Development of Mathematics Learning Media for Multiplication Material Based on Macromedia Director MX

Uliya K. Nisa

ABSTRACT

Learning media is one of the tools that make it easier for teachers to teach the material to students. Learning mathematics using media can activate students and provide a more learning experience. However, the development of mathematics learning media for multiplication material has not been carried out. This study aims to determine the development of mathematics learning media for multiplication materials based on Macromedia Director MX. This research was carried out using the Research & Development (R & D) method using the development procedure model from Dick and Carey, namely the ADDIE (Analysis, Design Development, Implementation, Evaluation), development model with a limit to the ADD stage. In the design stage, the preparation of the learning material flow is carried out, as the preparation of the structural framework, the preparation of the outlines of the content of the learning media, and the determination of evaluation. In the development stage, the creation of learning media using Macromedia Director MX is carried out. The development of mathematics learning media for multiplication material based on Macromedia Director MX has been carried out. Based on the data obtained from the validation results by material experts and media experts, it can be seen that the developed media meets the ideal score by making several revisions to the suggestions given by the validator. This research uses Macromedia Director MX as a basis for the development of mathematics learning media multiplication material.

Keywords: development, learning media, macromedia director MX, mathematics, multiplication.

I. INTRODUCTION

Multiplication material is one of the mathematics materials taught since elementary school. This material is material that is quite difficult for low-grade students. If viewed at a glance, the mathematical concepts taught to elementary school-level students do seem very simple, but the mathematics material contains important and basic concepts so it should not be considered easy (Wardani & Setiadi, 2020). In addition to the material, which is quite difficult, the delivery of material carried out by the teacher is sometimes less than optimal. Submission of multiplication material for low-grade students should be made interesting and encourage students to be more active.

There are four categories of mathematical understanding: Principled, concrete, intuitive, and computational knowledge (Lampert, 1986). In teaching mathematics, it is necessary to realize that every student has different abilities so that teachers can make a good approach to students. In addition, by knowing the students' abilities, it will be easier to determine the learning scheme that will be carried out when delivering material, especially difficult material. When the teacher already knows the condition of the student and the needs of the student, the teacher will also find it easier to determine the media that will be used to help students learn and of course also be adjusted to the facilities available at the school so that they can maximize the existing facilities.

Some elementary schools have school computer laboratories that were built as a means for students to learn. In addition, not a few elementary school students can already operate a computer or laptop. The existence of this computer laboratory has not been utilized optimally by teachers. So far, the computer laboratory is still used by computer extracurricular teachers only.

Currently, the development of mathematics learning media in elementary schools has been widely carried out. The development carried out is in the form of print media, concrete media, image media, and multimedia. There are many materials and software that can be used in developing interesting learning media.

Macromedia Director MX is a software developed by Adobe. This software is one of the software that can be used to create learning media because it can display animations, and games and can be inserted by video. However, this software is still rarely used. Usually, the software that is often used in developing learning media is Macromedia Flash software.

Research on the development of learning media using
software that has been widely carried out is research using Macromedia flash. Learning media research that has been done on multiplication material for elementary school children is still rarely based on Macromedia Director MX. Research that is similar to the development of mathematics learning media based on Macromedia director MX multiplication materials is among the studies by Swalagana (2018) and Wardani and Setyadi (2020). However, the media developed by some of these researchers have not utilized the software Macromedia Director MX. This happens because not many researchers have tried to develop media based on Macromedia Director MX. Researchers tend to use Macromedia flash which has been very often used by previous researchers.

Based on this, researchers are interested in developing mathematics learning media on multiplication material for lower-grade students in elementary schools. The learning media that will be developed in Macromedia director MX-based learning media is still very rarely used to develop learning media for elementary school children.

Mathematics learning at the elementary school level has the ultimate goal of making students skilled in using various mathematical concepts in everyday life (Wardani, 2012). Mathematics material in elementary school which is often considered light does not show that. Mathematics material taught in elementary schools is the material that will be the basis for learning mathematics at a higher level. Multiplication material is one example of the material that often occurs misconceptions when studying it. Multiplication material is one of the materials that will always be used at the next level of education.

Teaching multiplication material in low grades can use assistance in the form of media and props. This will certainly make it easier to convey the material and can attract the attention of students. This will also provide a valuable learning experience so that every material and concept learned by students will last longer in students memories. If students are interested in learning, the course students will find it easier to understand the material provided by the teacher.

Students need tools that can be in the form of media or teaching aids to clarify what the teacher will convey so that students will more quickly understand and understand when abstract mathematics learning takes place (Wardani, 2012). To get to the skilled stage, of course, several phases need to be passed. The phases that need to be passed include: 1) Planting basic concepts, (can be done using media/props that can help students' mindsets), 2) Concept Understanding, (is a continuation of concept cultivation, not necessarily in the same meeting as concept planting, but is still a continuation of concept cultivation, and 3) Skills Development which is further learning from concept cultivation and understanding (Wardani & Setyadi, 2020).

Learning media is one of the means that can be used in delivering learning materials. Learning media can be interpreted as all tools and materials that can be used for educational purposes, such as books, radio, newspapers, television, magazines, and so on (Sanjaya, 2008). Learning media can also be interpreted as tools or materials that contain messages or information that contain teaching purposes. When used appropriately during the learning process, learning media will become a more efficient and effective support tool for achieving learning objectives (Puspitirini & Hanif, 2019). In simple terms, learning media is an intermediary for introducing material in the implementation of the learning process from a teacher to a learner. Apart from being an intermediary for materials, the use of appropriate and appropriate learning media with the material being taught, as well as according to the needs of students, will be a special attraction for the media and allow students to be more active in the learning process. To make learning achievement goals more effective, learning media are needed in learning communication (Widodo, 2018).

Macromedia Director MX is a program specifically designed for creating self-contained or self-running programs. Macromedia Director is a program that can assist in the creation of engaging animations and interactive multimedia to boost student interest in education (Melianti et al., 2020). This application can be used as a presentation medium or as an interactive medium to create an Interactive CD (Compact Disc). This application can also be used to create web page content in shockwave form. The advantages of Macromedia Director MX include: 1) Stage Zoom, a facility to enlarge the display on the Stage by simply pressing the ctrl key and the (+) or (-) button on the keyboard, 2) Cast Member, displaying various media or elements grouped in Cast Member, 3) Bitmap Compression, Bitmap compression allows someone to compress images so that they can be displayed or downloaded by others but the image quality is not reduced. 4) Lock and Unlock Sprites, in Macromedia Director MX you can lock the Sprites on the stage to protect them Sprites cannot be viewed and can be reopened if you want to just press unlock, 5) Control Bitmap Images with Lingo, which allows one to manipulate and create bitmap images using Lingo Scripts, and 6) Play Audio with Lingo, making it easy to manage audio and can freely play and stop the audio music contained in the Score (Madcoms, 2005).

II. RESEARCH METHOD

The research method used in this research is a research and development method or often referred to as Research and Development. The Research and Development method is a research method that aims to create/develop a product and then test the effectiveness of the developed product (Sugiyono, 2007).

The model used in this study is procedural. The procedural model is a descriptive model, where the steps that must be taken to produce the product and use the product are shown in detail. In this development, researchers will use the application program Macromedia director MX to create teaching material in the form of computer-based learning multimedia.

This research was carried out using the Research & Development (R & D) method using the development procedure model from Dick and Carry, namely the ADDIE (Analysis, Design Development, Implementation, Evaluation) (Gusmida & Islami 2017). Development model with a limit to the ADDIE stage.

The steps for developing mathematics learning media for multiplication material based on Macromedia director MX
include 1) Analysis, carrying out activities in the form of pre-
planning which usually includes needs analysis, product
thinking to be developed, identifying product suitability with
the material, learning environment, learning objectives and
also characteristics students., 2) Design, namely designing
new product concepts on paper, designing new product
development tools. The design is written for each learning
unit, and the instructions for implementing the design or
product manufacture are written in detail, including making
storyboards, 3) Development, which is the stage that includes
product manufacturing, making product validation
instruments, and conducting product reviews or validations
by experts.

III. RESULT AND DISCUSSIONS

A. Analysis Stage

The analysis was carried out on aspects related to the
development of mathematics learning media for
multiplication materials based on Macromedia director MX
which included needs analysis, learning material analysis,
technical analysis, and analysis of the school laboratory
where the test was conducted. Needs analysis is done by
conducting interviews with teachers and students. analysis of
learning materials is done by analyzing material that is
considered difficult by students and allows it to be developed
through the software Macromedia Director MX. Analysis of
the school laboratory where the test was carried out by
checking the condition and number of computers in the
laboratory. Technology analysis is done by identifying the
software and hardware needed in developing the media.

Based on the technology that will be used in the
development of interactive multimedia learning mathematics,
an analysis is carried out on the required software and
hardware. The required software includes Macromedia
Director MX, Sothink Glanda 4.2, Corel Draw X4, Adobe
Photoshop CS 4, Photoscape, Total Video Converter,
Wondershare Video Editor, and Adobe Audition 1.5. The
required hardware includes Personal Computer, microphone
headphones, and compact disk.

B. Design Stage

The stages include the preparation of the flow of learning
materials, the preparation of the structural framework, the
preparation of the outlines of the media content, and the
determination of the evaluation. The preparation of the flow
of learning materials is based on needs analysis and material
analysis. After obtaining the learning materials that will be
developed, the structure framework and storyboard are
prepared. After determining the outline of the media content
and evaluating it.

C. Development Stage

The development stage includes making mathematics
learning media using Macromedia Director MX and
conducting product reviews or validations by experts. Here
are some pictures of the media display that was developed.
To find out how the homepage looks, you can see in Fig. 1.

After the homepage, the user will be shown instructions for
use and button descriptions. Some views of the instructions
and the use of buttons can be seen in Fig. 2.

The next display is the menu display. The menu display
contains the content in the application that was created. The
screenshot on the menu display page can be seen in Fig. 3.

One of the menus in the menu view is learning material.
Learning material contains several sub-menu choices that
contain different material. The display of the learning
material menu can be seen in Fig. 4.

The sub menu in the learning material contains an
explanation of the material which contains writing, images
and is equipped with sound. Display of some of the material
in learning materials can be seen in Fig. 5.
In addition to containing learning materials and practice questions, the developed media is also equipped with an evaluation. The evaluation on this media contains 20 multiple-choice questions that can be worked on and at the end of the process will automatically display the results of the evaluation that has been done. Evaluation will train and measure students' ability to understand the material that has been studied. Display evaluation menu and evaluation results can be seen in Fig. 6.

At the development or development stage, the media validation stage that has been developed by material experts and media experts is carried out. The results of the validation by material experts and media experts will be a temporary evaluation and provide input on the developed media. Further revisions will be made based on the input provided by the material and media experts.

The assessment of the developed media is carried out by material experts and media experts by filling out a validation instrument in the form of a checklist questionnaire sheet that has been provided. The material expert assessment sheet consists of 18 assessment criteria. The results of the assessment are in the form of qualitative data which are then tabulated and analyzed to determine the quality of the developed media. The results of material validation can be seen in Table I and Fig. 7 below.

**TABLE I: MATERIAL VALIDATION RESULTS**

<table>
<thead>
<tr>
<th>Assessment Aspect</th>
<th>Skor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Presentation of math material</td>
<td>19</td>
</tr>
<tr>
<td>B</td>
<td>Curriculum</td>
<td>14</td>
</tr>
<tr>
<td>C</td>
<td>Study evaluation</td>
<td>15</td>
</tr>
<tr>
<td>D</td>
<td>Execution</td>
<td>9</td>
</tr>
<tr>
<td>E</td>
<td>Language</td>
<td>13</td>
</tr>
<tr>
<td>F</td>
<td>Sentence clarity</td>
<td>13</td>
</tr>
</tbody>
</table>

Based on the quantitative scores obtained from the material expert's assessment, scores from all aspects were averaged and converted into qualitative categories according to the criteria for the ideal assessment category and got a score of 83 and the ideal percentage of 92.22% which is the quality of the mathematics learning media that has been developed.

**TABLE II: MEDIA VALIDATION RESULTS**

<table>
<thead>
<tr>
<th>Assessment Aspect</th>
<th>Skor</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>Video Appearance</td>
<td>13</td>
</tr>
<tr>
<td>H</td>
<td>Display Quality</td>
<td>18</td>
</tr>
</tbody>
</table>

Based on the quantitative scores obtained from the assessment of media experts, scores from all aspects were averaged and converted into qualitative categories according to the criteria for the ideal assessment category and got a score of 31 and the ideal percentage of 88.57% which is the quality of the mathematics learning media that has been developed.

**IV. CONCLUSION**

Mathematics learning media for multiplication material based on Macromedia director MX has been successfully developed. This media has been validated by media experts and material experts and revised according to the suggestions given by the validator. This media is still limited to computers or laptops only. Researchers hope that in the future they can develop similar media that allows them to be accessed via laptops, computers, or smartphones.

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REFERENCES


