ISPEAK SIGNS: A FILIPINO SIGN LANGUAGE LEARNING APPLICATION WITH STATIC FSL RECOGNITION FOR CAVITE STATE UNIVERSITY-CAVITE CITY CAMPUS GENDER AND DEVELOPMENT UNIT

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ABSTRACT

The Cavite State University aims for quality and accessible education for all. The Gender and Development Resource Center mainstreams an inclusive environment for Gender Equality, Disability, and Social Inclusion (GEDSI) in all its university functions, from Research, Extension, Instruction, and Production. One of the disabilities that require unique educational needs is the disability of deafness. The main obstacles to acquiring knowledge for people with deafness are associated with language and communication. The Filipino Sign Language (FSL) Act of 2018 (RA 11106) mandates that FSL be recognized and promoted in schools and other transactions involving the deaf community. Further, Section 16 of the Magna Carta for Women states that equal access and elimination of Discrimination in Education, Scholarships, and Training should be observed in developing gender-sensitive curricula and instructional and academic materials. Thus, the researchers developed a mobile application as a learning mechanism for CvSU – Cavite City students to understand Filipino Sign Language using static FSL recognition technology. The Android application has seven modules focusing on the most used words and phrases in the community of FSL interpreted in text and video and powered by FSL recognition for real-time validation and knowledge assessment. The system was thoroughly evaluated and found to be a functioning piece of software that meets ISO 25010 evaluation requirements and quality goals, with above-satisfactory results for all indicators. It operates online according to set specifications, provides accurate results and featured functions, and achieved a grand mean of 4.50, which is interpreted as "very good."

Keywords: Android Application, Gender-sensitive curricula, Gender Equality, Disability, And Social Inclusion (GEDSI), Magna Carta of Women, and RA 11106

INTRODUCTION

Cavite State University- Cavite City Campus continuously mainstreams an inclusive educational institution to all society members, specifically those marginalized sectors. The 2018 Filipino Sign Language (FSL) Act (RA 11106) requires that FSL be acknowledged and encouraged in educational institutions and other activities involving the deaf community. This legislation serves as a step toward promoting inclusivity and accessibility for deaf individuals (Parrocha, 2018).

Moreover, Section 16 of the Magna Carta for Women calls for equal opportunities and eliminating discrimination in education, scholarships, and training. It highlights the importance of creating gender-sensitive curricula, instructional materials, and academic resources to ensure that every individual receives the same level of education regardless of gender (PCW, 2010). By implementing these provisions, the government can ensure that the educational system is fair and inclusive for all individuals, including those with disabilities and those belonging to marginalized groups.

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Hence, the lack of appropriate communication aids, and speech and deaf and hard of hearing individuals are relatively isolated from mainstream society. Ordinary people do not comprehend sign language as it is not their principal mode of communication. Learning Sign Language requires ample learning time, especially if one lacks the learning resources. According to the Cavite Provincial Disability Affairs Office (2022), there is a need to create interventions for the disabilities such as hearing and speech impairments, reporting a spike of 982 cases and 5,098 cases, respectively, from 2019-2020 to 3,818 in 2021.

One of the aids in making this inclusive learning is the increasing innovation on the internet and mobile platforms; the developed application would be an accessible and user-friendly initiative for deaf and speech-impaired individuals and non-signers that would like to learn the FSL. Thus, this application can be a learning communication aid for FSL while providing timely, efficient, and reliable information and communication that integrates static FSL recognition technology. According to Kumar (2018), mobile learning easily incorporates learning into everyday routine, resulting in successful course completion and knowledge retention.

When mobile learning is part of a digital training plan, it has the distinct advantage of being available 24/7. When an employee is about to execute a task or make a sales pitch regarding a new product, they may immediately pull out their phone and run a brief course to refresh their mind. According to Howlett et al., (2009), learning is a continuous and long-term process according to modern educational institutions, and e-learning has facilitated this.

Objectives of the Study

The general objective of the study was to develop iSpeak Signs, a Filipino Sign Language Learning Application with Static FSL Recognition for CvSU-CCC GAD Unit. This application would serve as a learning resource for signers and non-signers learning the FSL. Specifically, the study aimed to:

1. design and develop an android application named "iSpeak Signs" as a learning resource with the following features:
  a. a dictionary of FSL essential words and video phrases by category
  b. FSL Sign of the day
  c. Mini Game for FSL learners
  d. CvSU Mission and Vision Sign Language demonstration
  e. A profile screen that shows the progress of the user
  f. A static FSL Recognition module for the FSL alphabet
  g. An About module;

2. create the application using Android Studio with Java as its core programming language for the application UI and backend, Python for the static FSL Recognition module component of the application, and Adobe Photoshop 2020 for designing the UI; and

3. evaluate the developed application using the ISO 25010 instrument.

METHODOLOGY

People, especially those with needs, such as the deaf and speech-impaired individuals, rely heavily on communication. iSpeak Signs: A Filipino Sign Language Learning Application with Static FSL Recognition for Cavite State University – Cavite City Campus Gender and Development Unit was developed as a learning material for CvSU – CCC GAD Unit and for people, especially those with needs, such as the deaf and speech-impaired individuals. The research design employed in creating the application was quantitative developmental research, where students and campus faculty members became the beneficiaries. The application was tested and evaluated using ISO 25010 as the evaluation instrument. There were 12 Information Technology (IT) Experts and 2 GADRC Staff who evaluated the overall reliability and efficiency of the system. The application was also tested for use in Android versions Pie (9), Quince Tart (10), and Red Velvet Cake (11).
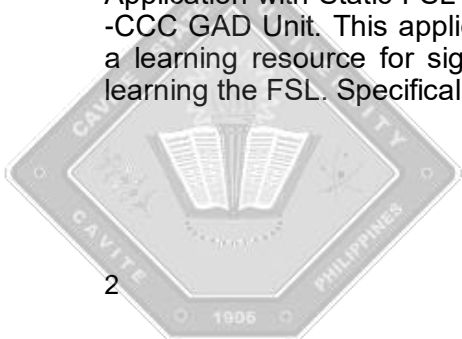
RESULTS AND DISCUSSION

The developed application has seven modules. The modules include the Learn module, Sign Language Recognition module, Mini game, FSL sign of the day, CvSU Mission and Vision, Profile, and the About module. The Learn module is composed of a word dictionary category and a phrase video category: the word dictionary category displays a sign language demonstration of each word through vector image representation in a sequence of steps, an audio resource, a text description of the steps shown in the image, and an online video demonstration of each word. The categories include basic word categories such as *Araw ng linggo, Buwan, Transportasyon, Lugar, Prutas, Gulay, Kulay, Hugis, Hayop, Parte ng Katawan, Miyembro ng Pamilya, Alpabeto, Numero, Kasarian,* and *Emosyon*. On the other hand, the phrase categories include videos for *Pang-emergency, Pangkomunikasyon, Ekspresyon ng Oras, Ekspresyon ng Pagmamahal*, and *Pagbati* phrase categories. The FSL Recognition module presents a real-time recognition of FSL and translates it into plain text using a translation model.

The SLR module only recognizes sign language physical demonstration through the use of a live camera. The translation model is limited in conversion, including only FSL Alphabets, and can create added letters into words. The FSL Recognition Technology also requires Android devices to be Android versions 9, 10, and 11.

The profile screen displays the name and edits of the username and an avatar, along with the progress in each category on both word and phrase categories. The profile page is limited to showing each the progress of the user within the application with the Learn module and will not accumulate data from external sources. The profile screen will display the number of words, phrases learned, and favorites, along with the number of times a user logs in consecutively. The Mini-Game module presents "Guess the Sign" which can assess the knowledge of the user regarding the FSL by guessing demonstrated words through hand signs on the screen. The game can only be accessed or played when the user learns all the FSL words in the Learn module. The game has the same format mechanics as 4 Pics 1 Word, which is a word
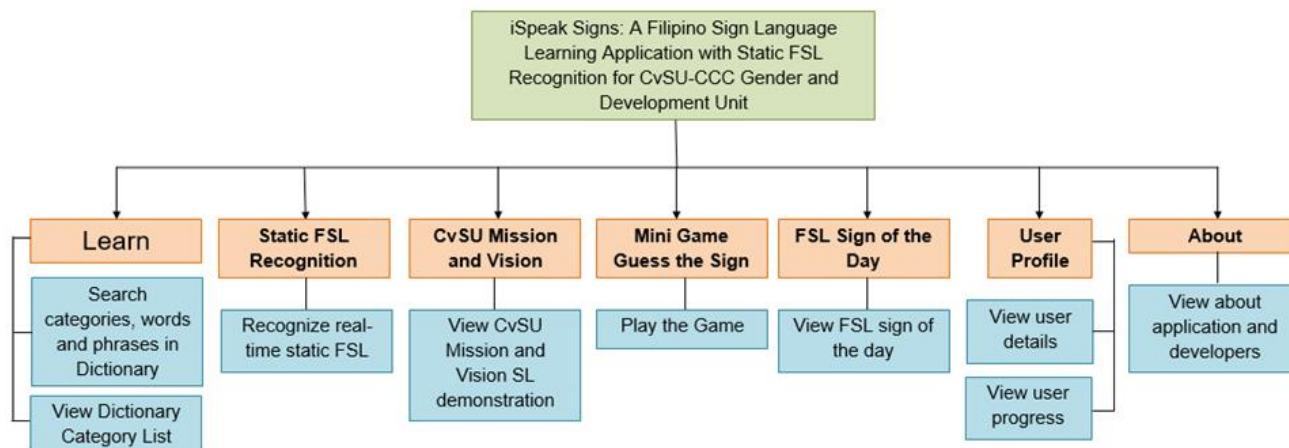

Figure 1. Functional Decomposition Diagram of the iSpeak Signs: A Filipino Sign Language Learning Application with Static FSL Recognition for CvSU-CCC Gender and Development Unit

game. For the hardware and software requirement, the application strictly runs on an Android mobile device as the sole operating system (OS) and hardware for the reason that there is a significant advantage for developers to create this kind of technology with Android OS since it is free to integrate and allows developers to access a deeper system-level functionality than iOS (Vujevic, 2023). The project design shows the scope and concept of the study that shows the functionality and entities involved in interacting with the iSpeak Signs application. A functional Decomposition Diagram was used as a systematic diagramming tool to show the functionality and entities interacting with the iSpeak Signs application. FDD was essential in creating the mobile application as it helped identify functional requirements, organize and manage the development process, improve collaboration, facilitate testing and debugging, and ensure scalability. By breaking the mobile application into smaller, more manageable components, FDD helped developers create a more efficient, effective, and user-friendly application (Neha, 2021) .

Figure 1 illustrates the functional decomposition diagram of the application iSpeak Signs. The application comprises module tabs that will undertake the full navigation. It has seven modules: Learn module, Static FSL Recognition, CvSU Mission and Vision, Mini-Game, FSL sign of the day, profile, and the about information. The Learn module displays the Search word and the View Categories functions. The Static FSL Recognition module helps users recognize sign language by presenting a real-time FSL to text recognition. The CvSU Mission and Vision presents a Sign Language demonstration of the University mission and vision. The user can play the Mini-Game to assess their Sign Language knowledge in FSL. The FSL sign of the day module will display a randomized word each day. The profile page will display user information, such as their name and their progress in each learning category. The last is the About module, which displays the application about the researchers.

Learning applications can significantly aid learning materials on specific topics, such as Filipino Sign Language, which can help the Gender and Development Unit in Cavite State University-Cavite City Campus. The application comprises seven modules that present several learning resources, such as images, text descriptions, and video resources, in aiding how to sign the FSL. The user can also assess their knowledge with the Mini-Game within the application and track their progress in their profile within the application.

The application iSpeak Signs has seven modules: Learn, Sign Language Recognition, Mini-Game, FSL Sign of the Day, CvSU Mission and Vision, Profile, and About. The developed application will effectively run on Android versions not lower than Android 6 (Marshmallow); however, at least Android 9 (Pie), Android 10 (Quince Tart), and Android 11(Red Velvet Cake) are required to use the FSL Recognition Technology. The developed system only proves that it is a working piece of software that meets the ISO 25010 evaluation requirements and quality goals (ISO 251010, 2011). ISO 25010 in creating mobile applications lies in its ability to help developers ensure that their applications meet specific quality standards, from quality assurance to user satisfaction, competitive advantage, and overall scalability rates. All the results of the indicators have proven to be above satisfactory results. The system is online with the set specifications and provides correct results and featured functions. After a thorough evaluation, the grand mean of the application is 4.50, with a verbal interpretation of *very good*.

CONCLUSIONS

In consideration of the objectives of the study and the results of testing and evaluations carried out, the following conclusions were derived:

1. The Android application iSpeak Signs was successfully developed, implemented, and evaluated such that:
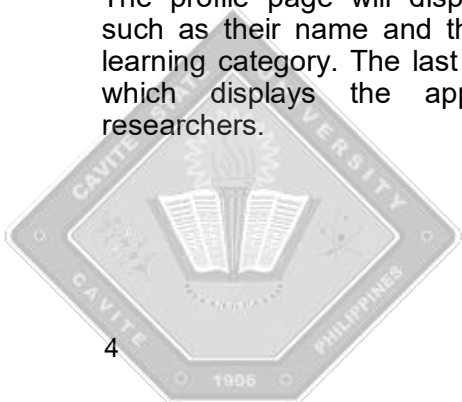
Table 1. Summary of ispeak signs: a FSL learning application with static FSL recognition for CvSU-CCC GAD Unit

INDICATOR	MEAN	VERBAL INTERPRETATION
Functional Suitability	4.53	Excellent
Performance Efficiency	4.53	Excellent
Compatibility	4.50	Very Good
Usability	4.57	Excellent
Reliability	4.50	Very Good
Security	4.45	Very Good
Maintainability	4.43	Very Good
Portability	4.51	Excellent
GRAND MEAN	**4.50**	**VERY GOOD**

a. The application modules provide learning materials for FSL learning;

b. Most resource contents within the applications can be accessed without an internet connection;

c. Learn module presents a dictionary for word and phrase categories;

d. FSL Recognition technology was created to recognize FSL alphabets for FSL learning;

e. Mini-Game was developed to assess knowledge of the user after learning from the application; and

f. A profile module was designed to track each progress of the user in each category.

2. The application was created using Android Studio with Java as its core programming language, Python for FSL Recognition Technology, and SQL Lite for the database.

3.The application was tested and improved using ISO 25010 as an evaluation instrument. Test results also validated that the application could be used in Android versions Pie (9), Quince Tart (10), and Red Velvet Cake (11).

4. The application received an overall performance with a grand mean of 4.5 through evaluations which can be interpreted as very good.

Policy Implications

This research was created to ease learning and recognizing FSL common words, alphabets, numbers, and phrases.

The creation of this study would mainly benefit the entire community of Cavite State University – Cavite City Campus through the inclusion of

Gender Equality, Disability, and Social Inclusion (GEDSI) in their gender mainstreaming strategy. The study would also benefit hard-hearing and speech-impaired communities and non-signers learning the FSL. The application will provide several learning resources, such as a dictionary of words and phrases, FSL demonstration, and FSL recognition, that are also useful in learning the FSL.

The study also provided learning aids for Sign Language Instructors in teaching Sign Language, especially for instructors specializing in FSL learning. Furthermore, the application contents can also be used as a learning material.

RECOMMENDATIONS

For future innovation of the study, the application should at least cover the following:

1. Flexibility for the application to be cross-platform to laptop and computer operating systems;
2. The FSL Recognition Technology also supports motion gestures for recognition;
3. The FSL Recognition Technology supports most Android versions to widen the reach of the technology; and
4. The application changes the data storage to an online cloud service to reduce the application size and improve access.

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