Kumpas Kamay: A Filipino Sign Language Instructional Application

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Abstract

This study aimed to create a Filipino sign language learning application that would provide both deaf and hearing users with an interactive learning environment using Android devices. It has a minigame, a video tutorial, a word translator with voice recognition, comment, and feedback sections, a built-in Filipino Sign Language (FSL) dictionary that is represented by 2D animated images, an audio recording of the FSL English definition and pronunciation spoken by a Filipino speaker, a word dictionary, and more. Animated images are included to show how users interact with the application. Fifty-five prospective users, Information Technology (IT) experts, and domain specialists participated in User Acceptance Testing (UAT) and a survey to assess the app's effectiveness. The expert's evaluation of the system based on ISO 25010 criteria was "very efficient".

Keywords: FSL, Filipino Sign Language, Sign Language, Android App, Mobile App, Instructional App, Learning Tool, Instructional Application.

1. Introduction

Filipino Sign Language (FSL) is a unique visual language used by deaf and hard-of-hearing communities in the Philippines. Despite its recognition as the official sign language of the country in 2018, FSL is still largely unknown and misunderstood by many Filipinos, leading to linguistic and cultural barriers that impede social inclusion and accessibility for the deaf and hard-of-hearing.

On October 30, 2018, RA 11106, An Act Declaring the Filipino Sign Language as the National Sign Language of the Filipino Deaf and the official Sign Language of the government in all transactions involving people who are deaf or hard of hearing, and mandating its use in schools, broadcast media, and workplaces, was signed into law by President Rodrigo Duterte declaring the Filipino Sign Language as the national sign language of the Filipino deaf. The Implementing Rules and Regulation (IRR) stipulated that the national policy necessary for the implementation of this Act shall include minimum requirements for the following: instruction and training on FSL in the civil service, including Continuing Professional Development; testing of FSL proficiency among both hearing and deaf prospective employees in the civil service, with a particular emphasis on teachers in early and elementary education, as well as those who work as interpreters, translators, and other interpreting services (mirror.officialgazette.gov.ph, 2023).

According to the 2010 Philippine Census of Population and Housing conducted by the Philippine Statistics Authority (PSA), there were 1,407,270 persons with disabilities (PWDs) in the Philippines. Of these, 58,276 reported being deaf or having a severe hearing impairment (Persons with Disability in the Philippines (Results from the 2010 Census),2023). However, according to the Philippine Registry of Interpreters for the Deaf (PRID), as of 2021, there were approximately 1,000 registered sign language interpreters in the Philippines(PRID,2023). As a result, a barrier exists between the deaf community and the broader public as a result. Deaf people use a system of hand gestures, body postures, and other movements known as sign language. It demonstrates that sign languages are actual languages in the same way that spoken languages are. Speaking languages are based on classes of sounds, whereas sign languages are based on visual units.

This research, entitled Kumpas Kamay: A Filipino Sign Language Instructional Application, was developed as an instructional tool for learning FSL in response to these challenges to foster language competency, cultural diversity, and social inclusion among Filipinos.

With an emphasis on improving user accessibility, engagement, and feedback, the Kumpas Kamay application can accommodate the varied learning needs, preferences, and backgrounds of beginner FSL learners. It has interactive multimedia features, FSL vocabulary and grammar, and a user-friendly interface that can work with different Android devices.

This study aimed to assess the efficacy and potential of the Kumpas Kamay application as a tool for fostering FSL proficiency among non-deaf people and the general public in the Philippines. It will entail gathering user opinions on the application's features and administering post-tests to gauge the learners' progress.

2. Literature Review

2.1. Sign Language

Sign language is a visual language expressed through physical movements instead of spoken words. Language relies on visible cues from the hands, eyes, facial expressions, and movements to communicate. Although sign language is primarily used by people who are deaf or hard of hearing, it is also used by many hearing people. As with any spoken language, sign language has grammar and structural rules and has evolved**.** Like spoken languages, there is no "universal" sign language. Countries typically have sign language versions unique to their region and culture.

Today, more than 300 different sign languages are spoken by more than 72 million deaf or hard-of-hearing people. In the United States, ASL has become the dominant sign language among deaf and hard-of-hearing communities (National Geographic Society, 2022).

2.2. Filipino Sign Language

Filipino Sign Language (FSL) is declared as the national sign language of the Philippines. The FSL shall be recognized, promoted, and supported as the medium of official communication in all transactions involving the deaf, and as the language of instruction of deaf education, without prejudice to the use of other forms of communication depending on individual choice or preference (mirror.officialgazette.gov.ph, 2023). According to “Filipino Sign Language A Compilation of signs from the regions of the Philippines,” published by the Philippine Federation of the Deaf (PFD) in 2005, the use of sign language in the Philippines

can be dated as far back as 1604. Using signs, a Spanish priest in Leyte taught two deaf Filipinos about God. When the American Thomasites arrived in 1907, they brought with them ASL and artificial signs in English, marking ASL's first entry into the Filipino Deaf's sign language system. The CEAD FSL research team shares that the Thomasites, U.S. Peace Corps volunteers, and American missionaries who founded Deaf schools in the Philippines have referred to 'Filipino,' 'Philippine,' or 'Traditional' signs in certain publications, such as "Love Signs," published by American missionary Rev Wayne Shaneyfelt (Mendoza, A., 2018). The school was run and managed by American principals until the 1940s. In the 1960s, contact with American Sign Language continued through the launch of the Deaf Evangelistic Alliance Foundation and the Laguna Christian College for the Deaf. Another source of ASL influence was the assignment of volunteers from the United States Peace Corps, who were stationed at various places in the Philippines from 1974 to 1989, and religious organisations promoting ASL and manually coded English (Martinez, L., 2012). The Bohol Deaf Academy also primarily emphasises the Philippine Sign Language (Bohol Deaf Academy, 2014).

According to the sign language researcher Dr Lisa Martinez, FSL and ASL deviate across three crucial metrics: different overall forms (especially a differing handshape inventory), different methods of sign formation, and different grammar (Martinez, L., 2012).

Filipino Sign Language was reported in 2009 as being used by 54% of sign-language users in the Philippines (Abuan, 2012). In 2011, the Department of Education declared that Signing Exact English was the Language of deaf education in the Philippines (mirror.officialgazette.gov.ph, 2023). In 2011, Department of Education officials announced in a forum that deaf and hard-of-hearing children were being taught. They would continue to be taught using Signing Exact English (SEE) instead of FSL (Matinez, L., 2011). In 2012, House Bill No. 450 was introduced in the Philippine House of Representatives to declare FSL as the National Sign Language of the Philippines and mandate its use as the medium of official communication in all transactions involving deaf people and the Language of instruction of deaf education (Surhoe, Tennoe, & Henssonow, 2011). The Philippine Deaf Resource Centre likewise called on the state to recognise the existence of Filipino Sign Language as a natural and legitimate visual language, citing research on its structure, sociolinguistics, and applications. It also called for the declaration of FSL as the national sign language in fulfilling international commitments (i.e., Salamanca Statement, UNCRPD) consistent with Article 5 of the 1997 SPED Policies and Guidelines (DLSU-CSB, 2018).

2.3. E-Tutor for Filipino Sign Language

The project's primary objective was to develop an FSL educational tablet application containing a dictionary, illustrations, and quizzes, simulation as its type of activity. It covers fifty essential FSL signs for Deaf and non-deaf users to familiarise them with the most commonly seen signage in the environment. The researchers met the requirements with proper aid and consultation from a Subject Matter Expert about sign language, particularly in FSL.

The project's goal of using human-model video illustration in the Dictionary module was also met through a successful collaboration with a Deaf actor and a non-deaf sign language interpreter who are proficient and fluent in signing FSL. They could also properly depict the

derivation and meaning and create scenarios of a signage entry in the Illustration module for the user to comprehend and define Filipino signage with ease and faster familiarisation. They also applied favourable visuals in the Challenge module containing a set of quizzes using 2D-animated signs as its main illustration of choices.

Finally, a thorough evaluation of the survey results for the user acceptance testing was conducted to verify user-specific requirements that were met upon the first version of the application where the GUI elements should be able to comply with the user's needs (Garcia, San Luis, & Samonte, 2016).

2.4. BridgeApp: An Assistive Mobile Communication Application for the Deaf and Mute

Communication was greatly affected by disorders such as hearing or speech impairment. Utilising a smartphone's capabilities and using it as an Assistive Technology, communication can be accomplished without too much inconvenience. This research focused on breaking the barrier between hearing and non-hearing, or mute, in terms of communication. The system was used to assist in the daily activities of mute or deaf people and other people without disabilities, whether it is used inside a household or outside. The purpose of its development as a mobile application is to enable people to use it anywhere at any time. The system was improved as the researchers gathered more data, conducted interviews in communities and with pathologists, and analysed the data to enhance further the application for better output (Samonte, Gazmin, Soriano, & Valencia, 2019).

2.5 SimboWika: A Mobile and Web Application to Learn Filipino Sign Language for Deaf Students in Elementary Schools

Deaf students in one elementary school in Manila were confused when learning Tagalog words because the sign language established before was American Sign Language (ASL). With this drawback, the researchers aimed to develop "SimboWika," a mobile application to help deaf students in elementary schools learn Filipino Sign Language. It provides illustrations to practice FSL and assess student learning. Teachers can also keep track of students' progress using its web application (Empe, Echon, Vega, Paterno, Jamis, & Yabut, 2020).

3. The Objectives of the Study

Generally, researchers designed, developed, and evaluated the Kumpas Kamay: A Filipino Sign Language Instructional Application for both deaf and hearing users.

Specifically, this study aimed to:

1. Design and develop a user-friendly and accessible instructional application for learning Filipino Sign Language (FSL), with a focus on visual and interactive elements to enhance user engagement and learning outcomes; and
2. Evaluate the effectiveness of the Kumpas Kamay application as a tool to improve FSL proficiency among beginner-level learners through user testing and feedback collection.

4. Conceptual Paradigm of the study

The study's conceptual framework provided a general view of the application, which showed its complex components based on the application's input – process – output, and evaluation design.

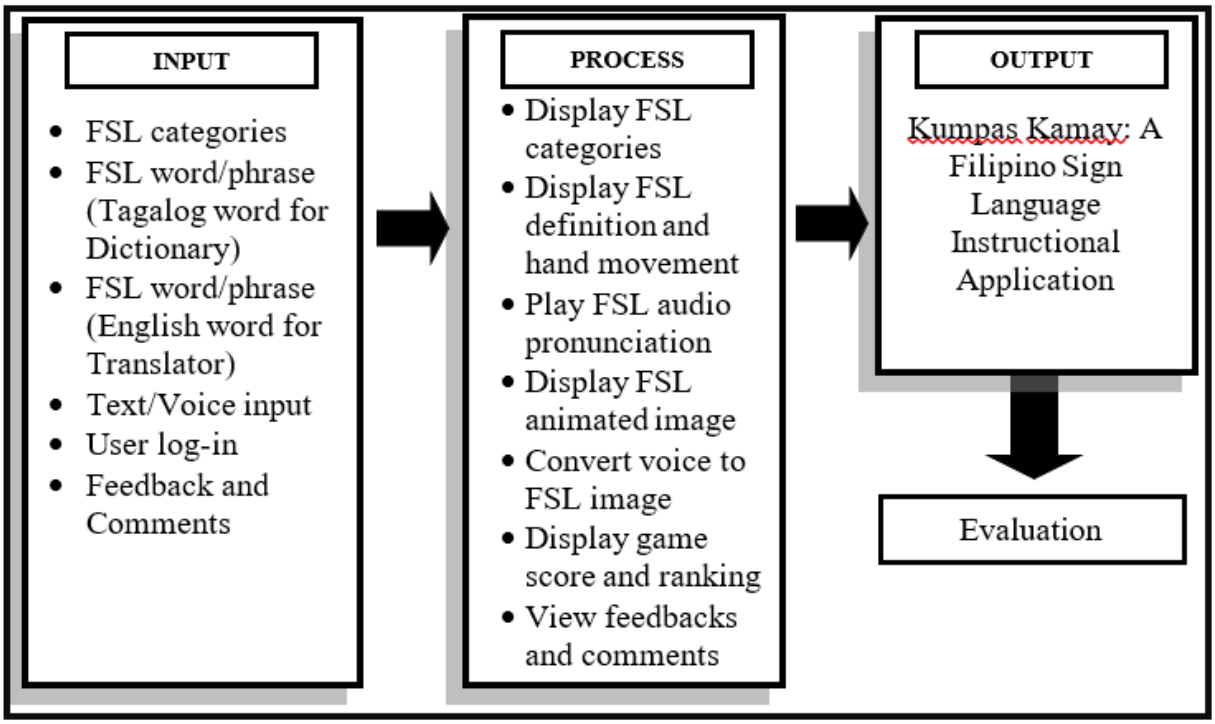

Figure 1. Conceptual Framework of the System

The FSL categories, FSL words/phrases (Tagalog for dictionary), FSL words/phrases (English for translator), text/voice input, user log-in, and feedback and comments inputs to the system are shown in Figure 1.

The application displayed FSL categories and definitions, played FSL audio pronunciation and FSL animated graphics, converted voice to images, showed game scores, and displayed feedback and comments.

In this system, users have the option to search by category. They identified the correct FSL categories listed in the application. This method reduced the time spent searching for and navigating an FSL word or phrase. As soon as they access the dictionary module, users also have the opportunity to see the FSL term and its related hand movements. All they have to do is type or insert a Tagalog word into the search field of the module. The sound of the FSL was in .wav format. These were recorded in Tagalog by using a Filipino speaker. The user can input or speak a specific English word into the translator module, and once the application accepts it, it displays appropriate FSL animated graphics. The application also shows each player's rating and the game score on the minigame module. This process helped the researcher evaluate the learning outcome of the users. The users could send feedback and comments through their email accounts.

Kumpas Kamay: A Filipino Sign Language Instructional Application is the system's output tested and assessed using the ISO 25010 quality standard.

5. Methodology

5.1. Research Design

This process, known as Rapid Application Development (RAD), aims to create apps quickly using frequent iterations and ongoing feedback. The need for new applications is growing as a result of the fiercer competition in the software market, putting pressure on the IT sector to provide working products more quickly. As a result, RAD is becoming essential.

Martin (1991) developed the RAD framework after realising and utilising software's limitless malleability to create development models. Rapid Application Development is a development lifecycle designed to give much faster development and higher-quality results than those achieved with the traditional lifecycle. It is designed to take the maximum advantage of powerful development software that has evolved recently. (Borg, B., 2021).

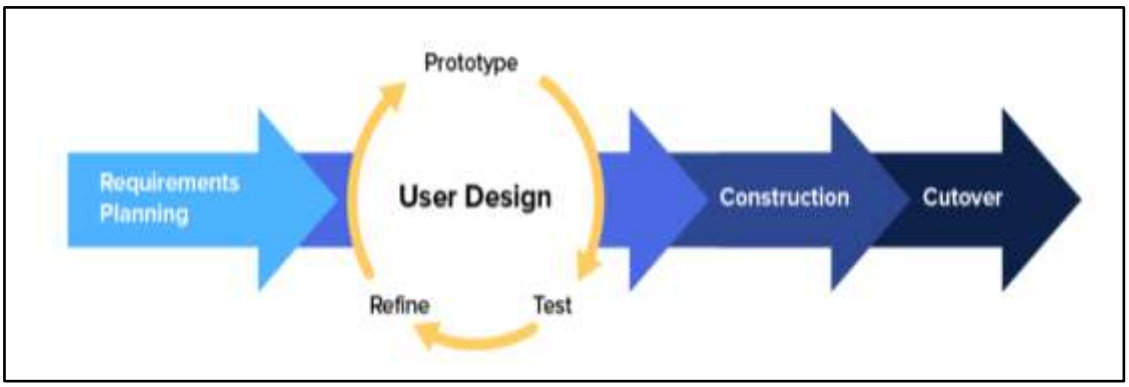

Figure 2. Rapid Application Development.

Figure 2 shows the steps for Rapid Application Development, which focuses on developing applications rapidly through frequent iterations and continuous feedback.

5.1.1. Requirements planning. Define project requirements.

The initial interview and data collection for the FSL and the current medium of instruction for Special Education Department (SPED) schools were done in this phase. Relevant data were also acquired, including statistics on the country's deaf and mute population and the original FSL hand gesture. As one of the primary resources for the study, the researchers contacted the principal of Oton Central Elementary School (OCES). The researchers acquired pertinent data for this research through their SPED program. To validate the Filipino Sign Language content, the researchers contacted Raymond J. Manding, Vice-President of WFD RSA Asia Deaf Youth Sections, two (2) SPED Teachers from the University of Iloilo, and five SPED Teachers from OCES.

This phase included the tools, database application, cloud storage, and deployment plan. The developers chose Google Firebase for the system's database, JavaScript (React Native) for the system's development tool, and Google Play Store for the application's distribution channel.

5.1.2. User design. Prototype, test, and refine.

This phase included developing the application design, menus, and functionality. Abode Photoshop and Adobe Flash were used to develop the design and animated images. This process also included the design for the screen layout, screen colour, font size, font face, font colour, and icons used in the project.

Coding, scripting, database creation, and prototype testing were also part of this step. The system was developed in this case using React Native, with methods and procedures added for the design's functionality. For app storage, Firebase was utilised, particularly for the app's content and other inputs needed during use, such as the user's name and the game result in the Game area, as well as for comments, ratings, and feedback. After conducting the initial test, the researchers tested the system using code-based testing (a process known as "white-box testing") to ensure that data flowed from input to output. Following the testing of the prototype, the researcher allowed the intended user to test the system using specification-

based testing (also known as "black box testing") to gauge how well the application functions. The input value and output value also worked during the phase. After the test results, the researchers repeatedly modified and enhanced the models until the application requirements were attained.

5.1.3. Cutover. Finalise product / implementation

Development teams transferred components to a real-world production setting during the implementation phase so any testing or training be conducted. Before confidently providing the client with a finished product, the team developed extensive documentation and did other necessary maintenance chores.

Building and deploying the finished application we included in this phase. The researchers used Android Studio to create the application's final version. Here, the Android Package (APK) was built for distribution. The application used Google Firebase as its cloud storage for updates, game results, and leaderboards. To launch the app via the Google Play Store, the researcher set up and purchased an account on the Google interface. It is not only a marketing strategy but is also regarded as the most straightforward means to get millions of potential customers.

5.2. Respondents and Sampling Plan

The study's respondents were IT experts who were Database Programmers, Web and Mobile Developers, Network Specialists, Game Developers, IT Instructors, Domain Experts, and possible users. Table 1 shows the distribution of respondents in the study.

Table 1. Distribution of the Respondents

Classification	**Respondents (25 pilot test)**
Domain experts	9
IT Experts	10
Possible Users	20
TOTAL	55

Table 1 shows the distribution of respondents. (55) respondents evaluated the testing of the system. Ten IT Experts evaluated the survey instrument based on the ISO 25010 standards in terms of its main characteristics; performance efficiency, reliability, usability, and portability.

Table 2. Distribution of the Domain Experts

Classification	**Respondents**
Deaf Translator	1
SPED Teacher	6
SPED Instructor	2
TOTAL	9

Table 2 shows the distribution of the domain expert who checked the validity of the FSL contents of the application. As reflected in the table, the domain experts comprised one (1) FSL translator and eight SPED Teachers and Instructors. Mr Raymond J. Manding, a deaf individual and a deaf translator from the Philippines Federation of the Deaf Youth Section, checked the FSL content of the application. Mr Manding provided the researchers with the

different FSL symbols and video tutorials. Aside from this, the researchers introduced the application to two faculty instructors teaching at the Special Education Department. Here, they tested the application functionality and checked the FSL symbol used. The researchers also conducted a validity check for the application's content at Oton Central Elementary School – SPED Department. Six SPED teachers installed and used the application with their deaf and hard-of-hearing students. After a series of testing, the results showed that the FSL symbol used in the application was correct, as per validated by the domain experts. The sample size used the Roscoe Simple rule of thumb. According to Roscoe, experimental research with tight controls may be conducted with samples as small as 10 to 20. In most ex post facto and experimental research, samples of 30 or more are recommended (Hill, 2012).

5.3. Instrument and Data Gathering Tools

In this study, the researchers used the standard ISO 20510 Questionnaire, which was adapted and prepared and then distributed to the IT experts, domain experts, and possible users for the system's evaluation. These standards are for the software's reliability, performance efficiency, operability, and portability.

5.4. Data Analysis

In analysing the data, the mean and standard deviation were used. Mean was used to determine the level of efficiency of the system. It was computed by adding up all the series values and dividing them by the sum of the total number of marks. This paper used the mean for sample sizes of 15 or more (Russel, 2017).

The standard deviation is the most common measure of variation for numerical data in statistics. The standard deviation measures how concentrated the data are around the mean; the more concentrated it is, the smaller the standard deviation (Ramsey, 2018).

To interpret the scores, the five-point Likert scale was used.

Range Descriptive Rating

4.21 – 5.00 Very Efficient
3.41 – 4.20 Efficient
2.61 – 3.40 Moderately Efficient
1.81 – 2.60 Less efficient
1.0 – 1.80 Inefficient

6. Results and Discussion

The software quality evaluation was based on ISO 25010 International Quality Standards. The four criteria of performance efficiency, usability, reliability, and portability were used in this study. The developer conducted user acceptance testing (UAT) and evaluation testing for 10 Information Technology (IT) experts in line with Database Programming, Web and Mobile Development, Networking, Game Development, and IT Instructor and 10 Domain experts coming from SPED schools and Philippine Federation of the Deaf Youth Section.

The mean and standard deviation (SD) value was computed to determine the general perception of IT and Domain experts. A high value of SD indicates a wide range of perceptions, while low values indicate similarity or commonality in their perception.

Performance Efficiency. The result, as shown in Table 3, reveals that the application had a "Very Efficient" performance efficiency (M=4.3) because the application had a "Very

Efficient" time behaviour (M=4.3), resource utilisation (M=4.3), and capacity (M=4.3) features.

Table 3. Result of the Performance Efficiency Quality Characteristic Evaluation of the System

ISO 25010 Software Quality Criteria	Mean	Description	SD
C. Performance Efficiency			
1. Time behaviour (The system's response, processing times, and throughput meet requirements.).	4.3	Very Efficient	0.67
2. Resource utilisation (The amounts and types of resources used by the system meet the requirements.).	4.3	Very Efficient	0.67
3. Capacity (The maximum limit of a product or system parameter meets the requirements.).	4.3	Very Efficient	0.67
Total	4.3	Very Efficient	0.67

This result implied that the users agreed with application performance efficiency, specifically its time behaviour, resource utilisation, and capacity. Making the application an Offline application further enhanced the system performance efficiency because all the components are dependent on the device. However, the application's performance depends on the Android device hardware specification as per the compatibility testing results. The study result agreed with Tom Melamed's article "Offline-first: What is it, and how could your application benefit?", which discussed the advantages of an offline application. He stated the following advantages for an offline application: the application is likely to be used in areas of poor connectivity, the application offers an extensive directory of content accessible via a search function, and the application does not require online functionality (Melamed, T., 2018).

Reliability. The result, as shown in Table 4, revealed that the application had a "Very Efficient" reliability (M=4.4) because the application had a "Very Efficient" maturity (M=4.3), availability (4.6), fault tolerance (M=4.4), and recoverability (M=4.3) features.

Table 4. Result of the Reliability Quality Characteristic Evaluation of the System

ISO 25010 Software Quality Criteria	Mean	Description	SD
E. Reliability			
1. Maturity (The system is reliable under regular operation.).	4.3	Very Efficient	0.67
2. Availability (The system is reliable if required to be used.).	4.6	Very Efficient	0.52
3. Fault tolerance. (The system operates as intended despite hardware or software faults.).	4.4	Very Efficient	0.79
4. Recoverability. (In the event of an interruption or a failure, the system can recover the data directly affected and re-establish the desired state of the system.).	4.3	Very Efficient	0.48
Total	4.4	Very Efficient	0.615

The result implied that the application is reliable under regular operation and can perform despite error occurrence. Making the application an offline application further enhanced the application's performance efficiency. It is because all the components were dependent on the device. However, the application's performance depended on the Android device hardware specification as per the compatibility testing results. The study result agreed with Tom Melamed's article "Offline-first: What is it, and how could your application benefit?", which discusses the advantages of an offline system. He stated the following advantages for an offline application: the application is likely to be used in areas of poor connectivity, the application offers an extensive directory of content accessible via a search function, and the application does not require online functionality (Melamed, T., 2018).

Usability. As shown in Table 5, the result reveals that the application had a "Very Efficient" usability (M=4.5). It is because the application has "Very Efficient" appropriateness recognizability (M=4.3), learnability (4.5), operability (M=4.6), user error protection (M=4.5), and user interface aesthetics (M=4.6) features.

The result implies that the application is for use by different users with efficiency, ease, and satisfaction. However, the application's performance depends on the Android device hardware specification as per the compatibility testing results. The application was designed to be user-friendly based on the principles of software development for the Android system. The methodology mentioned this principle used by the researchers.

Table 5. Result of the Usability Quality Characteristic Evaluation of the System

ISO 25010 Software Quality Criteria	Mean	Description	SD
F. Usability			
1. Appropriateness recognizability. (The users recognise the appropriate need for the system)	4.3	Very Efficient	0.82
2. Learnability. (The users can use the system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use to achieve specified goals of learning)	4.5	Very Efficient	0.53
3. Operability. (The system is easy to operate and control)	4.6	Very Efficient	0.52
4. User error protection. (The system protects users against making errors)	4.5	Very Efficient	0.70
5. User interface aesthetics. (The user interface enables pleasing and satisfying interaction for the user)	4.6	Very Efficient	0.70
Total	4.5	Very Efficient	0.654

The result of the study agreed with the article of Siemasko (2015) discusses the importance of users' participation in any mobile application's usability and efficiency through users' feedback and comments. Similarly, this study has incorporated the same feature that provides feedback and comments modules in the system. This result is a basis for further enhancing the system and future application upgrades.

Portability. The result, as shown in Table 6, reveals that the application had a "Very Efficient" portability (M=4.5) because the application had a "Very Efficient" adaptability (M=4.4), installability (4.7) and replaceability (M=4.4) features.

Table 6. Result of the Portability Quality Characteristic Evaluation of the System

ISO 25010 Software Quality Criteria	Mean	Description	SD
H. Portability			
1. Adaptability (The system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments.).	4.4	Very Efficient	0.70
2. Installability (The system can be installed and uninstalled in a specified environment.).	4.7	Very Efficient	0.48
3. Replaceability (The system can replace another specified software product for the same purpose in the same environment).	4.4	Very Efficient	0.70
Total	4.5	Very Efficient	0.63

The result implies that the application can efficiently adapt to different environments, replace old software using similar hardware specifications, and can be easily deployed or retracted.

The study's result agreed with Sue Smith's article regarding "Android Studio," which mentioned that Android Studio provides an adaptive application framework that provides unique resources for different system configurations. World-class code editing, debugging, performance tooling, and instant build/deploy system allow the developer to focus on building a high-quality system. This framework has significantly helped the researchers of this system to complete a portable mobile system. Although some platform environments cannot support the system, like those mobile devices run by Apple iOS, most mobile phone users worldwide use the Android operating system and devices. Thus, it was indicated in the recommendation of this study that the Apple iOS environment might be considered in the future so that the portability characteristic of the system will become complete.

Table 7. Summary of Result of the Quality Characteristics Evaluation of the Application Based on the ISO 25010 International Standards

ISO 25010 Software Quality Criteria	Mean	Description	Sd. Deviation
A. Performance Efficiency	4.30	Very Efficient	0.67
B. Reliability	4.40	Very Efficient	0.615
C. Usability	4.50	Very Efficient	0.654
D. Portability	4.50	Very Efficient	0.63
Total	4.425	Very Efficient	0.64225

Summary of the Result. Table 7 summarises the evaluation results of the application's quality in terms of ISO 25010 standards.

The result reveals that the respondents found the application "very efficient" and conformed to ISO International Quality Standard (M=4.425, SD=0.64225). Specifically, the respondents found the application “very efficient” on its performance efficiency (M=4.30), reliability (M=4.40), usability (M=4.50), and portability (M=4.50) characteristics. This outcome shows that the application met all the criteria and conformed to the international standards of ISO 25010 regarding performance efficiency, usability, reliability, and portability.

The result implies that the application is of good quality and could provide quality service to its beneficiaries whether he/she has an internet connection or not. Hence, an assurance that the application can operate efficiently.

The study results agreed with the provision of ISO 25010 (2023)that only quality software products must deploy to its stakeholders. A comprehensive specification and evaluation of the quality of software and software-intensive computer system must be done to ensure the value of these software products.

7. Conclusions and Recommendations

This study aimed to develop Kumpas Kamay: A Filipino Sign Language Instructional Application. This closure is a mobile application intended to introduce Filipino sign language to deaf and non-deaf users in the Philippines and abroad. This application will be available on the Google Play store and could be installed on any Android phone and tablet with an Android OS version of KitKat up to the latest. The application comprises five modules: Dictionary, Categories, Extras, Feedback and Comments, and About. This application comprises over 100 FSL words/phrases duly certified by FSL teachers and experts. Each FSL word/phrase has an English definition, hand movement instructions in both English and Filipino Language, FSL pronunciation in Filipino, and 2D animated images.

Ten IT Experts and 10 Domain Experts for system evaluation based on ISO 25010 International Quality Standards participated in the evaluation process. The four criteria are performance efficiency, usability, reliability, and portability. The results showed that the respondents "strongly agreed" that the system complied with these criteria set by ISO. This result implies that the system software is of good quality and could provide its intended objectives to the users. The user acceptability test was conducted for potential users of the system. The test criteria were the functionality and usability of the system. The result showed that the users “strongly agreed” that the system’s functionality and usability conform to its objectives, description, and specifications. Twenty possible users comprised of a teaching professional served as evaluators. These groups comprise call centre agents and students from different schools with different courses.

The following is the summary of the findings of the study:

- The system's overall efficiency level results showed an evaluation rating described as "very efficient." This finding means the application is a valuable and friendly tool for learning the Filipino sign language.
- The overall result of the expert's evaluation of the system based on the ISO 25010 criteria was "very efficient." This summary means that the system conformed to the software quality characteristics set by the ISO 25010 standards. This summary implies that the software is of good quality, which could provide a quality learning experience for its users.

The application has great potential to introduce Filipino Sign language to its possible users. Because this application can be used offline and run-on minimum Android API, the application could be an excellent tool for learning Filipino sign language compared to the existing application, which requires an internet connection and higher Android API.

Based on the findings and conclusions, the following recommendations were formulated:

- Allow users to contribute additional content for the application as the administrator approves.
- Allow the application to be hosted by the server to accumulate many files.
- Develop the application for iOS devices to reach more users further.
- Provide online help for any inquiry about the application.
- Introduce the application as a learning tool inside the classroom.
- Add more FSL content in the Category module and to the video tutorial module for more learning experiences on the part of the users.
- Add a chat room for the users' collaborative exchange of information.

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- Above all, to our Almighty God, who makes everything work according to His plan.

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