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Developing Indonesia Sign Language (BISINDO) Application with Android Based for Learning Sign Language

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ABSTRACT

Problems in learning Indonesian sign language, especially for the Solo area, are the scarcity of opening sign language classes for the public and the limited use of instructional media. An Android-based sign language learning media application was developed with the ADDIE research method to overcome this problem. ADDIE method, namely analysis, design, development, implementation and evaluation. This research will focus on the feasibility test of the application of learning media by using the indicators on the ISO 25010 standard that is used to test the feasibility of the software. The aspects tested are functional suitability, usability aspects, portability aspects and validation by material experts and media experts. The results of the feasibility test obtained, for the functional suitability test 100%, usability test 83.2%, 100% portability test, 100% material expert test and 93% media expert and it can be concluded that the application of sign language learning media is feasible to use.

Keywords: Sign Language, ADDIE, Bisindo

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1. INTRODUCTION

Indonesian sign language (Bisindo) is a sign language that develops naturally in the deaf community. Bisindo is different from the Indonesian Sign Language System (SIBI) because the government makes SIBI without involving the deaf community, so that they have difficulty understanding SIBI sign language (Gumelar, Hafiar, & Subekti, 2018). This happens because the deaf has a problem applying language vocabulary that is too standard in Indonesian grammar sentences, so they prefer to use Bisindo, which is faster and more practical in its use even though it does not follow Indonesian language rules. Learning sign language is intended for teachers who want to teach deaf children, but this language can also be understood by most people who want to interact and improve hearing impairment quality (Mursita, 2015). Sign language can be learned through classes organized by the Movement for the Welfare of the Deaf Indonesia (Gerkatin) and several related institutions (Borman & Priyopradono, 2018).

For beginners who want to learn sign language, teachers or instructors are needed to teach sign language from the beginner level to the advanced level through sign language classes. Constraints that occur related to sign language classes are associated with the class's uncertain opening period, resulting in difficulties in learning sign language. Especially for cities where sign language development is still underdeveloped, such as Solo, where there are still no public sign language classes that are routinely held. Sign language classes held in Solo are only temporary and only rely on minimal learning media making it difficult to learn the Solo sign language (Zusfindhana, 2017).

In solving this problem, an alternative is needed to accompany the sign language learning process. One of them can use learning media applications that contain sign language material for beginner level—learning media applications that will be developed based on Android. In developing Android-based learning media applications, it is expected to be able to help sign language learning independently. So the purpose of developing a sign language learning media application is not to eliminate the role of teacher/instructor in teaching sign language, but this application is useful as a companion tool for the teaching and learning process of sign language.

The newness in this research is compared with previous studies; that is, researchers develop an Android-based sign language learning media application using Android Studio software that contains an introduction to the form of letters and words in Sign Language (Cade, 2014). The material that will be displayed in this application is in the form of images with

gif format (graphics interchange format) that indicates the forms of gestures. The gif format was chosen because this format has a small file size, so the developed application will have a smaller size compared to applications that display videos. Similar applications that use video as an introductory media have a size that reaches three times more than media that uses gif as an introductory media. In addition, learning media applications that are made will be uploaded to the Google Play Store so that the general public can use this application to learn sign language.

2. RESEARCH METHOD

The method used in this study uses Research and Development (RnD) with ADDIE development models, namely Analyze, Design, Develop, Implementation and Evaluation. ADDIE is a research model that is commonly used in developing learning media because this model uses a systematic and efficient, and effective process in developing a variety of learning products (Buchori & Cintang, 2018).

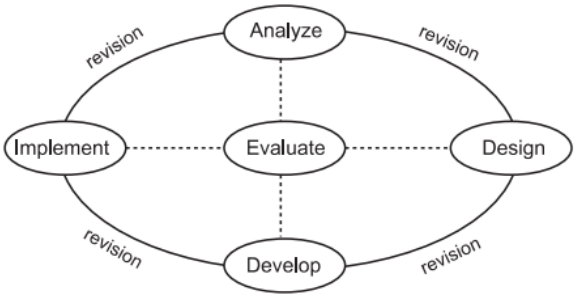

Figure 1. ADDIE Phase

This research will focus on the feasibility test of the developed sign language learning media application. Material experts would carry out the testing, media experts and users by using the existing indicators in the ISO/IEC 25010 Standard, which is limited to three aspects, functional suitability, usability and portability aspects. The practical suitability aspect will test whether the application developed can provide functional requirements according to the expected needs in certain circumstances, the usability aspect will test whether the application developed is easy and attractive to use, and the portability aspect will test the effectiveness and efficiency of the application that has been created when implemented in various devices.

3. THEORETICAL REVIEW

3.1 Application

Application is a program that is ready to be used to execute commands entered by application users that aim to get accurate results in accordance with the purpose of the application is made (Abdel-Fatah, 2018)

An application is a program created by a user that is intended to perform a specific task (Štorková, 2015). Application is a component that is useful for data processing and activities such as making documents. An application is a software unit created to serve the needs of a number of activities such as a trading system, games, community service, advertising, or all human processes that are almost done (Hoffman & Spatariu, 2011).

From some of the opinions above, it can be concluded that the application is a unit of software that consists of the process of data flow in information technology that is intended to perform a specific task by the needs of activities carried out by humans.

3.2 Learning Media

Media is a word derived from Latin, a plural form of medium that means intermediary or introduction. There are several opinions which state that the term "media" has many meanings. Media can be interpreted as all tools used to convey information (Liu, Navarrete, Maradiegue, & Wivagg, 2014). Media can also be interpreted as a human existence that can influence others without making direct contact (Garcia, Falkner, & Vivian, 2018). This understanding includes media such as television, films, telephones and correspondence that allows one to communicate with others.

Learning comes from the translation of instruction in Greek *instructus* or *intruere* which means to convey thoughts. Learning can also be said as a process of conveying thoughts that have been processed for use in learning (Abdulcadir, Marras, Catania, Abdulcadir, & Petignat, 2018). In learning, it is not only educators who are required to be active in the teaching and learning process, more importantly, the students themselves to be

involved in learning. So it can be concluded that learning is the process of delivering information and knowledge between educators or instructors to students using various media and learning resources available to improve cognitive, affective and motoric aspects.

3.3 Sign Language

Sign Language is the language used by the Deaf and Deaf community in communication (Tenrisara & Isma, 2012). Sign language is also a means for users to identify themselves and get information. Non-verbal communication, one of which is a sign language that uses all human communication tools, such as visuals, motion, tactics and taste. This makes sign language a valuable language where users can convey meaning without using words (Băiaș & Constantin, 2015).

Sign language is a language that uses body movements and facial expressions as a representation of spoken language (Fuks, 2014). The Deaf Community is the main user of this language which combines hand shapes, hand movements, body arms and facial expressions to explain their thoughts. From the explanation above, it can be determined that sign language is a hand gesture and facial expression by the Deaf community.

Sign languages, especially Indonesian sign languages, have two different types of sign, namely natural sign language and artificial sign systems. Natural sign language develops naturally in the Deaf community. Sign language has its own grammar that is different from the grammar used by people hearing in Indonesia. Examples of natural sign languages are American sign language (ASL), British sign language (BSL), Hong Kong sign language (HKSL), Yogyakarta sign language, Jakarta sign language, and Kolok Words. Meanwhile, an artificial sign system is not a language but rather a way to present oral grammar using cues. An example of an artificial sign *Sistem Isyarat Bahasa Indonesia (SIBI)*, whose system is similar to Signing Exact English (SEE) used in America (Irlang Suwiryo, 2013).

The conclusion obtained from the above opinions sign language is a form of communication that uses facial expressions, finger movements and body gestures to convey messages to users.

4. DEVELOPMENT STEP

Analysis

The analysis phase is the initial stage of this research. At this stage, the formulation of the problem is carried out, identifying the source of the problem and determining the possibilities used in solving the problem (McGriff, 2000). In analyzing the source of the problem, the problem occurs because of the lack of a comprehensive opening of sign language classes in the city of Solo and also the limited use of instructional media in learning sign language. For the target users in this application, learning media applications can be used by the general public who want to learn sign language.

For feasibility test, it will be carried out by material experts, media experts and users. A material expert is a person who is an expert in sign language, namely the chairman of Gerkatin Solo. For media experts, those who understand the learning media, namely lecturers who teach about making instructional media. For users, the test will be carried out by UNS Special Education study program students who have taken sign language courses, namely PLB students from 2017 to 2015 (Benz, 2017; Kurt, 2017). The analysis of the purpose of this study is to find out whether the learning media application developed is suitable to be used as one of the sign language learning media or not.

At the development stage, needs analysis, a functional requirements analysis, non-functional needs analysis, and media development analysis will be carried out (Branch, 2009).

Functional Requirements Analysis:

1. Learning media can be presented with an attractive appearance.
2. Learning media can display the form of the sign from the alphabet and vocabulary presented on the application
3. Learning media displays application usage instructions

Non-functional Requirements Analysis:

1. Learning media can be used by the user anytime
2. Learning media can be used offline or without an Internet connection
3. Learning media can run on an Android device with 1 GB RAM minimal, 5.0 Android version, 5.5-inch screen and internal memory of 8 GB.

Development media Requirements Analysis:

1. Hardware
    a. Windows 7, Windows 8, dan Windows 10 (32-bit or 64-bit)
    b. 3 GB RAM, recommended 8 GB RAM
    c. 2 GB harddisk, recommended 4 GB harddisk

   d. 1280x800 screen resolution
2. Software
   a. Android Studio
   b. Adobe Photoshop CC
   c. Wondershare Filmora
   d. InShot
   e. Format Factory

Design

The design phase is carried out by reviewing information relating to product development and existing innovations in instructional media development so that learning media are made to have an updated side compared to previous learning media (Kurt, 2017). At the design, stage will be carried out the design of learning materials or content, the design of research instruments or testing strategies, the design of learning media application display, the specifications of the prototype application, the assessment criteria of testing the learning media applications developed (Benz, 2017; Branch, 2009; Kurt, 2017).

Learning material or learning content in the learning media application refers to the material in sign language courses in the UNS Special Education program and the website https://bisindo-surakarta.com.

Table 1 Sign Language material

Category	Content		
Alphabet	A	J	S
	B	K	T
	C	L	U
	D	M	V
	E	N	W
	F	O	X
	G	P	Y
	H	Q	Z
	I	R	
Number	1	8	15
	2	9	16
	3	10	17
	4	11	18
	5	12	19
	6	13	20
	7	14	Angka
Month	Januari	Mei	September
	Februari	Juni	Oktober
	Maret	Juli	November
	April	Agustus	Desember
Day	Senin	Kamis	Minggu
	Selasa	Jumat	
	Rabu	Sabtu	
Animal	Anjing	Harimau	Monyet
	Ayam	Ikan	Nyamuk
	Babi	Jerapah	Sapi
	Bebek	Kambing	Singa

	Buaya	Kelinci	Tikus
	Burung	Kucing	Ular
	Gajah	Kuda	
	Bapak	Nenek	Anak
Family	Ibu	Laki-laki	Anak-anak
	Kakek	Perempuan	Bayi
	Aceh	Jambi	Solo
	Bali	Karangnyar	Sragen
	Bandung	Klaten	Sukoharjo
City	Banyuwangi	Lampung	Wonogiri
	Bekasi	Lombok	Yogyakarta
	Depok	Makassar	
	Jakarta	Manado	
	Bulutangkis	Lompat jauh	Tembak
Sport	Fitnes	Panah	Tenis
	Futsal	Renang	Tolak peluru
	Lari	Sepakbola	Voli
	Arsitek	Guru	Presiden
Job	Bupati	Pembantu	Satpam
	Dokter	Perawat	Tentara
	Dosen	Polisi	Walikota
	Aku	Kalian	Mereka
Greeting	Apa	Kami	Nama
	Dia	Kamu	Perkenalan
	Dimana	Kita	Siapa
	Bahagia	Jahat	Ramah
	Baik	Kalah	Sedih
Manner	Bodoh	Marah	Semangat
	Cemburu	Menang	Senang
	Diam	Pengecut	
	Emosi	Pintar	
	1990	1997	2014
	1991	1998	2015
	1992	1999	2016
Year	1993	2010	2017
	1994	2011	2018
	1995	2012	2019
	1996	2013	2020
	Apotek	Kampung	Rumah
	Bank	Kantor	Sekolah
Place	Bengkel	Lapangan	Toko
	Desa	Mall	Warung
	Gedung	Pasar	
Transportation	Bajaj	Kapal	Pickup

Money	Becak	Kereta	Sepeda
	Bis	Kereta listrik	Tank
	Gojek	Mobil	Truk
	Grab	Motor	
	Helikopter	Pesawat	
	1.000	7.000	40.000
	2.000	8.000	50.000
	3.000	9.000	1 Juta
	4.000	10.000	1 Miliar
	5.000	20.000	1 Triliun
	6.000	30.000	Uang
Time	Besok	Kemarin	Pagi
	Detik	Lusa	Siang
	Dulu	Malam	Sore
	Jam	Menit	Tadi
Color	Abu-abu	Hitam	Putih
	Biru	Kuning	Ungu
	Cokelat	Merah	Warna
	Emas	Oranye	
	Hijau	Pink	
Sentence	Acara ulang tahun Budi hari Kamis, tanggal 31 Juli 2019		
	Pertandingan basket tahun ini bertempat di Surabaya		
	Bis berwarna merah bertabrakan dengan truk berwarna hijau		
	Ayahku bekerja sebagai guru di SD Kerten 1		
	Lina berjalan-jalan di mall Solo Paragon di Kota Solo		

Learning media applications will be made prototypes of applications with the .apk extension installed on an Android smartphone and testing the learning media application. Learning media applications that have been developed will be tested using indicators on ISO / IEC 25010, which are international standards used for evaluating software quality. This standard has eight characteristics: functional suitability, reliability, performance efficiency, usability, maintainability, security, compatibility, and portability. This study will use three characteristics of ISO / IEC 25010: functional suitability, usability, and portability (Wattiheluw, Rochimah, & Fatichah, 2019).

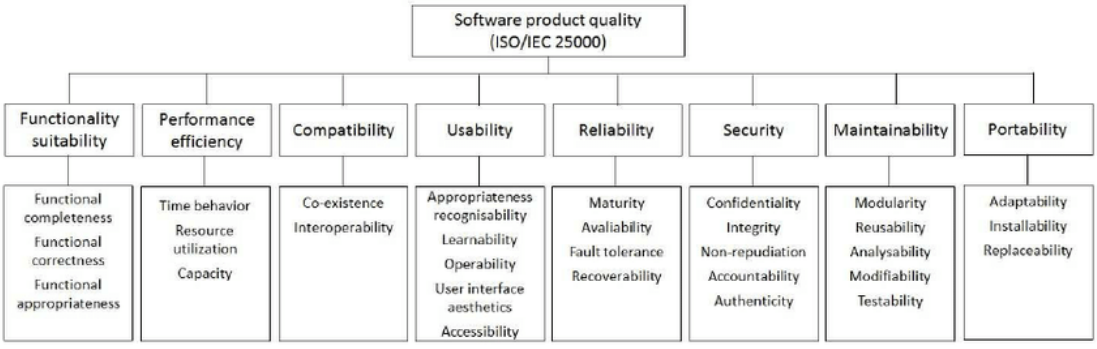

Figure 2. ISO/IEC 25010 Characteristics

Development

At this stage, researchers will begin to make learning media applications based on data that has been obtained in the previous step. To create this sign language application, it will use Android Studio software, InShot, Wondershare Filmora, Adobe Photoshop CC, and Format Factory. After developing the application, application testing will be done using the portability and functional suitability aspects of the ISO / IEC 25010. This aspect is carried out to determine the performance of the application developed when implemented on various devices by installing-running-uninstalling media applications learning on various devices. In addition to functional testing aspects of portability and portability, material experts and media experts conducted a feasibility test during the development stage.

1. Wondershare Filmora
   This software is used to adding text and subtitle for the category Kalimat.

Figure 2 Software Wondershare Filmora

2. InShot
   This software used for cutting the sign language video to a 1:1 ratio.

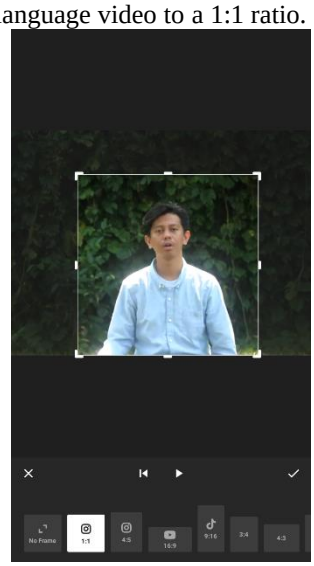

Figure 3 InShot Application

3. Format Factory
   This software is used to convert sign language video to gif format.

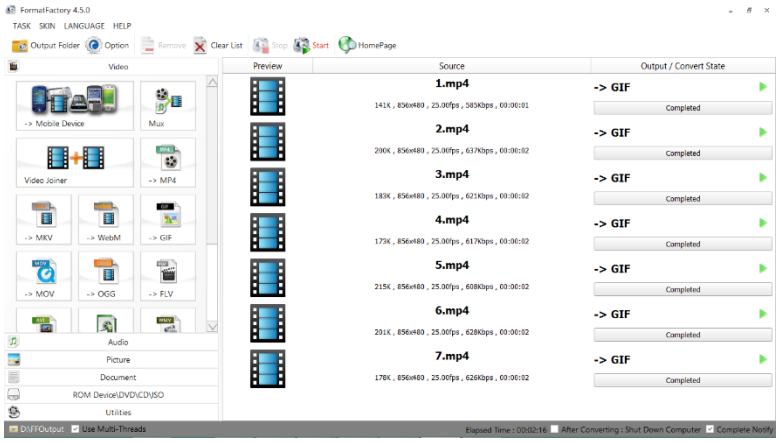

Figure 4 Format Factory Display

4. Android Studio

This software is used for making the Android-based learning media application.

```
public class SplashScreen extends AppCompatActivity {

    public static int TIME_OUT = 2000;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_splash_screen);

        Handler handler = new Handler();
        handler.postDelayed(() -> {
                Intent intent = new Intent( packageContext: SplashScreen.this, NavDrawer.class);
                startActivity(intent);
                finish();

        }, TIME_OUT);
    }
}
```

Gambar 5 Android Studio Display

Implementation

At this stage will be tested from the learning media application that has been developed in the UNS Special Education Study Program. This trial will depend on the assessment instruments that have been designed to determine the appropriateness of the applications that have been made. Before collecting data from the feasibility test, the researchers collected respondents for testing consisting of 20 UNS Special Education study program students from 2015 to 2017 who had already taken sign language courses. They tried the developed sign language learning media applications and then filled out questionnaires containing questions about the applications they had used.

The type of research instrument that will be used is using a questionnaire. The questionnaire is a data collection tool that contains several questions related to learning media applications that are made. The indicators used in the questionnaire use indicators from the ISO 25010 standard. The ISO 25010 standard is a standard used to evaluate software quality, especially in terms of product quality. At this stage, users will be tested using the usability aspects of the ISO 25010 Standard. The questionnaire used in this aspect refers to the USE Questionnaire, which contains an assessment of usefulness, ease of use, ease of learning and satisfaction.

n the usefulness section contains questions about the effectiveness of instructional media applications in understanding sign language material, the benefits of applications in sign language learning, whether the application is in accordance with user needs, and whether the application can run as expected. For ease of use, it is about whether the application is easy to use, easy to understand, whether the user has difficulty using the application, and whether there are inconsistencies during application use. For ease of learning contains whether the respondent can understand the use of the application, considering how to use the application and proficient in the use of learning media applications. For satisfaction contains whether the user is satisfied with the performance of the application, whether the application can be recommended to others.

From the results of user tests, obtained percentage of usefulness 82.5%, ease of use 84.3%, ease of learning 87.3%, satisfaction 80% and received a total of 83.2% of the 20 users stated the application sign language learning media is "very feasible" to be used.

Evaluation

Tahap evaluasi akan mengkaji data-data pengujian yang telah dilakukan sebelumnya yaitu dalam aspek functional suitability¸ portability, usability dan validasi oleh ahli. Untuk validasi ahli akan dilakukan oleh ahli media dan ahli materi.

1. Functional suitability
   Functional suitability is carried out to find out whether the developed application can function as expected. Functional suitability testing is carried out using a test case. The functional suitability test results obtained 100% results because the materials and buttons available in the learning media application can be run perfectly when tested.
2. Portability
   Portability is an aspect used to test how an application works in a variety of diverse device specifications. This aspect tests by experimenting with install-running-uninstalling applications on various operating systems and device screen sizes.

Table 2 Portability test

No.	Device Name	OS Version	*Install*	*Launch*	*Update*
1.	Samsung Galaxy A8	6.0.1	√	√	√
2.	Samsung Galaxy A9	8.0	√	√	√
3.	Motorola Moto E (2nd Gen)	6.0	√	√	√
4.	Motorola Moto G6	9.0	√	√	√
5.	Samsung Galaxy S8+	7.0	√	√	√
6.	Samsung Galaxy S10+	9.0	√	√	√
7.	OnePlus 6	9.0	√	√	√

3. Material expert validation test
   The feasibility test conducted by material experts is used to find out whether the material used in sign language learning media applications is in accordance with the learning indicators. Feasibility testing conducted by material experts can be concluded that the material available in sign language learning media applications is in accordance with the 100% eligibility standard with some input. The quality of the gif is not good, and the background video display should be dark in colour.
4. Media expert validation test
   The feasibility test conducted by media experts is used to find out whether the learning media applications developed are as expected. From the test results of the feasibility test of media experts, it can be concluded that the learning media application that was developed is very feasible to use with a percentage of 93% with some

input, namely to add examples of the use of sign vocabulary in sentences and add application information in learning media applications.

5. CONCLUSION

Based on the research results, the learning media application developed is an Android-based application. After the learning media application has been developed, the application is tested using the assessment characteristics of ISO / IEC 25010, the standard used to test the quality of the software. The assessment characteristics used concluded that the development of sign language learning media applications could assist in the learning process. With research data obtained during user tests, namely the percentage of usefulness (usefulness) 82.5%, ease of use 84.3%, ease of learning 87.3%, satisfaction 80%. The results of the validation test conducted by material experts and media experts get satisfactory results. Functional suitability and portability testing get 100% results. After all the data is accumulated with the user test data, which obtained 83.2% of the 20 users stated the sign language learning media application is feasible to use.

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