interviews, observations, tests of cognitive skills (pre-test and post-test), student responses, and documentation. The results of the study can be concluded that: students' responses to the development of interactive multimedia at the field testing stage are 80.24% and are included in the good and feasibility category; student learning outcomes in the testing phase of the main fields before and after the use of interactive multimedia increase. Moreover, based on the t-test the results are 101,333. So that it can be concluded that multimedia learning developed meets the requirements for teaching and learning.

Keywords: Interactive Multimedia, Cognitive Skills

1. Introduction

In the 2013 curriculum, thematic learning is a basic requirement and need in the teaching and learning process in elementary schools (Geni et al., 2020; Laksana et al., 2016). Thematic learning is mentioned as integrated learning as a translation of integrated teaching and learning. In some ways, they mention it as an integrated curriculum approach, or a coherent curriculum approach (Indrawini et al., 2017). These opinions show that thematic learning is also an integrated learning model. This model has advantages, including the actual theme, approach to the world of students, and related to daily life. The active involvement of students is necessary for the continuity of the learning process. Thematic learning that is challenging and fun will build up students being the critical nation's next generation. Thematic learning not only encourages students to gain learning to learn, but also learn to do, learning to be, and learning to live together (Andrajati et al., 2020; Ulfah et al., 2019). Although thematic learning needs a student-centred learning process, the role of educators is essential in designing learning (Mulyadin, 2016; Rukayah, 2018). The implementation of thematic learning demands the ability of teachers to transform the subject matter in class. Therefore, teachers must mastery how to implement it in the learning environment in the classroom and must understand the material.

Learning media is needed to assist students' understanding of the various sources of energy through a medium so that students do not only imagine something abstract (Abtahi, 2012; Nusir et al., 2013; Vebrianto & Osman, 2011). Learning media are developed with the active participation of students, teachers and the surrounding environment. In this kind of education pattern, students not only memorize lessons but also need to understand and connect the material being studied with real-life situations (Wibowo et al., 2013; Widyatmojo & Muhtadi, 2017). This concept is identified as the implementation of contextual theory (Purwanto & Rizki, 2015; Zukmadini et al., 2018). Elaine explains that contextual learning and teaching is understood as learning that involves students in important activities that assist them to relate academic learning to the real-life contexts they face. One of the media

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that students can use is using interactive multimedia as an alternative media selected by students (Anantyarta & Sari, 2017; Fauyan, 2019).

The idealism of the learning process as referred as mentioned is still not applicable in Indonesia (Diputra, 2016; Suwindra, 2012). Based on observations and interviews conducted by researchers during the fourth-grade observation at SD Muhammadiyah Condongcatur, it could be seen that the cognitive abilities of students were still low, indicated by the large number of students lazing around while learning was taking place. Cognitive ability is a process that occurs internally in the centre of the nervous system when students are thinking. Learning resources used in the learning process of the 2013 curriculum were student handbooks in the form of thematic books that each student had and thematic companion books for teachers. Teachers only applied subject matter using media in the classroom environment in the learning process. However, not all materials could be explained by utilizing existing media in the classroom environment. Educators found it difficult to exemplify various sources of energy by utilizing existing media in the classroom environment, as a result, students had difficulty understanding the material.

The success of the learning process depends on the creativity of teachers in delivering subject matter (Afandi et al., 2019; Pali & Rando, 2020). SD Muhammadiyah Condongcatur has complete supporting facilities, such as a computer laboratory equipped with a headset, LCD, wifi and speakers. It makes the possibility to use interactive multimedia-based learning media since at SD Muhammadiyah Condongcatur it has not used interactive multimedia in the learning process. Students have their interest in computer technology, none other than that most of the educators in these schools are already skilled in operating computers. This condition makes SD Muhammadiyah Condongcatur having the potential to use multimedia-based learning media to support thematic learning. Multimedia itself is defined as the sequential or simultaneous of a variety of media in a presentation or self-study program. Computers are often involved in multimedia presentations that incorporate text, audio, and still or animated images (Pravitasari & Yulianto, 2018; Suartama, 2019). Multimedia is a series of several kinds of media in a presentation or self-study program. Computers are often used in multimedia presentations that bring within the text, audio, and still or moving images. This statement shows the notion of multimedia is a combination of various media such as text, audio, and images that make it easier for students in the learning process.

Interactive multimedia prepares teachers to face the shift in conventional learning practices towards information and communicative technology-based learning (Darma et al., 2019; Sahronih et al., 2019). Teachers use interactive multimedia so that learning is following increasingly advanced technological developments. Besides, the use of technology in learning also prepares students to face global challenges. Related research found that the results of individual tests conducted by Class IV Teachers of Undiksha Laboratory Elementary School showed that multimedia had very good qualifications, and the results of small group tests showed that multimedia had good qualifications. It means that developed multimedia is ready for public use (Diputra, 2016). The other related research shows that multimedia-based learning can improve math skills. The use of multimedia in the teaching and learning process is effective in getting the attention of students, particularly when cartoon characters are used (Nusir et al., 2013). In addition, the use of multimedia which results that the teaching and learning process using various constructive teaching media has significantly increased achievement and knowledge among students (Vebrianto & Osman, 2011). In other hand, other research found that multimedia has a positive impact on student learning outcomes and can foster student motivation during learning (Lee & Keckley, 2006).

Based on related researches conducted by experts, it can be concluded that interactive multimedia has an important role in learning. The use of interactive multimedia provides space for students to be active in learning. An attractive interactive multimedia display makes students enthusiastic about learning. Interactive multimedia also makes it easy to understand the material because it is not only displayed through text but also pictures, audio, and learning videos. This study aims to develop interactive multimedia to support thematic learning in elementary schools.

2. Method

This research model is the research and development of Borg and Gall with three steps, they are preliminary Exploration Phase Study / Study; Product Development stage; Product Testing stage (Borg & Gall, 1983; Sugiyono, 2012). The product development stage includes: preliminary field testing activities carried out by 15 students at SD Muhammadiyah Condongcatur. Data obtained through observation and questionnaires then analyzed; the second product revision, the revision was based on initial field testing activities; main field testing activities were carried out at SD Muhammadiyah Prambanan and SD Muhammadiyah Purbayan; The third product revision was based on test results using interactive multimedia learning products for grade IV elementary schools in testing the main areas. Data collection techniques in this study used interviews, observation, achievement tests (pre-post-test), student responses, and documentation. The data analysis technique used was qualitative and quantitative data analysis. Qualitative data analysis got from the results of students' responses, while quantitative data was obtained from the main results of field testing; the pre-test and post-test scores of students' essay writing as consideration for improving the next interactive multimedia draft. Testing the data at the design stage of the main field testing using one group pre-test-post test. Furthermore, to determine the level of significance of the effect of interactive multimedia before and after learning, student learning. The results were then tested using the t-test.

The main field testing phase produced the final output design of interactive multimedia in the fourth grade of elementary school students that had been revised and had the following specifications: Development of interactive multimedia for fourth-grade students of the first semester of elementary school. Interactive Multimedia as a learning program contains instructional components that could guide and direct the learning process of the user interactively. This learning program was designed for independent learning. Therefore, this program was developed with a user-friendly principle so that even novice users would find it easier to operate the program and press buttons that facilitate their learning. This program was packaged using a communicative principle so that the interaction between the user and the program could be closer emotionally. This program was packaged in an attractive appearance according to the characteristics of the wearer.

3. Result and Discussion

Results

At the preliminary study stage, a literature study was carried out, by conducting an assessment of journals and research reports to obtain information on interactive multimedia development. Besides, analyzing core competencies and basic competencies on theme 2 sub-theme 1 energy sources. As content material in interactive multimedia, the topic of energy sources was determined. This stage was used to determine the development of interactive multimedia in thematic learning. The response of students at the preliminary study stage of the learning process shown in Table 1.

Table 1. Preliminary Stage Frequency Distribution

No	Criteria	Aspect					
		Interactive Multimedia		Sentences Clarity		Interactive Multimedia Presentation	
		F	%	F	%	F	%
1	Least	0	0	0	0	0	0
2	Less	0	0	0	0	0	0
3	Adequate	8	26,64 %	1	8,33 %	5	21 %
4	Good	15	50 %	3	25 %	10	41,7 %
5	Very good	2	6,66 %	8	66,6 %	6	25,02 %

Besides students' responses to interactive multimedia, researchers also get the final results of science learning scores obtained by students in the preliminary stages of the fields presented in Table 2. Overall, students' responses to interactive multimedia development in thematic learning at the preliminary study stage were good. However, some students found typing errors in interactive multimedia. At this stage, the creation of multimedia began to be carried out followed by expert validation, revisions, improvements, limited trials and evaluations. Improvements would continue to be repeated until the media was feasible to be tested extensively, then re-evaluate and revise. At the stage of developing a multimedia product, it started by making a development design. At the design stage, a storyboard was also made. A storyboard was a picture that told what you want to convey. The program display would be made following the storyboard that was created at the design stage. The display was created using Adobe Flash Professional CS6. The field trials were conducted on January 18 to 23, 2021 at SD Muhammadiyah Prambanan with 7 students and SD Muhammadiyah Purbayan with 7 students, so that the overall main field testing students were 14 students with low, medium and high ability categories. This stage aimed to determine whether the development of interactive multimedia on thematic learning had a positive effect for further quality improvement so that interactive multimedia was ready for use on a larger scale.

Table 2. Score Data for the Preliminary Stage

Interval	F	Percentage
36-45	2	33,33 %
46-55	1	16,67 %
56-65	2	33,33 %
66-75	1	16,67 %
Total	6	100%

The results of the pre-test scores of students with 53 students shows that the highest score achieved is 65, the lowest score is 30 and the students' mean score is 47.17. The number of students who obtained a score of 26-30 is 7 students, the score between 31-35 is 7 students, the score between 36-40 is 7 students, the score between 41-45 is 6 students, the score is between 46- 50 is 7 students, the scores between 51-55 are 7 students, the range 56-60 is 7 students and the scores in the range 61-65 is 5 students. The results of the post-test scores of students with 53 students indicated that the highest score achieved is 100, the lowest score is 65 and the students' average score is 82.64. The number of students who obtain scores ranging from 61-65 is 6 students, scores between 66-70 are 5 students, scores between 71-75 is 6 students, the range 76-80 is 8 students, scores in the range 81-85 is 7 students, the scores between 86-90 is 8 students, the range 91-95 is 9 students who obtain scores between 96-100 is 4 students. Hypothesis Testing Results on Pre-test and Post-test Data shown in Table 3.

Table 3. Hypothesis Testing Results on Pre-test and Post-test Data

Variable	T _{count}	T (0,05;53)	Decision
Pretest	101,333	1,885	Different
Posttest			(Ho is rejected)

By changing to the initial design the menu made it more multimedia easier to use. The user does not need to leave the initial selection to switch to other options. Simply pointing the cursor to the left the menu will appear and just press the option being selected. This ease of use is following one of the requirements for quality multimedia namely that multimedia must be easy to use by teachers and students. The screen captures of multimedia that developed in this study is shown in Figure 1 until Figure 6.

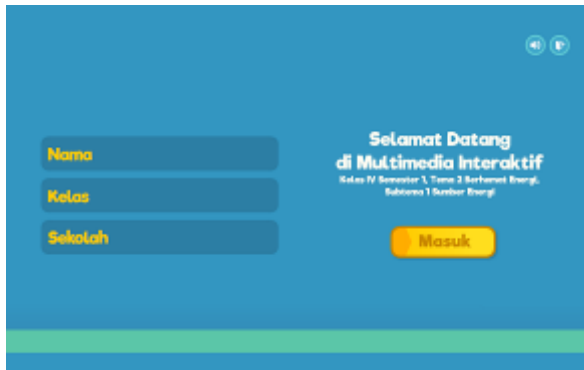


Figure 1. Welcoming interface



Figure 2. Homepage



Figure 3. Direction Menu

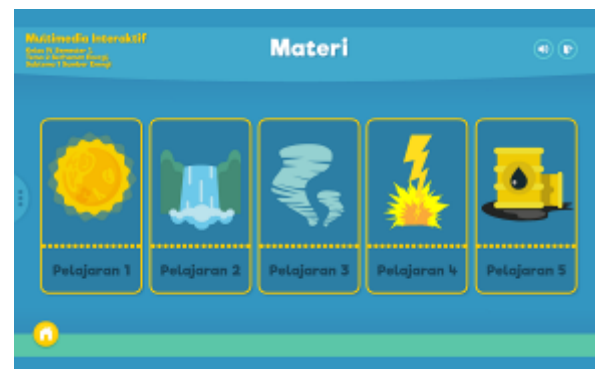


Figure 4. Table of Contents Menu

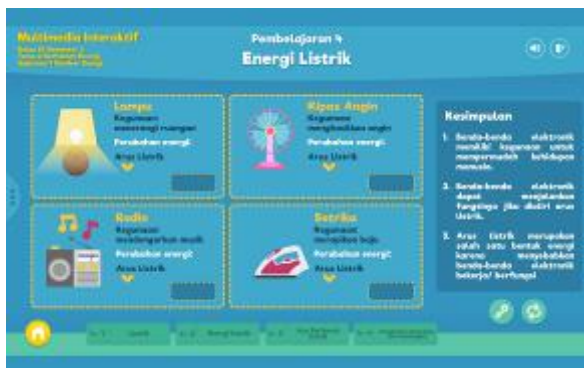


Figure 5. Material Page



Figure 6. Game Page

Discussion

Learning multimedia that is selected, developed, and used appropriately and well, will provide enormous benefits for educators and students. Interactive multimedia is very effective in delivering educational content (Herron & Haglund, 2006). Multimedia has the potential to reduce or even remove such problems. For example, learning materials, containing text, can be supplemented with and/or represented in graphical and auditory forms (Abtahi, 2012). Multimedia has the potential to reduce or even eliminate problems in the learning process. For instance in multimedia, teaching materials that combine text, graphics and audio so that students are interested in multimedia. In line with previous research, multimedia is any combination of text, art, sound, animation, and video delivered to you by computer or other electronic or digitally manipulated means (Wu et al., 2001; Zin et al., 2013). Multimedia is a combination of text, art, sound, animation, and video transmitted by a computer or other electronic means. The benefits of using multimedia is: the learning process is more interesting and more interactive; the amount of teaching time can be

reduced; the quality of learning of students can be improved and the teaching and learning process can be done anywhere and anytime; students' learning attitudes can be improved (Lou et al., 2012; Nusir et al., 2013). The use of interactive multimedia is suitable for teaching a processor stage. Based on the results of students' responses, it is concluded that interactive multimedia developed by researchers are in a good category. However, even though the assessment is getting better, there are some suggestions for improving interactive multimedia, it is an increase in several typing errors. After the improvement, the researcher developed interactive multimedia in stage II, the revised interactive multimedia was tested on a larger scale, called field testing.

Video and animation have a more significant effect on student achievement in the context of thematic learning than static images, both in terms of operating equipment, technical operations, experimental procedures, and observations (Lou et al., 2012). The use of computer media (multimedia) can be an alternative because it can integrate molecular animation and demonstration videos (Pekdağ, 2010). Related research results were which states that the use of computer simulations can help in improving problem-solving and the use of multimedia applications to improve the learning process (Lee & Keckley, 2006; Shu-Ling, 2000). The use of multimedia also corrects misconceptions and misinterpretations that have occurred in previous lessons. This is in line with the conclusion that students who learn to use interactive multimedia get higher scores than those who do not (Fauyan, 2019; Wibowo et al., 2013). Rapid development, comprehensive technology and interest in education have provided space and opportunities for teachers to contribute their ideas and experiences (Lee & Keckley, 2006; Nusir et al., 2013). The implementation of methods assists in understanding concepts, processes and terms in multimedia, simultaneously providing a conducive teaching and dynamic learning environment to visualize information attractively and effectively. Besides, educational technology is a challenge, impact and responsibility for educators and requires more than just the involvement of students. Multimedia learning improves quality and creates a generation capable of facing challenges. Multimedia-assisted learning can be recommended as an alternative learning facility to optimize physics learning in achieving conceptual understanding and learning outcomes (Suwindra, 2012).

At this stage, before being given interactive multimedia for learning, the researcher conducted a pre-test to determine the initial abilities before using interactive multimedia. After that, students were given interactive multimedia and explained the procedure for using interactive multimedia. Then, students were allowed to learn interactive multimedia and discuss with other students. Furthermore, after using interactive multimedia, students were given a post-test to determine the feasibility of interactive multimedia in improving cognitive skills. Besides giving the pre-test and post-test, students were also given an instrument sheet for students' responses to find out the students' responses to the given textbook. Based on the results of the pre-test and post-test, it showed that there was an increase in the mean score of students in the post-test score. The results of hypothesis testing on the pre-test and post-test scores show that H_0 is rejected. This shows that learning using interactive multimedia developed is used in learning activities. Needs analysis is the initial stage in development research. In the interactive multimedia development stage to improve cognitive abilities, the first step taken is to analyze the needs of research subjects. The need which is the focus in this study is the gap between the actual situation that teachers have not used interactive multimedia in the learning process and the conditions that should be that students can use it more easily to understand learning. The inhibiting factor in learning is that students are less interested in learning because teachers are less innovative in delivering learning so they need an interactive multimedia solution that can be used as a learning medium in schools.

4. Conclusions and Suggestions

Based on the results of the analysis, in general, the use of interactive multimedia affects the cognitive abilities of grade IV elementary school students, or in other words that

the use of interactive multimedia can improve the cognitive abilities of grade IV students. It can be identified through the increase in the mean score of students from 47.17 in the pre-test to 82.64 in the post-test score. By using multimedia equipped with music, narration, pictures and animation, it can overcome boredom in learning which generally only uses the lecture or powerpoint method. Besides, Interactive Multimedia can be used in independent learning, especially for students.

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