

Implementation of Multimedia Development Life Cycle in Learning Media Applications for Children with Mental Disabilities

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A B S T R A C T

Mental retardation is a condition of intellectual disabilities experienced by children who have abilities below average. Children with intellectual disabilities are difficult to understand the lesson because they have a delay in developing intelligence. Interactive multimedia-based learning media can be used as one solution to become a method in mentally disabled children's learning process. This study aims to build a learning media for mentally disabled children based on interactive multimedia called Edinata, which stands for learning media for children with intellectual disabilities. Edinata is an application to help developmentally disabled children in introducing letters, numbers, surrounding objects, and coloring games. The method used in the development of this interactive multimedia learning media is the Multimedia Development Life Cycle (MDLC), which consists of 6 stages: concept, design, material collecting, assembly, testing, and distribution. In this study, the black box method is used to conduct testing. Based on black-box testing that has been done, all the menus contained in the application can be run properly.

INTRODUCTION

Mentally disabled is a term used to refer to children who have an intellectual level below average, namely $IQ \leq 70$ [1]. Mentally disabled children need specific assistance or services, including in their education. The memory and attention of mentally disabled children are weak, unable to pay attention to something seriously and for a long time, the attention of mentally disabled children will often shift to other problems in an instant, especially in terms of paying attention to lessons, mentally disabled children will quickly get bored [2]. Despite their limitations, every child has the right to receive an education, including mentally disabled children. Unlike children in general, mentally disabled children tend to have difficulty grasping lessons because they have delays in the development of their intelligence. Therefore, it is important to identify the limitations of mentally disabled children, so that teachers and parents can choose learning media that are appropriate to the needs of mentally disabled children. The learning media must be fun, interesting and easy to understand so that mentally disabled children do not get bored quickly and are distracted. As time goes by, the development of technology is also increasing. In an effort to utilize technology, the types of learning media are currently increasingly diverse. One of them is by using interactive multimedia. The use of interactive multimedia can improve student learning outcomes in children with mild mental retardation [3]. Through interactive learning media, teachers can also help improve the activeness and understanding of mentally retarded students.

One of the software that can create interactive multimedia is Adobe Flash software. Adobe Flash is an animation program that also supports programming with Action script, this program is appropriate for developing MPI (Interactive Learning Multimedia) because it supports animation, images, images, text & programming [4], so that the media is expected to be in accordance with the character of mentally retarded children, material that is easy to understand and concrete. There is evidence that learning with Adobe Flash game applications on computers using Adobe Flash software is well received by mentally retarded students and provides great potential for them in learning mathematics [5].

Of course, in building interactive multimedia-based learning media, it requires an appropriate software development method so that it can run optimally. Multimedia software has different characteristics from classical software [6]. This is because multimedia is a combination of text elements, still images/photos/graphic art, sound, animation, and video that are manipulated digitally. One of the appropriate methods for developing interactive multimedia that can be used is the Multimedia Development Life Cycle (MDLC) method.

Based on this, the researcher created an application in the form of interactive multimedia learning media for children with mild mental retardation using the Multimedia Development Life Cycle (MDLC) process model. This application is a learning media that contains education about recognizing letters, recognizing numbers and counting, recognizing objects, and has an educational game menu in the form of coloring. This application was created for the education of children with mild mental retardation so that they can learn to read, write, do simple arithmetic and recognize objects around them.

METHOD

This study uses a literature study research method. The literature study research method is to search for reading literature and reference sources that support and are related to the research topic as an accurate theoretical basis. This study uses the Multimedia Development Life Cycle as a software development method used.

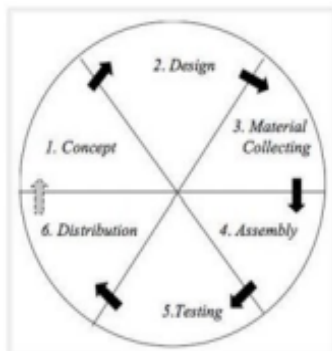


Figure 1. Multimedia Development Life Cycle

The following are the stages of the Multimedia Development Life Cycle:

1. **Concept**
The concept stage is the stage to determine the purpose and who the program users are (audience identification). In addition, it determines the type of application (presentation, interactive, etc.) and the purpose of the application (entertainment, training, learning, etc.).
2. **Design**
Design is the stage of making specifications regarding the program architecture, style, appearance and material/material needs for the program.
3. **Material collecting**
Material collecting is the stage where the collection of materials according to the needs is carried out. This stage can be done in parallel with the assembly stage. In some cases, the material collecting stage and the assembly stage will be done linearly, not in parallel.
4. **Assembly**
The assembly stage (creation) is the stage where all objects or multimedia materials are created. The creation of the application is based on the design stage.

5. Testing

Testing is done after the assembly stage is completed by running the application or program and seeing whether there are any errors or not. This stage is also called the alpha test stage where testing is carried out by the creator or the creator's environment.

6. Distribution

The stage where the application is stored in a storage medium. At this stage, if the storage medium is not sufficient to accommodate the application, compression is carried out on the application.

Multimedia Development Life Cycle

The Luther method is a multimedia software development method where the method used in this multimedia development is the Multimedia Development Life Cycle which consists of six stages, namely concept, design, material collecting, assembly, testing, and distribution [13].

Black box Testing

Black box testing is a type of software testing in terms of functional specifications without testing the design and program code [14]. There are several advantages in conducting black box testing [15]:

1. The number of test cases can be reduced to achieve reasonable testing
2. Test cases can show whether or not there are errors.
3. Testers do not have to know coding.
4. Programmers and testers are both independent of each other.
5. More effective than white box testing on long source code.

RESULTS AND DISCUSSION

Concept

This application has a concept as a learning media for mentally retarded children or which can be shortened to Edinata. The Edinata application contains learning about recognizing letters, numbers, and objects around them that are interactive, fun, and easy to use. This application is also accompanied by exercises with a game concept so that mentally retarded children do not get bored quickly. Users of this application are for children with mild mental retardation. However, it is possible that children with moderate mental retardation can also use it. It is hoped that this application can be a useful learning media for mentally retarded children, especially in the mild category, in the process of learning to recognize letters, numbers, and objects around them.

Design

This research design uses navigation structure and mockup as a description of the application.

1. Navigation Structure

The following is the navigation structure of the Edinata Application.

2. Mockup

The design is made using a mockup on the main page and each menu in the Edinata Application. The following is a mockup display design on learning media for mentally retarded children or the Edinata Application.

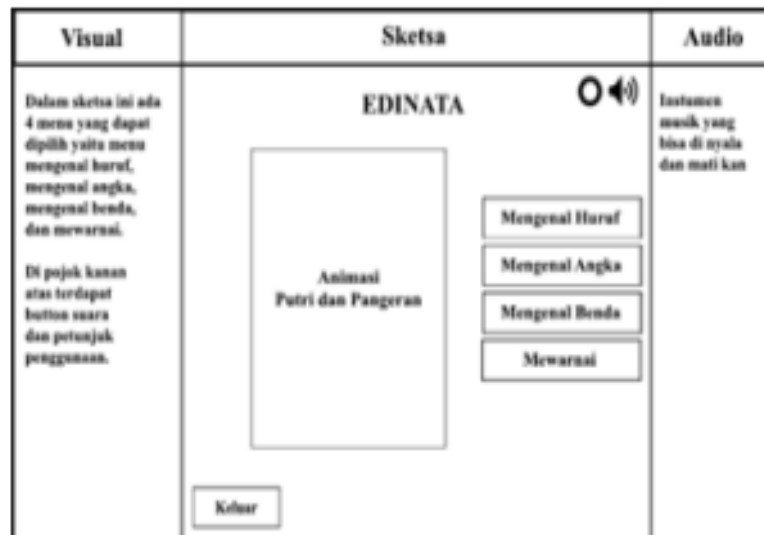


Figure 2. Home Page Design

On the main page there are buttons to recognize numbers, recognize letters, recognize objects, color, and exit the application. On this page there is also a button for instructions on use in the upper right corner for teachers and parents.

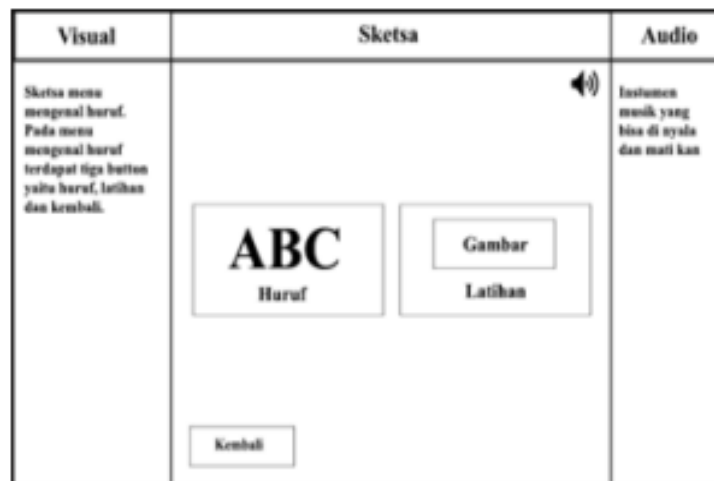


Figure 3. Menu Page Design Getting to Know Letters

On this page, children will learn to recognize letters packaged with interesting animations. Not only recognizing, children will also be taught how to spell words. After that, children can practice the material taught by playing games. In the game of recognizing letters, children will be asked to find a letter among other letters.

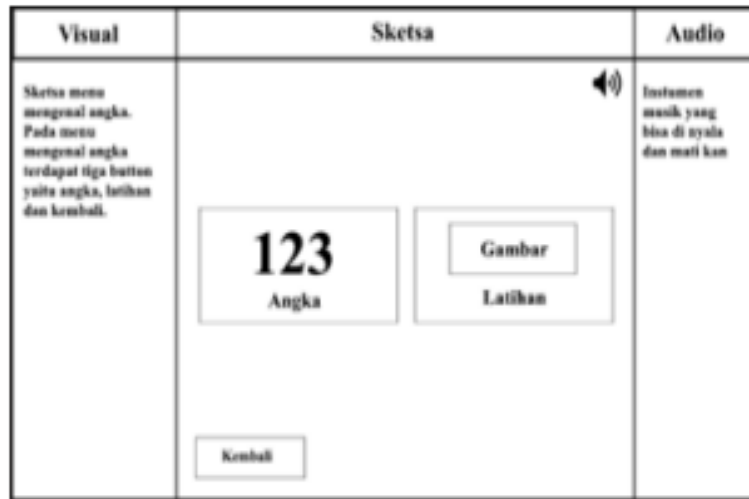


Figure 4. Menu Page Design Knowing Numbers

On this page, children will learn to recognize numbers from zero to ten. After that, children can practice the material taught by playing games. In the number recognition game, children will be asked to count the number of objects.

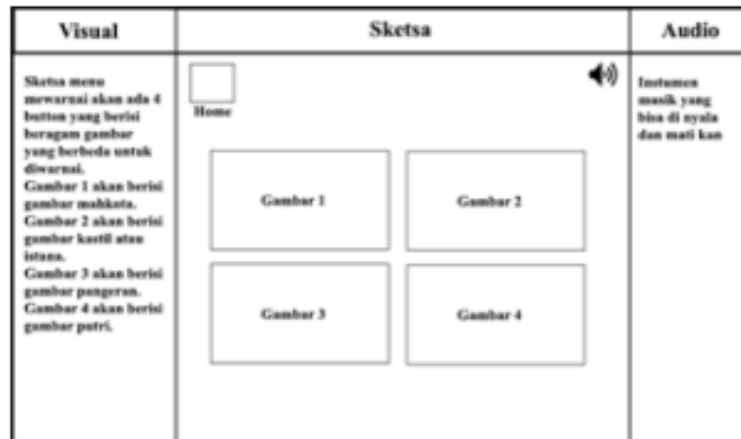


Figure 5. Coloring Page Menu Design

On the coloring pages, children will be taught to recognize colors and train their creativity in coloring.

Material Collecting

At this stage, the collection of materials related to the learning materials is carried out. Learning materials are obtained by conducting a literature study obtained from articles or scientific journals from the internet. The materials collected are related to the creation of applications such as images, animations, and audio. These materials are obtained for free from the internet. Then, the images and animations that have been collected will be modified using Adobe Photoshop CC 2017. Audio in the form of children's backsound is obtained for free from the internet and other audio is audio for commands and application instructions using children's voices that are recorded by themselves.

Assembly

This stage is the result of the implementation of the design process that has been done previously. The software used in creating learning media is Adobe Flash CS6. Almost every animation in this application contains sound and every page in this application contains music that can attract children's attention. The following is a partial display of the interface of the learning media application for mentally retarded children.

1. Home Page

On the main page there are buttons to recognize numbers, recognize letters, recognize objects, color, and exit the application. On this page there is also a button for instructions on use in the upper right corner for teachers and parents.

2. Letter recognition page

On this page, children will learn to recognize letters packaged with interesting animations. Not only recognizing, children will also be taught how to spell words. After that, children can practice the material taught by playing games. In the game of recognizing letters, children will be asked to find a letter among other letters.



Figure 6. Menu View Recognizing Letters

3. Number recognition page

On this page, children will learn to recognize numbers from zero to ten. After that, children can practice the material taught by playing games. In the number recognition game, children will be asked to count the number of objects.



Figure 7. Menu Display Recognizing Numbers

4. Object recognition page

On this page, children are taught to recognize the names of objects around them. Among them are in the bathroom, kitchen, bedroom, and in class. After that, children are asked to practice by mentioning the name of an object that has been studied. In the puzzle game, objects that have been studied previously are made into puzzles and children are asked to put the puzzle pieces together.



Figure 8. View menu to recognize objects



Figure 9. Display the search menu for objects

5. Coloring pages

On the coloring pages, children will be taught to recognize colors and train their creativity in coloring.



Figure 10. Coloring Menu View

Testing

After the application is successfully run, testing needs to be done to ensure the application functions properly. The testing used in testing this application is black box testing. The following are the results of the application testing.

Table 1. Black box testing

Input	Process	Output	Result
Opening Application	Showing loading animation	Loading animation	As per
Sound Button	Turn backsound on/off	Back-sound on/off	As per
Recognize Letters Button	Displays the recognize letters menu page	Recognize letters page	As per
ABC Learning Button	Displays ABC learning page	ABC learning page	As per
Practice Quiz Button	Displays the practice quiz page	Practice quiz page	As per
Number Recognition Button	Displays the number recognition menu page	Number recognition page	As per
123 Learn Button	Displays the 123 learn menu page	Page 123 learn	As per
Practice Button	Displays the practice menu page	Practice page	As per
Recognize Objects Button	Displays the Recognize Objects menu page	Recognize Objects page	As per
Search for Objects button	Displays the search for objects menu page	Search for objects page	As per
Puzzle Button	Displays the puzzle menu page	Puzzle page	As per
Coloring Button	Displays the coloring menu page	Coloring page	As per
Exit button	Close the application	Exit the application	As per

In the testing phase, black box testing was conducted for all functions in the Edinata Application. Based on the testing that has been carried out, it can be concluded that all menus in the application are as expected and can run well.

Distribution

The distribution stage is the stage where the application is stored in a storage media. Such as hard disks and CDs that have previously been made into autoplay files. This is the final stage where the media (in the form of CDs) is ready to be operated or duplicated for publication. This learning media application for mentally retarded children was created using Adobe Flash Professional CS6. After the application is finished, the application is exported into a file in .exe format, so that the application can be run easily on a computer device.

CONCLUSION

Based on the research results, it is concluded that this research produces an interactive multimedia-based learning media application for children with mild mental retardation called the Edinata Application. In the black box test, testing was carried out on each functionality of the menu in the application. Based on the black box test, each menu in the application can be run properly. It is hoped that with this application, it can be an alternative as a learning media for children with mental retardation in recognizing letters, numbers, and objects so that the learning process can be done more easily. The conclusion should be linked to the title and objectives of the study. Do not make statements not adequately supported by your findings. Write the improvements made to industrial engineering field or science in general. Do not make further discussions, repeat the abstract, nor only list the results of research results. Do not use bulleted points, use paragraphed sentences instead.

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