

# *Development of Android-Based Interactive Multimedia Using Total Communication Approach to Introduce Sign Language for Deaf Communities*

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**Abstract**—Sign language is a language that makes use of hand, finger and lip movements to communicate. Sign language is widely used in the education of the Extraordinary School (SLB), especially for the deaf and hard of ways that have shortcomings in listening and speaking. Because it has a lack of hearing and speaking, the deaf and underprivileged children are lacking in the vocabulary. Multimedia role is very important especially in the field of education. One of them is a sign language recognition media for deaf. The research aims to develop a multimedia interactive sign Language Introduction to the deaf using a total communication approach based on Android. Thus, the application can be utilized by deaf persons outside school hours. The method used in the application development is the MDLC (Multimedia Development Life Cycle) method of Luther Sutopo in 2010. Some phases of this method are concept, design, material collecting, assembly, testing, and distribution. Based on the results of the beta test done by the dissemination of the questionnaire against teachers who handle deaf children in the SLB Kartini Batam, interactive multimedia application of sign language recognition for the deaf child of Class 1 SDLB can help Add a child's vocabulary. The results gained from the tests conducted by researchers were divided into three aspects, 88.3% for the ease of user aspect, 82.5% for the aspect of the view and 82.5% for the educational aspect. All three aspects of the test results belong to the very good interval category.

**Keywords**— *Android apps, interactive Multimedia, deaf, sign language*

## I. INTRODUCTION

Deaf children are children who have a hearing loss and are unable to hear sounds perfectly. These hearing imperfections make hearing impaired children have difficulty communicating. There are several levels of hearing impairment, namely mild (27-40 dB), moderate (41-55 dB), real (56-70 dB), severe (71-90 dB) and extreme or deaf (91 dB or more) [1]. Each level has an influence on understanding the language and hearing the surrounding sound.

The results of Penduduk Antar Sensus (SUPAS) of the 2015 Central Bureau of Statistics [2] The number of people in Indonesia was 255,182,<sup>144</sup>. As much as 2.7% of the Indonesian

population has impaired hearing. It is calculated based on the total population of 6,952,797 people with hearing impairment.

Recently, the mobile phone has become the premier need. It is know that the number of mobile users has exceeded the population of Indonesian. From the US Census Bureau data in January 2014 Indonesia had about 251 million inhabitants, compared the number of mobile users is 281 million users [3]. In 2014, 7.3 smartphone units in Indonesia made Indonesia the largest smartphone selling market in Southeast Asia with 68% market growth [4].

Based on observations conducted at the extraordinary elementary school of Kartini Batam, deaf child is taught using a total communication approach which is a concept aimed at achieving effective communication. By using talking media, reading lips, listening and signaled [5]. The use of this total communication approach aims to allow deaf children not only to communicate with sign language, but also to speak or communicate using lip or speech movements. Based on an interview with one of the SLB teachers, revealed that teachers are always struggling to introduce to deaf children who are new to school, especially in Grade 1 in remembering the vocabulary pronunciation and demonstrations that have been taught before. One way is to use multimedia technology to make learning media for the deaf child to study outside of school. Therefore, multimedia technology is needed to make learning media for deaf children to study outside of school.

From the explanation above, researchers were inspired to create an interactive media based on Android. Researchers developed interactive multimedia to introduce the SIBI sign language using a total communication approach for deaf persons of 6-7 years of age. In addition to providing some sign language recognition material there are some games according to the material learned aims to train deaf children given the learned vocabulary.

## II. SUPPORTING THEORY

### A. Interactive Multimedia

Multimedia is a computer utilization to create and combine text, graphics, audio, and motion pictures (video and animation). Combining links and tools that allow users to navigate, interact, create and communicate. Multimedia is divided into two, which are linear multimedia and interactive multimedia. Linear multimedia is not equipped with any control device that can be operated by the user. [6]

### B. MDLC Method

The MDLC (Multimedia Development Life Cycle) method is one of the development methods. Quoted from Binanto (2010) The method of multimedia development of MDLC according to Luther Sutopo in 2003 consists of 6 stages, namely concept, design, material collecting, assembly, testing, and distribution. [7]

### C. Storyboard

Storyboard is a general design of a sequentially arranged application equipped with explanations and specifications of each image, screen and text. Storyboard is used to design interfaces that interact directly with the user. [8] Storyboards are now more widely used to create interactive websites and media frameworks such as ads, short films, and games.

## III. METHOD

The investigation method is carried out with the technique of collecting data from various literatures such as scientific journals. In addition to conducting a search through the journal, researchers observe directly on the research site and conduct interviews with a teacher at SLB Kartini Batam. From the interview the authors can continue the research on the interactive multimedia application of Android-based SIBI learning.

The development of this interactive multimedia uses the MDLC or Multimedia Development Life Cycle method (Luther Sutopo, 2003). Some of the steps contained in the development method are in Figure 1.

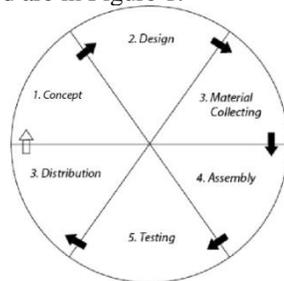


Fig. 1. MDLC (Multimedia Development Life Cycle) Development method

### A. Concept

Some of the things done at this stage are:

- 1) The purpose and benefits of learning media "Ayo Mengenal Isyarat SIBI"
- 2) Determine the target user for the media learning "Ayo Mengenal Isyarat SIBI"

- 3) Designing the design concept and format of an interactive multimedia application to be built.

### B. Design

At this stage, designing the specifications on the program architecture, style, appearance and material needs for the program. The designs are made at this stage such as storyboard design, scriptwriting and other needed materials.

### C. Material Collecting

Material Collecting is the stage of collecting the materials needed during the interactive multimedia development process. This stage can be done parallel to the Assembly stage. However, in some cases, the Collecting Material stage and the Assembly phase are executed linearly and not parallel. Some examples of materials to be collected such as audio, video, photographs, and others that can be obtained free of charge or by booking to other parties.

### D. Assembly

At this stage, it performs the creation of an interactive multimedia application using Adobe Flash CS6. App creation adapts to the design stage with pre-designed storyboards and flowcharts.

### E. Testing

This stage is done to ensure that the results of the creation of multimedia applications according to the plan. There are two types of testing used: Alpha testing and beta testing. Alpha testing is done by the developer, i.e. testing the page Views, button functions, and the resulting sound. Beta testing is a test by the respondent, to fill in the questionnaire about the application that has been created

### F. Distribution

The distribution stage is the last stage in this multimedia development cycle. Distribution can be done after the application is declared worthy of use. At this stage, the application is stored in a storage medium such as a Flash disk, a mobile device or a website. If the storage media is not enough to accommodate the application, it will compress the app.

## IV. RESULTS AND DISCUSSION

The results of the research using the MDLC development method are as follows:

### A. Concept

The results of the concept formulation at this stage are:

- 1) The purpose of this interactive multimedia application as a sign language recognition media for deaf children based on Android. The benefit of this interactive multimedia is to make it easier for the deaf child to get acquainted SIBI signals outside of school.
- 2) The Target user of the application is a deaf child with a range of ages 6-7 years in particular Class 1 extraordinary elementary School.

3) The concept of display design that adjusts for the child is using landscape concept. The app can be played on Android.

Here is the application design flow that is a description of the application to be built. The application design flow is in Figure 2.

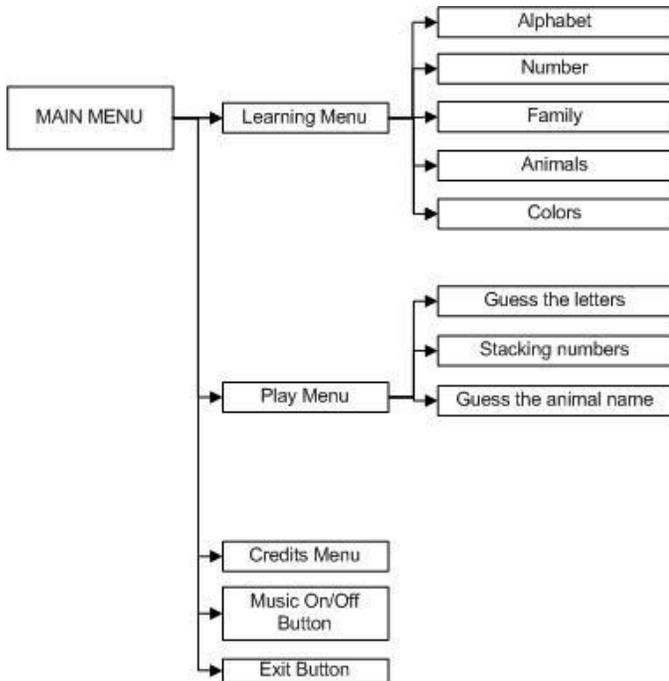


Fig. 2. Application planning pipeline

B. Design

At the design stage, make specifications regarding the program architecture, style, appearance, and material needs/materials for the program. Here are the results from the design phase:

1) Scriptwriting

Scriptwriting is part of pre-production stage in the creation of animations, movies, and games that use stories. Scriptwriting contains the environment, time, basic movement of characters, and dialogue. All scripts or final scripts become the backbone at a later stage [9].

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EXT. Menu Utama - Scene No.2
Pada Menu Utama terdapat 5 tombol menu yaitu tombol Belajar, Bermain, Petunjuk, Kredit dan Keluar
- If user menekan tombol belajar, then user akan masuk ke menu belajar.
- If user menekan tombol bermain, then user akan masuk ke menu bermain.
- If user menekan tombol kredit. then user akan masuk ke kredit aplikasi.
- If user menekan tombol musik. then musik akan on/off.
- If user menekan tombol keluar. then user akan keluar dari aplikasi.

[SELECT SCENE]
GO TO MENU BELAJAR
GO TO MENU BERMAIN
GO TO MENU KREDIT
  
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Fig. 3. Scriptwriting

2) Storyboard

Storyboard is used to describe each scene of the application to be built. Here is the Storyboard of this study:

Scene Name: Main Menu	Scene No :1
	Audio : soundtrack
	Text : static
	Time: Unlimited
	Layout Description: In this view displays the Learning menu, play menu, credits and music settings.

Fig. 4. Storyboard of main menu

Figure 4 is the main menu display in this application. Consist of: Learning button, play button, credits button, music buttons on/off, and quit button.

Scene Name: Learning Menu	Scene No :2
	Audio: soundtrack, Sound button
	Text : static
	Time : unlimited
	Layout Description: This layout displays several menu of application materials, which are numeric cues, letters, family, colors, and animals.

Fig. 5. Storyboard of learning menu

Figure 5 is the Learning menu view. The app will display five materials. The material consists of sign language of numbers, alphabet, family, color and animal.

Scene Name: Play Menu	Scene No :3
	Audio: soundtrack, Sound button
	Text : static
	Time : unlimited
	Layout Description: On this layout displays several play menus i.e. the game's guess letters, stacking numbers, stacking the names of animals.

Fig. 6. Storyboard of the Play menu

Figure 6 is the menu display of the play, the play Menu consists of a sub menu that is guess the letters, stacking numbers, stacking the name of animals.

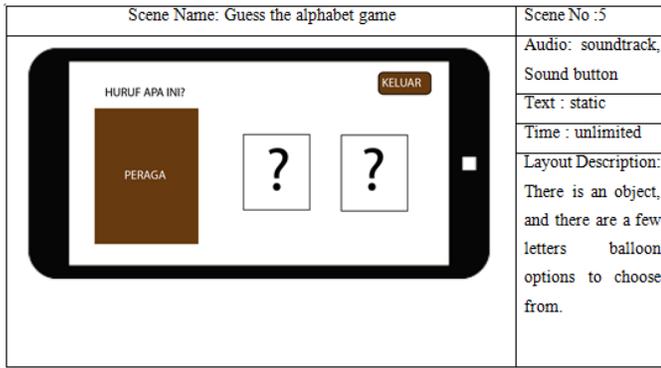


Fig. 7. Storyboard of the Game Guess the letter

In Figure 7 is a game of guess the letter, the user is asked to choose one of the balloon moves are demonstrated by the teacher in the video, if the choice is true then the game is resumed and the score becomes ten, but if the option is wrong, then the score and the game continues.

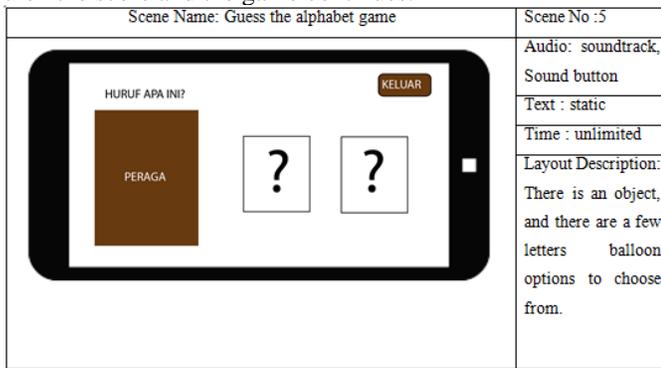


Fig. 8. Storyboard of the Credit Menu

Figure 8 is the credit Menu contains information from the developers of this interactive multimedia application.

C. Material Collecting

Material Collecting or material collection is the stage of collecting the materials needed by the application. These materials include back sound, music/instrument, clip art and other supporting materials through the search process on the Internet. Once the materials are obtained they are merged into a folder. In addition, the authors also collect self-made materials, which are still in the form of pencil sketch and have a digital form designed using Adobe Illustrator and Adobe Photoshop, as well as recorded video materials themselves are then neatly arranged into a folder.

D. Assembly

This interactive Multimedia is a basic language learning medium that contains basic vocabulary recognition materials with a sign language display that uses the Bahasa Indonesia signal system. Presentation of material utilizing multimedia technology employing text, 2D animation, video, image, and sound. At this stage Assembly divided into several stages including, video recording of the manufacturer, the creation of logos, the creation of background, the creation of applications in Adobe Flash CS6. If the application is completed designed proceed with rendering that converts into apk form

The results of the implementation made according to the application design concept are as follows:



Fig. 9. Main Menu Display

Figure 9 is the main menu display, the main menu consists of 5 buttons, which are the learn button to go to the Learning menu, the play button to go to the play menu, the credit button to go to the credit menu. Then there is the music Settings button to turn background music on or off, and exit to exit the app.



Fig. 10. Study Menu Display

Figure 10 is a learning menu display consisting of five material submenus: letter material, numeric material, color material, family material, and animal material.



Fig. 11. Play Menu Display

Figure 11 is a menu view playing menu consists of three Play sub menu, namely guess the letters, stacking numbers, and

guess the name of the animal. Then there is one main menu button.



Fig. 12. Guess the game display letters

In Figure 12 is the look of the game guess the letters. The player is asked to choose one of the correct letters according to what is being signaled. If the player answers correctly then score will increase. But if the answer is wrong then the score does not increase.

**E. Testing**

Testing on this study consisted of alpha testing and beta testing. Alpha testing is used to test the functions of the application. Beta testing is then conducted by providing a questionnaire to teachers who handle a blind child to know the response to the application's eligibility for deaf children.

**1) Alpha Testing**

The alpha testing phase is done by exposing the functions to be tested and the expected results to determine whether or not the application has been built. This test uses the black box testing method, which is to test the functions of each key in the application. Based on the results of the alpha test conducted by Informatics Engineering Department lecturer then it can be concluded that the built-in application is working properly.

**2) Beta testing**

The beta testing phase is done by giving an interactive multimedia application to the deaf child of the Special Elementary School Grade 1 who is the target user. Then conduct a questionnaire against the teachers of Kartini Batam School who handles deaf children. In this test, the author provided a questionnaire containing 10 statements using the Likert scale. Prior to filling the author's questionnaire gave the teacher a learning application to be assessed. Respondents to this test amounted to 8 people. The testing site was conducted at Kartini Batam School. Here is the percentage of each statement.

Fig. 13. Beta test Results

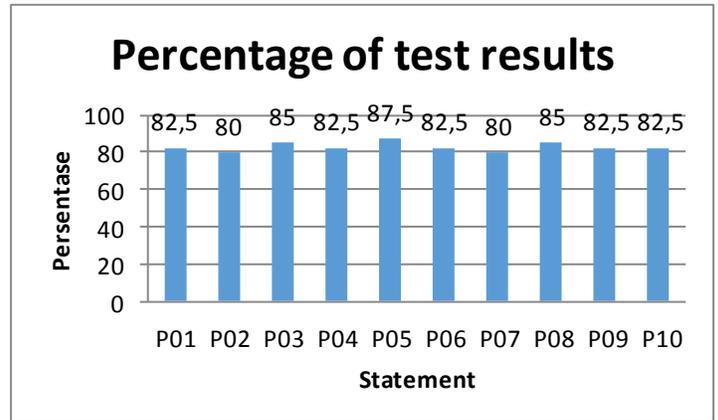


Fig. 13. Beta test Results

Based on the results of application testing through the questionnaire distributed to 8 teachers who handle deaf child Kartini Batam School, it can be concluded that 10 statements get good results. 10 statements from the P01-P10 listed in the questionnaire can be seen in Table I.

TABLE I. STATEMENT OF QUESTIONNAIRE

NO	Statement
P01	The app is easy to use.
P02	Interesting app view.
P03	Application design is suitable for children especially deaf children.
P04	Each application button can work.
P05	The Audio/Instrument application goes well.
P06	The application materials provided correspond to those of SIBI sign language.
P07	Materials and games on those given are suitable for children of the Deaf 1st class in Elemetary Special school
P08	App can help deaf child to add vocabulary
P09	Videos on apps that display sign language can be clearly visible.
P10	Applications may be applied outside lesson hours.

From the percentage of 10 statements, it is grouped into three aspects, namely aspects of easy user aspect (consist of P02, P03), aspect of view (consist of P01,P04 and P05), and educational aspects (consist of P06,P07,P08,P09 and P10).

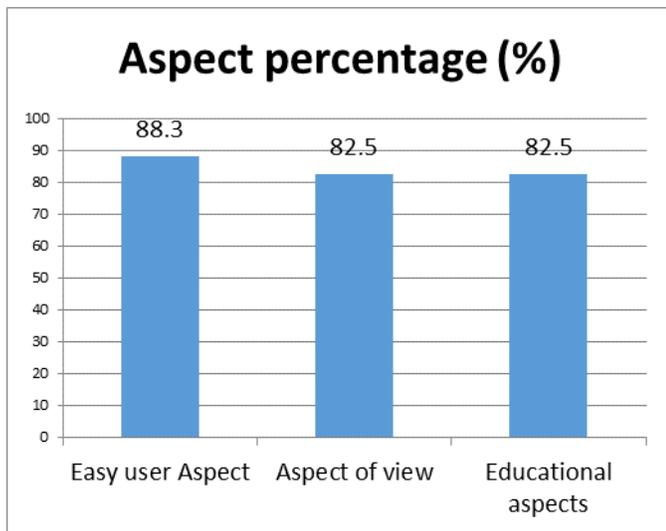


Fig. 14. Aspect Percentage

By using the formula to calculate the Likert scale of the very agreed, agreed, hesitant, disapproving and highly disapproving attitude was obtained the test results grouped in 3 aspects. Judged by the percentage of each aspect that has been tested, it was obtained by the results aspect user ease 88.3%, the aspect of the coordinating view of 82%, and aspects of education 82.5%. The percentage results of these three aspects include a very good interval category. So that, the application can be concluded can be used by deaf children, especially 1st Class at extraordinary elementary school and help the deaf child in getting to know SIBI cue language.

#### F. Distribution

Once the application testing is done and the application has been running well it will be done this stage. An android-based. APK application is channeled to the user according to the specified target that is a child of Grade 1 extraordinary elementary school deaf person is given to the student's parents and is ready to use.

### V. CONCLUSION

The following conclusions are found in this study:

- 1) Application come get to know the SIBI cue has been built as a sign language recognition media especially SIBI cues for deaf children by providing materials and games based on Android.
- 2) Based on the results of testing of respondents, namely teachers who handle deaf children in Kartini Batam school can be concluded that the respondent gave a positive response to the application with the results referring to beta testing ie; Aspect ease user 88.3%, aspect of the Ministry of view 82.5%, education aspect 82.5%. So it can be concluded that this interactive multimedia application is effective as a cue-recognition media SIBI for the Deaf child of extraordinary elementary school of Kartini Batam Grade 1.

### ACKNOWLEDGMENT

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