

## **Developing Interactive Multimedia Model 4D for Teaching Natural Science Subject**

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### **Abstract**

This study aims to produce interactive multimedia products for teaching natural science subject. Learning Media has a function to give more understanding and to facilitate educators in delivering information in the form of subject materials to their students. Model of development of 4D (Define, Design, Development, Dissemination) developed by Thiagarajan is adopted in this study. This development product was in the form of CD Rom which consisted of learning materials, evaluation and discussion of problems by using Microsoft Powerpoint application. This development product was assessed by three experts, i.e.: learning media, content/material, and natural science teacher. Questionnaires as tool for data collection which were obtained from content experts, media experts and teacher as tool for data collection then analysed using Likert-scale. The results of the assessment by the media expert on the display aspect showed that 92% with excellent qualifications, on the interactive aspect provided an assessment was 96% with excellent qualifications while on the usefulness aspect provided a 100% assessment with excellent qualifications. For the overall aspects of display, interactive and usefulness, the media expert provided an assessment was 96% as excellent qualifications. While, the content/material expert on the display aspect provided an

assessment was 92% with excellent qualifications remark. Whereas, on the linguistic aspect, the content/material expert gave an assessment was 88% with good qualification. For the overall multimedia-based interactive learning media, the content/material expert was 91% assessment with excellent qualifications. The peers stated that the display aspect was 84% with good qualification. While in linguistic aspect, they give assessment of 90% with excellent qualification. The overall assessment results by peers on the interactive multimedia was 86% with good qualifications.

Keywords: learning media, interactive multimedia, natural science subject

## 1. Introduction

Science and technology that is growing rapidly give influence to almost all aspects of human life. Such changes can lead to many things. Some is useful to solve the problems arising but some other can also bring people in the increasingly strict global competition. One of the efforts that human resources can survive in the era of free competition is to improve the quality of human resources. Improving the quality of human resources requires a directive plan that is conducted intensively, effectively and efficiently. The increasing quality of human resources can not be separated from the quality of education. The quality of education in Indonesia is still low due to the effectiveness and efficiency in the learning process. The learning process runs effectively when students can learn easily, feel happy and comfortable, have no sense of compulsion and the learning objectives can be achieved. In order to run effectively then the teachers are required to have the ability to improve the effectiveness of learning.

From the results of interview with a natural science teacher class VIII semester 1 school year 2017-2018 at MTsN 1 Surabaya and seeing the average result of student's daily test score was 70.5, while the standard of minimum mastery criteria is 75. It means that it is still less than what expected by the school. These results indicates that the learning activities of Natural Science have not run effectively.

Some efforts made so that the learning activities can run effectively, for instance, is by using learning media that can improve students to be more easily in learning, students become active and not easily bored during the learning activities. Learning media intended is an interactive multimedia-based learning media that have never existed or developed in natural science subjects at MTsN 1 Surabaya City. Such explanation underlies the development of interactive multimedia

learning media in studying the subject materials of natural subject which consists of a combination of several media such as text, images, audio and video that are expected to attract students and facilitate them to learn the subject materials.

The identification of the problem in this research is the absence of interactive learning media used by teachers in learning natural science at class VIII of MTsN 1 Surabaya City.

Based on the identification of the problem above, the goal to be achieved in this research is to produce interactive multimedia learning media.

## **2. Research Method**

This research used model development 4D model (Define, Design, Development, and Disseminate). However, due to limited time, researchers limit themselves only to the Development stage only. Researchers used the 4D model because this development model is arranged systematically with sequences of activities that can be used for proper problem solving on learning instruments. The 4D development model can be adapted to the school needs and its student characteristics so that it can be flexible and conditional.

This study used methods of data collection in the form of interview, documentation and questionnaires. The data collection was conducted to answer the problems of the quality of the development result of multimedia interactive learning media. Methods of interview and documentation were systematically used by researchers for needs analysis as a basis for determining learning media product that is designed to be developed. Required documents were in the form of Syllabus, Lesson Plan and Minimum Mastery Criteria (*Kriteria Ketuntasan Minimal/KKM*) class VIII MTsN 1 Surabaya City in the school year 2017-2018.

The next method was a questionnaire method used to determine the feasibility or quality of interactive multimedia development product. According to Sugiyono (2009: 199), it is explained that the questionnaire method is a technique of data collection conducted by giving a set of questions or written statements to respondents to answer it. Data collection in the form of questionnaires was used to record the validation results from the material/content expert and design/media expert. It is also used to collect data from students during individual test, small group test and field test.

This development research used quantitative and qualitative descriptive analysis techniques. Qualitative descriptive analysis is a technique to analyze the data obtained in order to get a true overview of the situation. According to Agung (2012: 67) that qualitative descriptive analysis is a

way of analyzing or processing data by systematically arranging in the form of sentences or words, categories of a subject to obtain general conclusion. This qualitative descriptive analysis technique was used to process the data of validation test from material/content expert, media/design expert, individual test, small group test or field test.

Qualitative descriptive analysis was done by grouping data in the form of input or response and criticism and improvement suggestion on the questionnaire. The results of this analysis were used to make revisions to interactive multimedia development product.

According to Agung (2012: 67) that quantitative descriptive analysis is a way of data processing by systematically arranging in the form of numbers or percentage, regarding an object studied so that it is obtained general conclusion. In this study, quantitative descriptive analysis technique was used to process data in the form of scores obtained through the questionnaire. To calculate the percentage of each subject in the questionnaire using the formula:

$$\text{Percentage} = \frac{\sum(\text{Answer} \times \text{score of each choice})}{n \times \text{highest score}} \times 100\%$$

Remark:

$\sum$  = Sum

n = Total number of questionnaire items

% = Describing expression level

While calculating the percentage of the overall subject used the formula:

$$\text{Percentage} = \frac{F}{N}$$

Remark:

F = Total percentage of the overall subjects

N = number subjects

To know the qualification of percentage calculation result, it is used a conversion with scale level 5 as in table 1 below:

Table 1. Conversion of scale 5 achievement level and qualification:

| Achievement level | Qualifications | Remark               |
|-------------------|----------------|----------------------|
| 90%-100%          | Excellent      | No need to revised   |
| 75%-89%           | Good           | Revised as necessary |
| 65%-74%           | Adequate       | Pretty much revised  |
| 55%-64%           | Deficient      | Much revised         |
| 0-54%             | Very deficient | Totally revised      |

Source: Tegeh (2014)

### **3. Results and Discussion**

In the research result, it is described some important things, those are 1) stages of designing interactive multimedia learning media, 2) validation test of expert test, 3) revision of development product, and 4) trial of development product.

This research used 4D development model which consists of 4 stages. Further, it was described the four stages of interactive multimedia development by using 4D model. The early stage that is often called needs analysis was used to determine and define requirements in the development of interactive multimedia. This stage is divided into several steps: initial analysis, student/learner analysis, task analysis, concept analysis and objective learning analysis. At this stage, an interview was conducted with a natural science teacher of VIII grade on student learning report and learning media used so far. Natural Science subject is a life-related subject with the details of the materials in the form of Biology, Chemistry and Physics which is in a unity of natural science. The natural science subject, not only memorize but also require real examples in everyday life so that students do not feel bored and saturated in studying the subject. Learning media used so far has not been referring to multimedia so it is still less effective and efficient. For those reasons, it is necessary to develop a learning multimedia on natural science subject so that the learning process becomes more active and fun. The existence of facilities in MTsN 1 Surabaya City is sufficient for the use of interactive multimedia. Some classes have been facilitated with permanent LCD Projector and a number of classes that have not equipped with permanent LCD Projector will be provided a mobile LCD Projector. In addition, each class is also equipped with a white board and 2 computer laboratory room that is very supportive to the interactive multimedia development in the learning process. Next is the student/learner analysis where basically the learning style of students is different. There are visual, auditory and kinesthetic styles. The diversity of learning styles also underlies the development of interactive multimedia learning media because this media combines many media in the application of both visual and audio. Next is the task analysis related to the materials in interactive multimedia and can be done in groups or individuals. After that is a concept analysis that aims to identify the main material in learning and arranging it systematically to be developed in interactive multimedia. And the last in this stage is the analysis of learning objectives that have a goal to determine competence and indicators of learning achievement that must be achieved by students.

In the second stage of the design stage of the researcher to determine the interactive multimedia design. Researchers determine the use of Microsoft Office Powerpoint as an application

in making interactive multimedia. The design of interactive multimedia learning media consists of Core Competence and Basic Competence of the presented materials, indicators, materials, practice questions and evaluation. Then, the researchers chose the right media in presenting the material in the form of images, text, audio or video that will be displayed in the media as a multimedia learning. In this stage, the researcher also prepares an instrument of questionnaire to test the validation of material/content expert and design/media expert.

The third stage after the definition and design stage is the development stage. This stage begins with the creation of a multimedia product storyboard. Then, it is continued with the production stage of interactive multimedia development. Further, there is an assessment by media expert and material expert on instructional media that have been designed. For the trial of product development is conducted through individual trial, small group trial and field trial. The results of validation of the experts and development trials used by researchers to make interactive multimedia revisions to conform to the specifications that have been set.

The fourth or final stage is the distribution stage. And because of the limited time, researchers do not perform this stage and only perform until the third stage, that is the development stage of multimedia interactive product.

In the development results of interactive multimedia product, the researchers will present the validation results of the material/content expert, media/design expert, individual test result, small group trial result and field trial result. Researchers will describe it in accordance with the sequence in accordance with the data obtained. The validation was performed by a material/content expert and one Natural Science teacher in MTsN 1 Surabaya. Assessment instrument that was used was in the form of questionnaires.

This interactive multimedia in validation test by the content/material expert on display aspect gave the assessment with 92% percentage with excellent qualifications so that the developed media need not be revised. As the linguistic aspect of the content/material expert gave an assessment with a percentage of 88% with good qualification. For overall multimedia-based interactive learning media, the content/material expert provided 91% assessment with excellent qualifications. While the assessment by peers stated that on the display aspect showed 84% percentage and good qualification. While in linguistic aspect gave assessment with percentage of 90% with excellent qualifications. Overall assessment results by peers on interactive multimedia had the percentage of 86% with good qualifications so that it needed to be revised as necessary only.

The results of this interactive multimedia validation by media/design experts obtained the results of the assessment on the aspect of the display with a percentage of 92% with excellent qualifications, the Interactive aspect provided an assessment with a percentage of 96% with excellent qualifications while on the aspect of usefulness provides assessment with 100% percentage with excellent qualifications. The overall aspects of the display, interactive, and usefulness, the media expert provided an assessment with a percentage of 96% and excellent qualifications, so it did not need to be revised.

Furthermore, Individual Trial conducted on three 8th grade students of MTsN 1 Surabaya City with different abilities that is lower average, average and higher average. From the results of this test, it was obtained the data for general display aspect assessment of natural science learning media by using interactive multimedia showed a percentage 93% with excellent qualifications, for display aspect of visual or images on each slide power point, the percentage was 80% with good qualifications, for the display aspect of text (Font) on each slide or display on the natural science Multimedia-based interactive learning media, it was obtained a percentage of 87% with Good qualifications, the aspect of content assessment presented through this multimedia helped to improve understanding of what materials to be learned obtained 87% with good qualifications, the aspect of material clarity assessment on each slide or display on natural science multimedia-based interactive learning media got the value of 80% with the Good qualification, the aspect of clarity assessment exercise on the learning media IPA based interactive multimedia obtained value 80% with good qualification, aspect of clarity assessment of the audio display obtained 87% with good qualification, the aspect of assessment on the existence of feedback (exercise questions and answers), whether it helped to improve your understanding in learning materials of this natural science obtained a percentage of 80% with good qualifications, aspect of assessment on the order of presentation of natural science materials that was presented through multimedia-based interactive learning media obtained 87% with good qualifications and aspect of the assessment on the structure of natural science materials presentation through multimedia-based learning media that was used as a learning strategy by educators to facilitate in learning obtained a percentage of 87% with good qualifications. Overall, questionnaire results on individual trial obtained percentage value of 85% with good qualifications so that researchers needed to revise as necessary.

For the small group trial consisted of nine students of grade 8 E of MTsN 1 Surabaya City with various capabilities. From the results of this test, it was obtained the data for general display aspect assessment of natural science learning media by using interactive multimedia showed a

percentage of 76% with Excellent qualifications, for display aspect of visual or images on each slide power point showed the percentage of 80% with good qualifications, for display aspect of the text (Font) on each slide or display on the natural science Multimedia-based interactive media learning obtained percentage of 80% with good qualifications, the aspect of content assessment presented through this multimedia helps improve understanding of what materials to be learned obtained the percentage of 86% with good qualifications , the aspect of material clarity assessment on each slide or display on natural science multimedia-based interactive learning media got the percentage of 76% with the Good qualifications, the aspect of materials clarity assessment on the natural science multimedia based interactive learning media obtained the value of 80% with good qualifications, aspect of the assessment on clarity of the audio display obtained 76% with good qualifications, the aspect of assessment on the existence of feedback (exercise questions and answers), whether it helped to improve your understanding in learning materials of this natural science obtained value of 86% with good qualifications, aspect of the assessment on the presentation sequence of natural science materials presented through multimedia-based interactive learning media obtained a value of 78% with good qualifications and aspect of assessment on the structure of natural science material presentation through multimedia-based learning media used as a learning strategy by educators to facilitate in learning obtained the value of 78% with Good qualifications. Overall, the questionnaire result on small group trial obtained the percentage of 80% with good qualifications so it needed to be revised as necessary.

While for Field Trial, it was conducted on 8 D grade students of MTsN 1 Surabaya City with 31 persons who had ability comparable with students in small group trial. From the results of the test, it was obtained data for the assessment of the general display aspect on natural science learning media by using interactive multimedia showed a percentage of 90% with excellent qualifications, for display aspect of visual or images on each slide power point showed the percentage of 83% with good qualifications, for the display aspect of text (Font) on each slide or display on the natural science learning media based Multimedia interactive this percentage obtained 79% with good qualifications, aspect of content assessment presented through this multimedia helped improve understanding of what materials to be learned obtained the value of 86% with good qualifications , the aspect of material clarity assessment on each slide or display on natural science learning media based on interactive multimedia got the value of 85% with Good qualifications, aspect of clarity assessment for the exercise questions on natural science learning media based on interactive multimedia obtained value of 88% with good qualifications, an assessment of the



existence of feedback (exercise questions and answers), whether it helped to improve your understanding in learning materials of this natural science obtained the value of 85 % with good qualifications, aspect of the assessment on presentation sequence of natural science materials presented through multimedia-based interactive learning media obtained the value of 87% with good qualifications and aspect of assessment on the structure of natural science materials presentation through multimedia-based learning media used as a learning strategy by educators to facilitate in learning obtained the value of 82% with good qualifications. Overall, the questionnaire result on field trial got the percentage value of 85% with good qualifications so it needed to be revised as necessary.

The revision of interactive multimedia development product was based on the input and suggestions by material/content expert, design/media expert and trials whether individual trials to field trials.

#### **4. Conclusion and Suggestion**

Based on the identification of the problem, the results of data analysis and discussion in this study, then the conclusion that can be taken as follows:.

First, that the development of interactive multimedia products is through several stages in accordance with 4D development model that is the definition stage, the design stage, the development stage and the dissemination stages. However, due to limited time, researchers only use the first three stages only. Multimedia is designed in a simple manner that aims to facilitate students in operating it. The menus used are available consistently at a point so it does not make the students confused. Selection of media used in accordance with the characteristics of 8th grade students of MTsN 1 Surabaya City.

Second, interactive multimedia for natural science subject in MTsN 1 Surabaya City has been produced from the development product in this research and feasible to wear. This is evidenced by the validation results by the material/content expert and media/design expert. Also, the results of individual trial, small group trial and field trial.

While the suggestion and input obtained from the Test by Experts and trials in this process is that the researchers shall make improvements on several things including the following: 1) reducing the writing with too many sentences without reducing the meaning or cutting the material, 2) audio media for some for some slides should be redesigned, 3) using more variation in using letters and fonts, 4) background design on display of the multimedia-based interactive media, 5) evaluation

questions should be packaged in problem-based form, 6) timing in learning activities with multimedia-based interactive media, 7) interesting images and 8) more interesting slide display

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