INTERACTIVE MOBILE BASED BRAILLE ALPHABET INTRODUCTION SYSTEM DEVELOPMENT AT SLBN A CITEUREUP

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ABSTRACT

SLBNA Citereup is the institution of education for visually impaired that teach its pupils to study braille alphabet since early stage. Braille alphabet is group of combined dots that forms a letter, the way to read it is to touch it.Application development is mobile based. Interaction design method using the UCD (User Centeren Design), a method that focuses on user characteristics. The use of UCD method is proven made student become more pleased to learn braille.
Keyword : Braille, User Centered Design, SLBN A Citeureup.

1. INTRODUCTION

Blind children need an education to read and write from an early age in order to facilitate them in carrying out their activities. The alphabet that commonly used to read and write is Braille alphabet, a combination of letters that form the points raised were how to read with a palpable way, this letter became an official letter to the blinds.

Based on observations and interviews, still find it difficult for students to write braille. Thus it is necessary to build an application that is suitable for blind students to follow the workings of the slate and stylus. Mobile-based application built, it is expected that students can be facilitated learning in a fun way.

1.1 Visually Impaired Meaning

The meaning of visually impaired is individuals who are visually impaired sense of vision (both) do not function as a channel receiver of information in daily activities as well as sighted people [1].

Individuals with impaired vision can be seen in the following conditions:

1. Sharpness of vision acuity owned less than sighted people
2. There was opacities in the lens of the eye or there are certain liquids
3. The position of the eyes is difficult to control by the brain nerve
4. There was damage to the nervous system of the brain associated with vision

Blind can be grouped into two kinds, namely:

a. Total Blind

Said to be blind if not at all able to receive light stimuli from the outside (visual acuity 0).

b. Low Vision

If still able to receive light stimuli from the outside, but the sharpness more than 6/21, or if it is only able to read a headline in the newspaper.

1.1.1 Braille Alphabet

Braille consists of cells that have a 6 point rise and the presence or absence of a point that would give the code for this symbol [1].

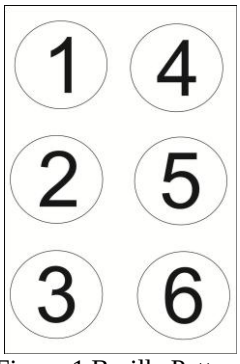


Figure 1 Braille Pattern

Braille alphabet consists of 26 patterns along with the Latin alphabet patterns of punctuation such as points, question marks and exclamation marks.

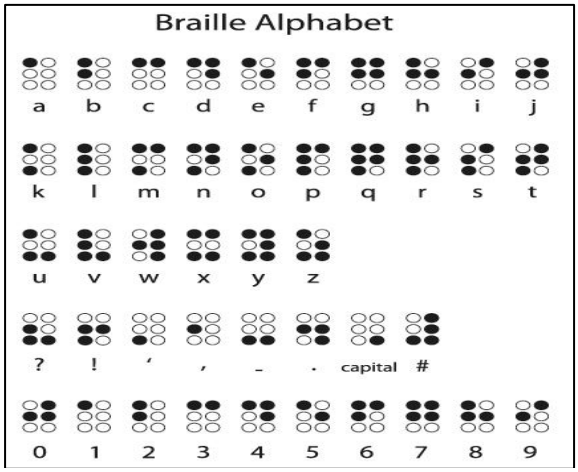


Figure 2 Braille Alphabet

1.1.2 Slate and Stylus

Slate is used to make points arise which would form a pattern that refers to the Braille letters [2].

Stylus is a needle or nail modification that is attached to the paper, the stylus pressed braille paper to make a raised dot pattern according to the pattern of Braille on purpose.


Figure 3 Slate and Stylus

1.2 Human Computer Interaction

Definitions of human and computer interaction has two paradigms including the following :

1. Galitz said that *"Human-computer interaction is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way*". Based on what was stated by Galitz, that human interaction and computer (HCI) is the study of the learning, planning, and design of how humans and computers can interact and work together so that human needs can be effectively resolved [3].

2. "*Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them*" (hewwet et al, 1996). This illustrates the notion that the HCI is a discipline that refers to a design, evaluation as well implementation of an interactive system for use by humans so that it becomes a lesson in environment [4].

From the two paradigms can be found similarities and differences. The equation of the two above definition is, that the HCI has a purpose built system that will actually be used as tools for human (user) that can meet their needs. In the second definition, there is the word "evaluation and implementation" This shows that the HCI not just create a view that can be understood by the user, but also must be evaluated in terms of function that will be used and implemented to the user [3].

1.2.1 Human and Computer Relationship

In the process of interaction between humans and computers linked to each other. The relationship between humans and the computer can be seen in Figure 4.

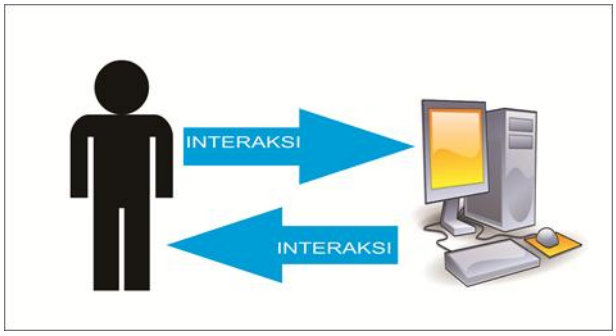


Figure 4 Human and Computer Relationship

An explanation of Figure 4 is as follows:

1. User

Both individual users or group of users in the organization, each of which are interconnected in a job or a process. Users can strive to finish the work by using technology.

2. Computer

The computer is a technology used to control a process or a sistem.Terdapat some kind of computer including small-scale computer / desktop to large-scale computer as a super computer. Computer technology can also be a unit that can be attached to / grafted (embedded systems) to an object.

3. Interaction

Interaction is a process of communication between the user computer by using the medium of interaction between the two that can be made directly or indirectly. In the interaction, generally involves a dialog with a feedback and control the results of the performance of a job.

Good interaction can provide an ease in doing so get the results that correspond to the needs.

1.2.2 User Centered Design Model

UCD (User Centered Design) is a new paradigm in the development of web-based systems. User-based design is a term used to describe a philosophy for designing [5]. UCD is the concept of the user as the center of the system development process, and the purpose / nature, context and environment systems are all based on user experience. UCD concept diagram can be seen in Figure 5

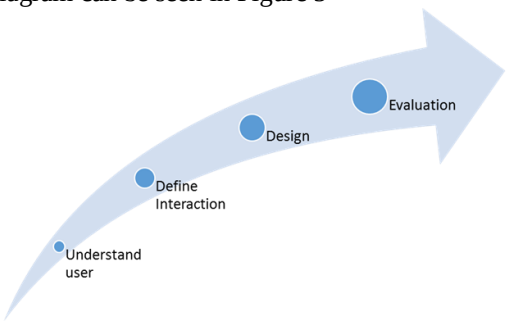


Figure 5 UCD Model

According to ISO 13407: 1999 Human Centered Design Process defines that the steps being taken in the method of User Centered Design are:

a. Understand and define the context of the user

This stage is the stage of identification of the characteristics of the user, the user assignments, and the environment around the user.

b. Determining needs user interaction

This stage is the stage of identification of the user's needs as well as activities undertaken by the user and organizational requirements on the user's environment.

c. The resulting design solutions

This stage is the stage of design solutions by studying literature or other references. After the resulting solution, the next step to do is to devise a way of learning or interaction and prototype were then tested with the user as the evaluation process.

d. Development

This section contains the evaluation phase of the design that has been tailored to the needs of users as well as the validation of the design which has been made whether it is appropriate or not. This evaluation was conducted to determine the extent to which the design is produced in accordance with user needs in order to do development.

1.3 Smarthphone

Smartphone is mobile phone that have a high rate capability, sometimes with functions that resemble computer. For some people, the smart phone is a phone that works using the entire operating system software that provides standards and fundamental relationship for application developers. For others, the smart phone is just a phone serving sophisticated features such as electronic mail, the internet and the ability to read e-books or are the keyboard (either as finished or linked out) and a VGA connector. In other words, the smart phone is a small computer that has the capabilities of a phone [6].

2. RESEARCH CONTENTS

Contents of research in the development of braille recognition applications include problem analysis, user analysis, analysis of business functions, interface design, implementation and testing.

2.1 Problem Analysis

Based on observations and interviews with teachers of 2nd grade elementary school of SLBN A Citereup named Mrs.Kasmiati, S.pd, there are problems in learning braille. The problems are :

1. Many students still incorrectly use slate, so that the letters were written become false anyway
2. Difficulty in making the letter that similar causing misperceptions
3. Students are less interested in learning to read Braille, they prefer to use a screen reader-enabled mobile phone that makes it easier, it makes the braille writing skills can not be applied and ability will gradually disappear

Problems experienced by children with visual impairment is the result of a physical disorder that they have experienced, so it is difficult to adjust the activities undertaken by sighted people. Therefore, it is necessary to design applications and how to use them are adapted to the circumstances and characteristics of blind people, namely by applying the method that uses the Braille alphabet writing using slate and stylus by utilizing application.

2.2 User Analysis

Analysis on the user which in this case is the child tunanetra.Identifikasi was conducted to determine general user characteristics. With the process of identifying the user is expected to be taken into consideration in building applications for users.

2nd grade blind students of SLBN A Citeureup has special characteristics, based on observations and interviews with Mr. Subagio as teachers, their characteristics are as follows:

1. Students in general are familiar with the letters A to Z and the numbers 0 through 9
2. Have difficulty writing braille using the slate and stylus, causing difficulty in reading anywaySiswa sudah bisa menggunakan handphone berkemampuan screen reader
3. Students are more interested in reading or writing using a screen reader-enabled mobile phone
4. Because the screen reader read out in English or English dialect, students have difficulty if there is a screen reader with other languages

For more details, knowledge of blind children from the observation can be seen in Table 1.

Table 1 Blind Children Knowledge

No	Experience and Knowledge	Condition	Result
1	Alphabet knowledge	Already familiar with the letters A to Z	Good
2	Number knowledge	Already familiar decimal numbers 0 through 9	Good
3	The use of slate and stylus	Many are still wrong to use slate, so perforated paper when pierced with a stylus too strong	Bad
4	Braille writing	The difficulty of writing a letter that similar	Bad
5	The use of handphone	Able to make letter composition	Enough
6	Language	Understand the words spoken by a screen reader even though in English dialect	Enough

2.2.1 Blinds and Computer Analysis

How to interact with computers is essential for users to be able to operate a computer as desired. 2nd grade blind children of SLBN A Citeureup already know how to use basic mobile computer that also enabled device. Based on observations conducted in SLBN A Citeureup. Blind children interaction with computers is as follows :

1. Blind children rely on their sense of touch and hearing for blind persons in total, whereas for persons with low vision or low berpenglihatan can still use the senses of sight.
2. Children with visual impairments operate mobile-capable screen reader.
3. To clarify the object being viewed, persons with low vision closer to the front of the monitor with his head very close distance.
4. The text read by the system using the English dialect.
5. The text which was read by the system to read at high speed.

2.2.2 Analysis of How to Identify Interfaces

The blind have a deficiency in vision, to identify the position of the component interface (buttons, backgrounds, etc.) certainly needed a way to identify them. To identify the components of the interface, users not only glued on the information presented by the application but also need to know the physical parts smartphone is used, as it will help determine the position of the components of the interface.

In the application, the means used is to add sound effects in the background application interface. During a voice that appears when touching the surface of the touchscreen still sound effects background, this indicates that the user has not appropriate to touch the buttons available on application. To identify more clearly interface components, stages can be seen in Figure 6

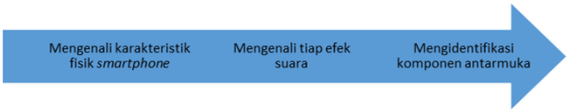


Figure 6 Steps to Identify Interface

1. Recognize the physical characteristics of smartphones

Although it has been determined the characteristics of smartphones that are used for applications, but there are other characteristics that can not be avoided for a known location on a touchscreen smartphone that is used. For example, the position of the speaker, charger hole, volume buttons, menu buttons, and other circumstances such as the existing physical disabilities.

2. Identify each sound effect

Visually impaired users need to know the sound effects that exist in the application so that no misunderstanding.

3. Identify the components of the interface

After undergoing two previous stages, the user can begin to identify the position of the component interface. Users can fumble while listening to the sound effects that appear to be dominated by the effects of background noise. Users can continue touching the screen with the help of background sound effects to know that any part of the background. Once the button is sought is found,

the user can press the button more than once to convince.

2.3 Analysis of Business Functions

Business functions are matters relating to the tasks and needs of users as well as the procedures to perform these tasks. Business functions consist of business functions that are currently ongoing and proposed business functions Business functions proposed an adaptation of ongoing business functions.

2.3.1 Analysis of Ongoing Business Functions

Learning activities begins with listening to the teacher and then the students were introduced to recognize a wide variety of both object surface of an object is solid, liquid or gas so the introduction of the surface by temperature differences. After recognizing the various surfaces then blind students are taught to recognize the labyrinth, a maze of blind children are taught to recognize to recognize a pattern or shape of an object, and then introduced braille dot. To make learning so exciting, teachers test the students with the game. Thus, students can know which tunentra surface containing braille alphabet.

The next learning activity after recognizing either using pantule point braille (braille writeboard) or paper, then the students recognize patterns and memorize the letters of each letter. After recognizing Braille then the students learn to write by using pantule well as slate and stylus. On Figure 7 shows the mental models of children with visual impairments in the function of ongoing business.

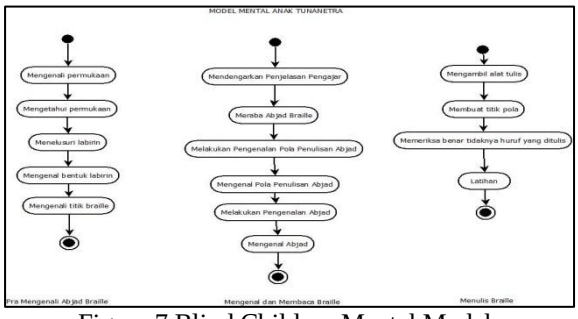


Figure 7 Blind Children Mental Model

2.3.2 Functional Requirements Analysis

Analysis of the functional needs of a business function or dimiripkan adapted from ongoing business functions. Functional needs of the proposed functions are modeled with activities tailored to the characteristics of the user. Business function performed blind children include the introduction of the alphabet, exercises and quizzes using the Android app done to determine the extent of the understanding that has been done.

The introduction of the alphabet or learning mode, is a process whereby students recognize braille dots that have different sound effects, as well as where the braille buttons.

Exercises done after students learn where to position braille buttons and each button as it sounds. Its activity is to develop the braille dots to form one pattern that will Braille users will check whether or not a pattern that has been compiled. If the structure is right or wrong, the user will be informed through sound effects.

The quiz is not much different from the training mode, only made more interesting quiz. The first time you log into the quiz mode, the user selects a matter which the matter is a list of names of animals. The name of the animal-shaped buttons. Each student chooses one of these buttons, the user will be redirected to the page braille. By the time a new entry, the user will be read about on the first letter of the name of the selected animal. Then users compose one pattern letter is meant as an answer.

2.4 Interface Design

Interface design is based on the implications of the interface refers to the characteristic. Design stage is the third stage of the method Centerd UCD or User Diagram. The steps required in the design of the interface can be seen in Figure 8

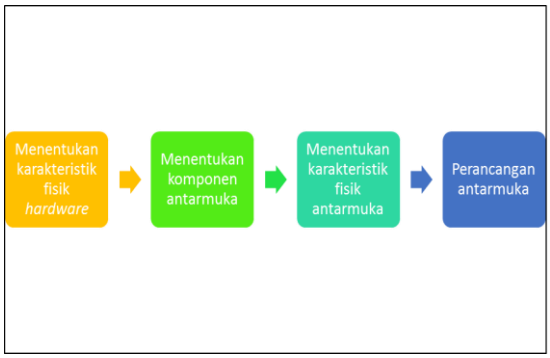


Figure 8 Interface Design Steps

Based on step interface design then interface design will be produced as in Figure 9.

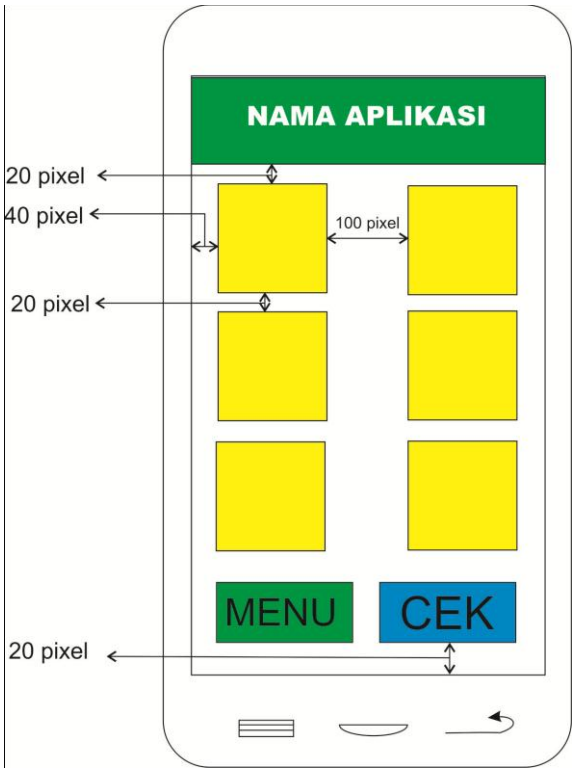


Figure 9 Braille Interface Design

The design of the interface to display the name of the animal in the picture 10. Button names of animals at the interface serves also as a matter of, each about the color distinguishable.

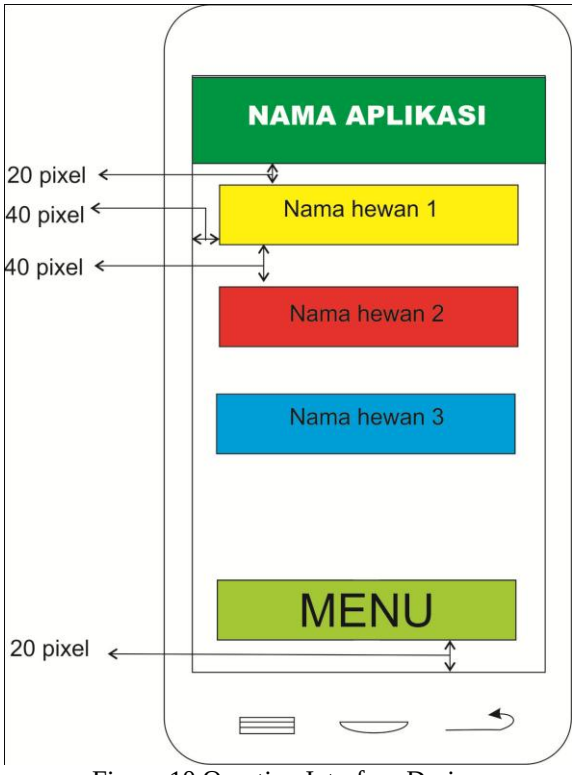


Figure 10 Question Interface Design

2.5 Implementation and Testing

2.5.1 Implementation

This implementation is the final stage of evaluation of the interface is generated to the user's needs on the method of User Centered Design (UCD). The implementation aims to provide a picture of the appearance of the application generated by the process of design that has been done. Implementation of the interface is divided into three sections based on the proposed business functions, namely, learning, exercises, and quizzes, while an additional form of animation opener.

a. Opening Animation Interface

Animation opening serves to inform the user that the user has entered the application by displaying the name of the application accompanied by the sound of music. Implementation of the interface can be seen in Figure 11.

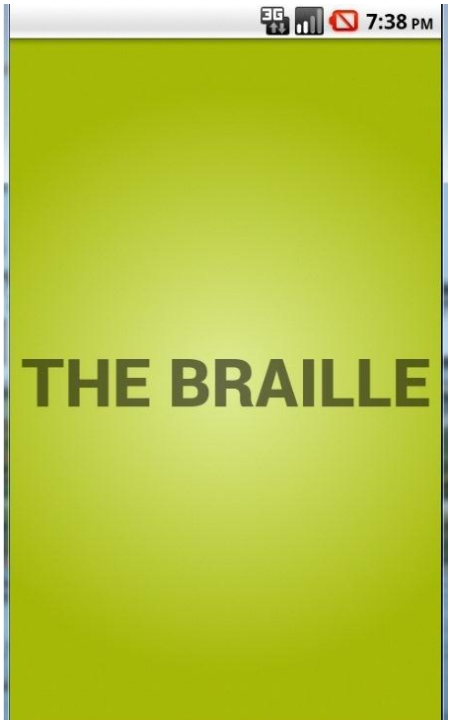


Figure 11 Animation Interface

b. Learning Mode Interface

Display learning menu is a menu that displays 6 yellow button braille patterns accom*panied* by two buttons that direct mode to practice mode and quiz mode. Training mode button is green while the color quiz mode biru.Selain it on the menu learned contained header name of the application whose role is the same as the background, so when touched will issue a background sound effects. The menu or page serves to introduce the 6 button braille with different

sounds for each menu tombolnya.Tampilan learning can be seen in Figure 12.

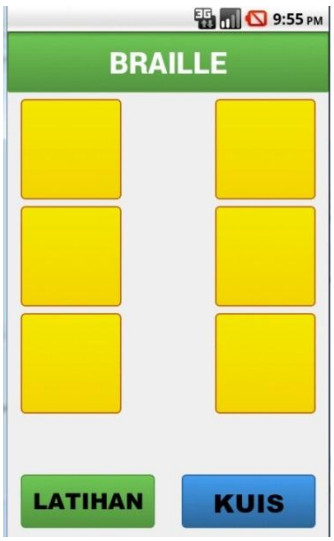


Figure 12 Learning Mode Interface

c. Exercise Mode Interface

Excercise menu is a menu that displays 6 yellow button braille pattern accompanied with mode switch button is green with a rectangular shape, but it also added a check once the reset button blue equally rectangular. Training mode serves to train the user in identifying patterns of each Braille which then determined the truth or falsity by reset button at the same checks. Training mode display can be seen in Figure 13.

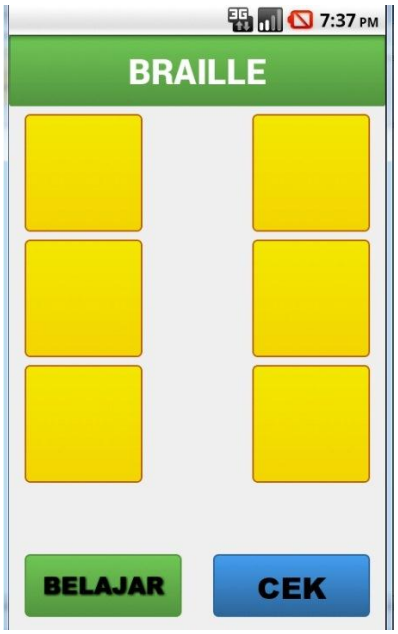


Figure 13 Excercise Mode Interface

d. Quiz Mode Interface

Quiz is a practice mode in the form of a game. Users will be trained interactively by guessing the first letter of the name of the selected animal. Then the user guessed by typing Braille is, if the answer is right or wrong, the system will play the selected animal sound effects if true, and the tone of the music if one.

Question page displays the names of animals in the form of buttons that are yellow, red, and blue. Under the buttons there is the name of the animal move mode to learn. Picture quiz mode interface can be seen in Figure 14.



Figure 14 Question Interface

2.5.2 Testing

Testing is an evaluation process conducted on the application based on user needs. This stage is the last stage is the evaluation of the resulting application to the needs of users on the method of User Centered Design (UCD). This test is done to determine the extent of compatibility between interfaces generated by the user's needs. The test is divided into two stages, namely the testing of *Alpha* and *Betha*.

a. Alpha testing

Alpha testing is functional testing is used to test the system that has been created. Based on the results of alpha testing, the application has been successfully run their functionality needs.

b. Betha Testing

Results of testing conducted beta can be concluded that the application can motivate student learning, students want more time to learn because the application is made to make suansa play while learning.

3. CONCLUSION

Based on the results of testing against the introduction of Braille application. Application has been successfully run all functionality requirements. For the implementation of the interaction, the size of the palm of 2nd grader's blind finger does not exceed the size of the braille keys. Based on the results of questionnaires blind children are excited by the application as a new medium of learning, students become more easily motivated the desire of learning.

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