The Development of an Android-Based Kata Kolok Sign Language Dictionary

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ABSTRACT
This study aimed at developing Kata Kolok sign language dictionary by utilizing an Android application. Applying Rapid Application Development (RAD) design model, several stages have been conducted namely business modelling, data modelling, process modelling, application formation, and testing and turnover. The development of this sign language dictionary application used the React Native framework to create mobile applications and firebase for the application backend. Several main features were included in this sign language dictionary such as registration, login, search, word categories, and search history. Therefore, the development of Kata Kolok sign language dictionary was expected to assist the deaf and hard of hearing children or referred to as *kolok* in learning the sign language through the presence of visual materials in the learning app.

Keywords: Android-Based Dictionary, Sign language, Kata Kolok.

1. INTRODUCTION

Inclusive schools are a relatively new development in integrated education that offers the possibility for every child, including those with special needs, to be accepted as a part of the class. Every effort is made to ensure that each child receives the best possible service based on his or her individual needs. This is accomplished through a variety of modifications, ranging from the curriculum, infrastructure, teachers, the learning process, and assessment [1], [2]. Inclusive education is a concept that addresses global concerns about the slow growth of education in developing countries for students with special needs.

Inclusive schools are being developed not only in urban areas but also in locations with special needs populations, such as Bengkala Village. This village has the largest deaf-speech community in Indonesia. People that are deaf in this area are referred to as k*olok*, and they communicate using a unique local sign language known as Kata Kolok. One of the primary schools in Bengkala Village which is the first and only inclusive school in the area is SDN 2 Bengkala. The school, which was founded in 2007, accommodates the needs of

the Bengkala Village community, some of which are deaf and speech impaired. This inclusive school follows a standard curriculum, similar to that of other normal or regular schools. The primary difference is that there is a special assistant who assists the deaf or hard of hearing students during his or her learning process.

The implementation of the regular curriculum in inclusive schools provides a wide opportunity for children with special needs to get the same learning as regular classes, one of which is local subjects, Balinese language. When learning Indonesian, the *sibi* or *bisindo* sign language is used as a means of communication. The Indonesian Sign System (SIBI) [3] is the system that is most widely used in special needs schools in Indonesia. Only the finger alphabets of sign language have been granted worldwide patent rights. It is possible that sign language varies amongst countries that speak the same language. The examples include the United States and the United Kingdom, which, despite sharing the same written language, have distinct sign languages (American Sign Language and British Sign Language) [4]. This condition implies that sign language is

different in each region depending on the agreement of the community members.

Although Bali is considered to be one of the regions with a language peculiarity in the form of Balinese, there has not yet been established a standard Balinese sign language. Consequently, it is more difficult to communicate effectively in the Balinese language to children who are deaf or hard of hearing. Kata Kolok is only restricted to the native Balinese used by the Bengkala community, which is referred to as Kata Kolok. Kata Kolok is different from the common deaf-speech sign language. Kolok language is easy to learn because the signs used are mostly related to the characteristics and activities of the word. Because of its characteristics, this language has the potential to be used as a Balinese sign language.

To address the needs of students studying the Balinese language, especially those who are deaf or hard of hearing, learning media such as a Kata Kolok dictionary is required. Due to the fact that deaf or hard-of-hearing students have difficulties in comprehending abstract concepts, they require more concrete and visual symbols such as pictures to aid them in their learning. Printed dictionaries tend to be thick and heavy, making it impractical to carry everywhere [5]. In related research, the use of audio-visual media in communication has been shown to be an effective media for improving understanding of deaf or hard of hearing children [6], [7]. In light of these issues, it is necessary to develop an electronic sign language dictionary in the form of audio-visual media associated with the use of appropriate technology that is both practical and familiar to deaf and hard of hearing students in the process of learning Kata Kolok.

Related research on the application of electronic dictionaries revealed that android applications are the appropriate media for developing electronic dictionaries [8], [9], [10], [11]. Android is an operating system on smartphones that can adjust specifications in the low-end to high-end classes. Currently, all vendors develop their gadget products with the Android operating system because of its sophistication and efficiency. The development of an android-based Kata Kolok sign language dictionary is the most appropriate solution in overcoming the media gap in Balinese language learning in inclusive schools. In accordance with this notion, the objective of this study was to develop a Kata Kolok sign language dictionary by utilizing an Android application that could be used effectively and efficiently. Therefore, it is necessary to research and develop an android-based sign language learning application.

2. METHOD

The software development strategy employed in this research was Rapid Application Development (RAD). This RAD method is a development of the linear sequential method which emphasizes a short development cycle but has a high speed in its production, as illustrated in Figure 1.
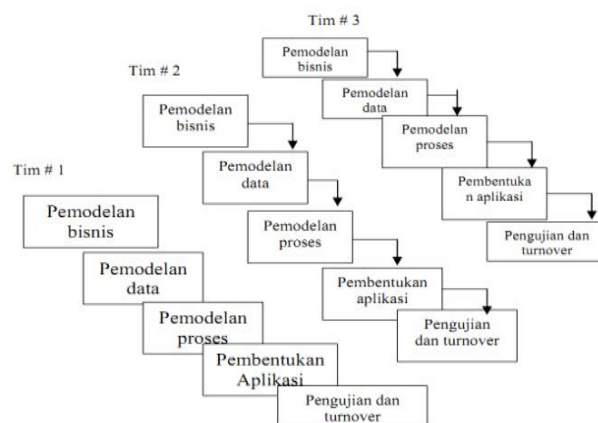

Figure 1 The design of RAD method

During the business modelling stage, several main features were included in this sign language dictionary such as registration, login, search, word categories, and search history. After the business modelling stage was done, the next step was to conduct data modelling. In data modelling stage, designing the database used in this dictionary application was carried out. In the process modelling stage, the flow design of the dictionary application and application interface design were obtained. The design of the dictionary application interface was done by Figma software as shown in Figure 2.
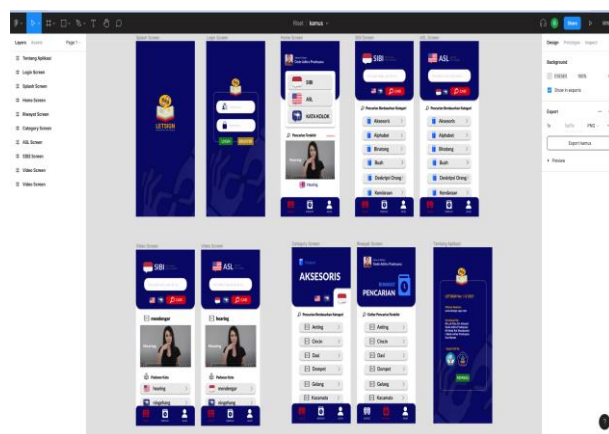

Figure 2 The design of interface sign language dictionary application

3. FINDINGS AND DISCUSSION

At the application formation stage, the implementation process of the design produced in the

previous stage was carried out. The implementation of this application includes both hardware and software environments. The development of this sign language dictionary application used the React Native framework to create mobile applications and firebase for the application backend. The dictionary app database was created using firebase firestore. Firestore is a database system in firebase that uses no sql of document type. In this firestore, a collection was created, each of which contains a document containing nosql in the form of key-value pairs. One document represents an entity or a setting within the application. The structure of the sign language dictionary application database can be seen in Table 1.

Table 1 The structure of sign language dictionary database

Nama Collections	Nama Documents	Tipe Data

datakamus	UID	categoryNameBali: string
		categoryNameEn: string
		categoryNameId: string
		data: [
		  {
		    bali: '',
		    english: '',
		    indonesia: '',
		    youtubeBali: '',
		    youtubeEn: '',
		    youtubeId: '',
		  }
		]

User	UID	Language: string Nama: string

The results of the development of this sign language dictionary application can be seen in Figure 3 to 6. When the user launches the program for the first time, a splash screen will show, which will contain the dictionary application's logo and information about the application as shown in Figure 3.
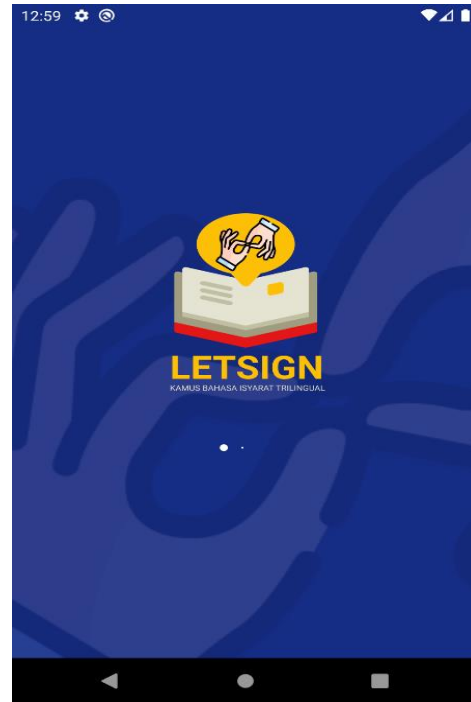

Figure 3 The splash screen dictionary application

Following that, the users will be prompted to log into the program on the screen; in addition to logging in, the application user can also establish a new account and select the forgot password menu. Users will be requested to input their name and email address on the 'create account' page in order to set up their new account. After creating an account, the users will be automatically redirected to the home menu. The display of the new user registration form can be seen in Figure 4.
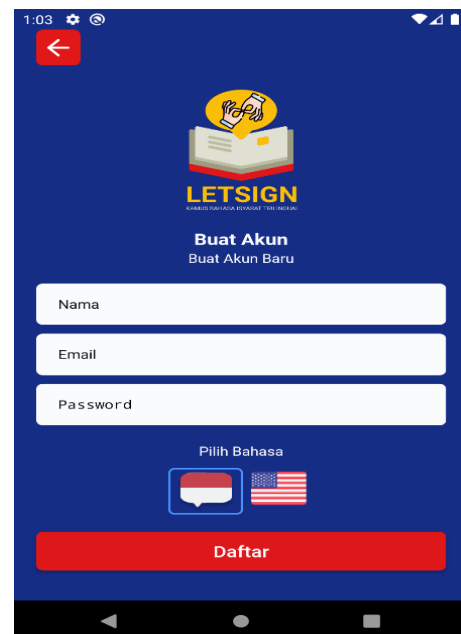

Figure 4 The register menu

In the home menu, the users can select a variety of menus such as SIBI, ASL, and KATA KOLOK, each of

which performs a search by word type. Additionally, the home menu includes a function that displays the most recent search term. Users can also examine the most recently searched word by selecting it from the history option at the bottom of the page as shown in Figure 5.
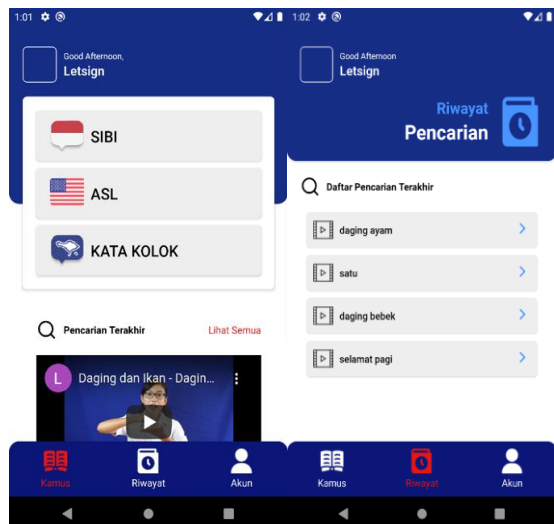

Figure 5 The home page and history

In addition to searching by word, the users can also search by category. The categories that appear are in accordance with what has been selected in the initial menu, for example SIBI, ASL and KOLOK, as shown in Figure 6.

Figure 6 The search menu based on category

The list of vocabularies in this sign language dictionary was performed in the form of gestures. This

is in line with the belief that gestures provide an early window into children with deaf and hard of hearing cognition and comprehension of language, as well as their ability to communicate. As a result, gestural communication are considered as one of the language screening techniques for deaf and hard of hearing children at an early age [12].

In order to motivate deaf and hard of hearing children to always actively produce language, the instructional media developed must be able to raise their desire to do so. As the result, the language learning of deaf and hard of hearing children is performed visually. It means that their language learning is conducted through visual representations such as using fingers to represent the alphabet, lip reading, and gestures that use and combine various strategies with verbal language. In accordance with this fact, the sign language dictionary developed in this study emphasizes the use of visual materials which encompasses any non-verbal and non-auditory media which enables children to convey the information visually [13], [14], [15], [16].

Through the use of visual learning materials, this dictionary can be tailored to the learning principles of deaf and hard of hearing students in order to build a desire to learn and improve their learning process [17]. The use of sign language dictionary also assists deaf and hard of hearing children in enriching their vocabularies as they learn Balinese as the local language [18]. In addition, children with deaf or hard of hearing who are properly introduced to sign language will reach the expected developmental milestones [19].

In 21st century learning, students' motivation, productive abilities, reading skills, and learning autonomy were all affected by the collaboration of learning materials and the usage of multimedia in the classroom [20], [21], [22], [23]. Thus, instructional media should be developed not just for people in normal physical conditions, but also for those with disabilities. Therefore, the development of this sign language dictionary also supported the studies on the development systems and multimedia in assisting deaf and hard of hearing children in their learning process [24], [25], [26].

4. CONCLUSION

Based on the result of the analysis, it can be concluded that this study developed a Kata Kolok sign language dictionary by utilizing an Android application that could be used effectively and efficiently. The development of Kata Kolok sign language dictionary application was based on Rapid Application Development (RAD). Several stages have been passed namely business modelling, data modelling, process modelling, application formation, and testing and turnover. Based on the result of the study, the

development of this sign language dictionary application used the React Native framework to create mobile applications and firebase for the application backend. Several main features were included in this sign language dictionary such as registration, login, search, word categories, and search history. The result of this development was expected to assist deaf and hard of hearing children or known as *kolok* children in learning Kata Kolok through the presence of visual materials in the learning app. The development of this sign language dictionary also supported the studies on the development systems and multimedia in assisting deaf and hard of hearing children in their learning process.

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