Computer-based interactive multimedia: a study on the effectiveness of integrative thematic learning in elementary schools

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Abstract. Computer-based interactive multimedia is one of the media that can be used to deliver learning materials to students. The purpose of this research is to know the effectiveness of computer-based interactive multimedia on integrative thematic learning in elementary school. Design this study applies two groups of respondents, namely Experimental class Group and Control class group. This study refers to the concept of the pre-test post-test control group. The results of this study showed that learning using interactive computer-based interactive applications more effectively in comparison with conventional media. This is because learning using interactive multimedia computer-based, students can control the learning activities and students determine the speed of learning and choose the sequence of learning activities in accordance with needs.

1. Introduction

The development of technology and communication make learning activities by using media is something that must be used. Educational developers recognize that learning will be more effective when utilizing learning media. Therefore, the development of learning media increasingly encouraged. Computer-based learning media is currently developing and used as an alternative learning media. According to Roblyer, et al [1], computer-based learning is how computer programs are used as a tool to deliver material in learning. With various features and accessories supporters,

In Indonesia at the Elementary School level using integrative thematic learning is applied in elementary school by combining various subjects (mathematics, science, social sciences, Indonesian language, Civic education) that have the same theme [2]. Thematic learning is commonly applied in elementary school because the characteristics of learners who still see something holistically, they have not been able to sort out the concepts from various disciplines. This illustrates the deductive way of thinking of the child from general to part-by-side. Therefore integrative thematic learning becomes the learning that matches the characteristics of learners in elementary school [3].

With the existence of integrative thematic learning in elementary school so to facilitate the learning activity hence required interactive multimedia based on scientific approach as a tool to deliver learning material. According to Saputri, et al [4], The development of multimedia technology has promised great potential in changing the way one learns, to obtain information, adjust information and so on. Multimedia also provides opportunities for educators to develop learning techniques to produce maximum results [5]. So also with students, with multimedia expected they will be easier to determine with what and how students to be able to absorb information quickly and efficiently [6], [7]. Learning
using multimedia makes it easy for students because multimedia as a source of information is no longer focused on text from the book alone but more broadly than that [8], [9].

Based on the background and some research results as described earlier, it is necessary to develop the learning by using interactive computer-based multimedia, which then will be investigated how the validity of the development of interactive multimedia-based computer and how effective the use of an interactive multimedia-based computer on integrative thematic learning in elementary school.

2. Computer-based Interactive Multimedia
Multimedia is defined by Haffost "as a computer system consisting of hardware and software that makes it easy to combine images, video, photography, graphics, and animations with voice, text, and data controlled by commuter programs" [10]. Multimedia also has interactive communication or high inter-attachment. And in the world of multimedia computers can be interpreted as computer information that can be presented through sound or images, text, graphics, and animation [11]–[13].

A multimedia is a tool that can create dynamic and interactive presentations that combine text, graphics, animation, audio and video images [14], [15]. or Multimedia is generally a combination of three elements, namely sound, images, and text [16]. or Multimedia is a combination of at least two input or output media, data can be audio (sound, music), animation, video, text, graphics, and images [17], [18]. Multimedia has four important components. First, there must be a computer that coordinates what is seen and heard. Secondly, there must be a link that connects the user with information. Thirdly, there must be a navigation tool that helps the user navigate the connected information network. Fourth, multimedia provides a place for users to collect, process, and communicate information with ideas [19], [20].

Multimedia can be categorized into two groups, namely multimedia linear and multimedia interactive. Linear multimedia is a multimedia that is not equipped with any controller in it. It is sequential or sequential and the duration of impressions can be measured. Movies and television are included in this group. While interactive multimedia is a multimedia equipped with controller tools that can be operated by the user, so users can choose what is desired for the next process [21]. In this paper, the researchers chose to develop interactive multimedia as a elementary school student learning resource. This interactive multimedia is expected to help the learning process in elementary school.

3. Method
This research is a development research. In this research has developed a computer-based interactive multimedia model for integrative thematic learning in elementary school. Computer-based interactive multimedia is developed using the Adobe Flash 8. The instrument used for data collection mastery of integrative thematic concepts is a multiple choice test. Subjects in this study are the fifth graders of public elementary schools in Kabupaten Mempawah West Kalimantan province amounted to 100 people.

This study applies two groups of respondents, namely experimental class group and control class group. The experimental class is the learning class using interactive multimedia based on the computer while the control group is a class using conventional media. The design used in this study refers to the pretest-posttest control group design concept. Data of mastering the concept of each learning material obtained then analyzed to determine the level of success of the use of the interactive multimedia-based computer in learning which is then compared with classes that learn with the same material through conventional media. To find out the difference test of two averages two samples were performed to determine whether between the Experimental Group and the Control Group there was a difference in N-gain (Gain of Normalization). Here is the N-gain formula (gain normalization):

\[ N - \text{gain} = \frac{S_{post} - S_{pre}}{S_{maaks} - S_{pre}} \]

*Formula Description:*
- \( S_{post} \) = End Test Score
- \( S_{pre} \) = Pre Test Score
- \( S_{maaks} \) = Pre Test Score
4. Results and Discussion

4.1. Result

4.1.1. Stage Design of interactive multimedia application based on computer

This design stage is the stage of making the design of an interactive multimedia learning with reference to the results of needs analysis from the previous analysis stage. Based on the analysis that has been developed, obtained a concept of “simple desktop”. In this concept, multimedia is designed with a simple look, easy to use, and interesting with the animation simple animation.

4.1.2. Computer-based Interactive Multimedia Validity in integrative thematic learning in elementary schools.

Stages of validation are the application that has been designed in given the assessment and advice to multimedia experts and integrative thematic learning experts. If the results of the assessment get the criteria of good value that is at least get an average total of 3.00. The following results of multimedia validation by media experts can be seen in the following table:

| Table 1. The result of Expert Multimedia Expert Validation |
|----------------------------------------------------------|
| Aspect of Assessment | Item | Criteria Score | Average |
|----------------------|------|----------------|---------|
| Navigation Key Existence | 5    | 25             | 5.00    |
| Multimedia View      | 10   | 40             | 4.00    |
| Ease of Use Multimedia | 10   | 45             | 4.50    |
| Text Typography      | 5    | 15             | 3.00    |
| Amount               | 30   | 125            | 4.86    |

From the table, it can be seen that multimedia validation by media expert got the average feasibility of 4.16 which can be categorized Very Good, and then for the validation of expert assessment material in elementary school can be seen in table 2:

| Table 2. The result of Recapitulation Validation of integrative thematic subject matter experts in elementary school |
|-------------------------------------------------------------------------------------------------------------------|
| Aspect of Assessment | Item | Criteria Score | Average |
|----------------------|------|----------------|---------|
| General Aspects      | 5    | 23             | 4.60    |
| Substance Matter     | 5    | 18             | 5.00    |
| Amount               | 10   | 41             | 4.10    |

Based on the results table of validation recapitulation of integrative thematic learning material, the average value of feasibility 4.10 which is biased is categorized very well. Furthermore, after the interactive multimedia-based computer in the validation test by experts and there are some that must be revised in accordance with the opinions of experts that the next stage of interactive computer-based multimedia applications in testing to students as users.

4.1.3. Test the effectiveness of the use of computer-based Interactive Multimedia on integrative thematic learning in elementary school

At this stage, the researcher wanted to know how big the effectiveness of the use of interactive multimedia computer based on integrative thematic learning developed and whether this multimedia can give effect to the improvement of learning result of elementary school students using multimedia in compare class using conventional learning media.

The material tested at the effectiveness stage in this study only measures students' cognitive abilities. Learning materials that are displayed on the theme of even seven semesters are the environment of our friends. With sub-themes 1; Human and Environment, sub-theme 2; Environmental Change, sub-theme
3; Environmental preservation efforts. Each student's test score on each sub-theme was analyzed for achievement level based on the initial test score, final test, and normalized gain. Percentage improvement of mastery of student concept on each sub-theme in experiment class and control class is presented in figure 1.

![Average N-Gain Score Comparison Each sub theme of learning](image)

**Figure 1.** Average N-gain Score Comparison Each sub theme of learning

Based on the analysis in the figure above can be seen that the highest increase in the experimental class of 85.2% in Sub-thema 2; Environmental Change, while the lowest in Sub-thema 1; Human and Environment of 71.5%. In the control class, the highest increase occurred in Sub-Thema 3; Environmental preservation efforts of 70.2%, while the lowest value in Sub-Theme 1; Human and Environment material. In the experimental class, the highest increase in material understanding Sub-Theme 2; Environmental Change can be understood by the students, the Environmental Change material has to do with the previous material and in the multimedia application, the Environmental Change material generates a lot of animations to motivate students to learn.

In this integrative thematic learning material, there is the highest difference in the improvement of the second class that is the experiment class that is learning using interactive multimedia application with control class using conventional media in the learning process. Based on the results of these effects results can be caused that learning activities using interactive multimedia-based computer developed to help students understand the concept of understanding the material better. Illustrations and visualizations provided motivate students to keep learning. Students are involved in a series of experiments that guide him to discover his own concept of environmental material.

4.2. Discussion

Based on the findings of research results obtained that the learning activities in elementary education by using interactive multimedia-based computer proved effective and can improve student learning outcomes. the benefits that can be gained from learning multimedia is a more interesting learning process, more interactive, can reduce the work time because it is assisted by multimedia sophistication, for students the quality of learning can be improved and the learning process can be done anywhere and anytime, can be increased [22]–[24]. Good learning media can also stimulate and generate motivation and interest in learning. Audio-visual effects in multimedia can provide a good stimulus to the senses of learners. Similarly, computer games usually attract people, so the presentation of learning materials in the form of computer games can also attract students' attention [25]–[27].

Interactive Multimedia is a presentation system using Computer application program that combines various Visual Media and Audio applications into it and is controlled interactively with a control application to give the user ease in processing or searching the required information in a row or random
through an interactive logic navigation system [28]. Multimedia Interactive contains information that is arranged and linked to each other into interrelated sequences. Each user (user) can freely select and access to each link-link information they want [29], [30]. With the ability to process better multimedia, interactive applications can come up with unlimited creativity [31]. With interactive applications we can provide guidance and learning about many things.

5. Conclusion
In this research has developed interactive computer-based multimedia on integrative thematic learning in elementary school. The results of the study show the mastery of the concept of understanding of integrative thematic learning materials using interactive computer-based multimedia is higher than the students taught conventional media. Learning using computer-based interactive multimedia can improve the direct interaction between learners with learning resources and learning implementation in accordance with their abilities, interests, and time.

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