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Development of Malaysian Sign Language (MSL) Mobile Apps

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Abstract

This work describes the development of a Malaysian Sign Language (MSL) mobile application to bridge the communication gap between the deaf and hard-of-hearing people in Malaysia. The motivation for this work stems from the lack of Malaysian Sign Language (MSL) learning resources, especially among the general public. The application is developed using Flutter on the Android platform. It contains topic-based video tutorials, interactive quizzes, and MSL vocabulary translation functions. A preliminary survey of college students aged 18-24 showed that 86.7% of the respondents had never used sign language. In contrast, 86.7% of the respondents showed a strong interest in learning sign language. Test results showed that the stability of the application reached 90%, and 100% of users reported that they did not encounter accessibility issues, which proves its effectiveness and inclusiveness. In addition, 66.7% of users were satisfied with the feature. Offline access, multi-language support, social features, and personalisation options will be further enhanced to improve the user experience and promote the broader application of Malaysian Sign Language education.

1. Introduction

The scarcity of resources for learning sign language, particularly Malaysian Sign Language (MSL), presents a significant obstacle to effective communication with the hearing-impaired community [1] - [3]. Communication barriers are a primary concern, impacting millions of individuals worldwide. According to the World Health Organization (WHO), more than 5% of the global population—approximately 430 million people—require rehabilitation to address disabling hearing loss, including 34 million children. This figure is projected to exceed 700 million by 2050 [4], [5]. In Malaysia alone, over 40,000 individuals are registered as hearing-impaired [4].

However, learning sign language, the primary means of communication for the deaf community, remains a challenge due to the scarcity of educational tools, particularly for beginners [6]-[9]. This resource gap is more evident in Malaysian Sign Language (MSL), where structured learning platforms, textbooks, and digital tools are limited. Consequently, the communication barrier between hearing individuals and the deaf community continues to widen [3].

Despite the growing awareness of sign language among Malaysians, people with normal hearing face considerable barriers to learning to use Malaysian Sign Language (MSL). Traditional methods of learning MSL, such as face-to-face classes and textbooks, are limited by geographical restrictions, time commitments, and a lack of engaging, interactive resources [10]. In addition, there is a lack of mobile apps that can effectively bridge this gap and provide an easy-to-use and comprehensive MSL learning platform [2], [3].

Existing sign language apps include Sign Language: ASL Kids [11] and Sign Language Quiz – Play and Learn [12]. Designed for children aged 1 to 12, Sign Language: ASL Kids only offers 21 free sign languages, and other content requires in-app purchases. This limits its use to users who cannot afford it. In contrast, the MSL app is free and designed for users aged 18 to 24 [11]. It provides comprehensive video lessons covering letters, numbers, and standard greetings and does not restrict paid content.

The Sign Language Quiz – Play and Learn focuses on quiz-based learning and lacks structured video tutorials or vocabulary translation features. The interface is too simple and may not fully engage users [12]. The MSL app makes up for these shortcomings by providing video lessons, an interactive quiz system, and vocabulary translation features, providing a better learning experience.

As a result, many people have difficulty learning Malaysian Sign Language (MSL) that fits their personal schedules and learning preferences, which hinders communication between deaf and hard-of-hearing people and the general public [13]. This work aims to address these challenges by developing a mobile application that helps learn Malaysian Sign Language (MSL) through interactive quizzes and multimedia content for people aged 18 to 24. Through the capabilities of the Android platform, the application provides a convenient, fun, and efficient way for general people to learn Malaysian Sign Language (MSL) at their own pace.

2. Methodology

Fig. 1 shows that the development process of the Malaysian Sign Language app has four (4) main phases: planning, design, implementation, testing, and evaluation.

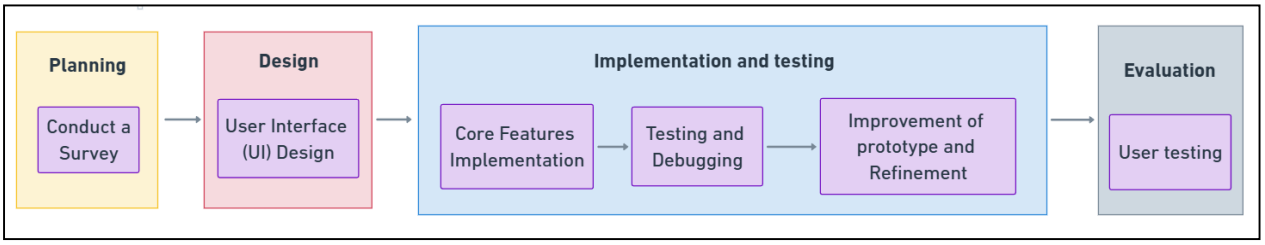

Fig. 1 *Development process of the proposed work*

In the planning phase, a user survey was conducted with 15 respondents aged 18 to 24. The responses were collected via Google Forms to understand the target population's familiarity with sign language and preference for learning tools.

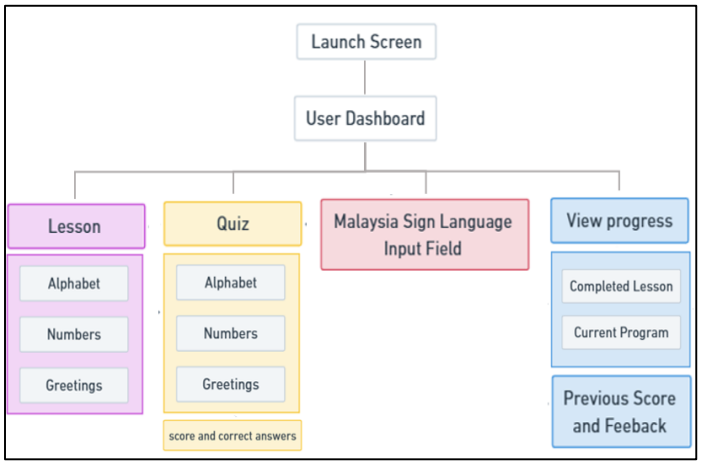

Fig. 2 *The structure of the content for the proposed apps*

In the design phase, user interface wireframes were created for core features such as the dashboard, video lessons, quiz modules, and MSL vocabulary translation tools. The proposed app was developed using Flutter software because it is a versatile cross-platform framework that supports deployment to Android apps from a single code base [14], [15]. The Dart is the primary programming language. At the same time, Android Studio is an integrated development environment (IDE) that provides the necessary coding, debugging, and testing tools [16]. As illustrated in Fig. 2, the app has a launch screen and a user dashboard. The launch screen is the sign-up screen users see after opening the app. The dashboard allows a user to navigate a list of lessons, quizzes, a Malaysian sign language input field and view the user's progress.

The design was translated into functional components in the implementation and testing phase. The video tutorial was embedded using the *youtube_player_flutter* package, and a progress bar was implemented to track

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the user's learning progress. Quiz questions were divided into letters, numbers, and greetings. The MSL word translation feature is implemented by inputting a word and displaying the corresponding hand gesture image. All core features are implemented using Dart in a Flutter environment.

Finally, during the evaluation phase, an APK was distributed to 30 respondents, users aged 18-24, to download the app. The evaluation form was distributed using Google Forms, and the evaluation questions include app features and functionality, ease of use and accessibility, performance and compatibility, and overall satisfaction. Additional suggestions are provided for future improvements.

3. Results and Discussion

The results of this work are divided into the survey results, the prototype's initial design, and user testing. The results present the content design and application development efforts, focusing on key user interface components such as registration, login, dashboard, video courses, quizzes, and text translation features. The initial and improved prototypes are compared, and user testing results are presented, including performance, accessibility, user satisfaction, and suggestions for future improvements.

3.1 Results of the Conducted Survey

Fig. 3 shows the survey results; 86.7% of the respondents cannot use sign language, and only 13.3% have it. However, 86.7% of the respondents expressed interest in learning Malaysian Sign Language (MSL). When asked about their preferences for sign language learning applications, 93.3% of the respondents said that video demonstrations were the most helpful feature. In addition, 53.3% of the respondents preferred images, 46.7% of the respondents wanted slow-motion playback, and 40% of the respondents thought progress tracking was important. Regarding purchasing such applications, 53.3% of the respondents said they were willing to buy, while 46.7% said they would not.

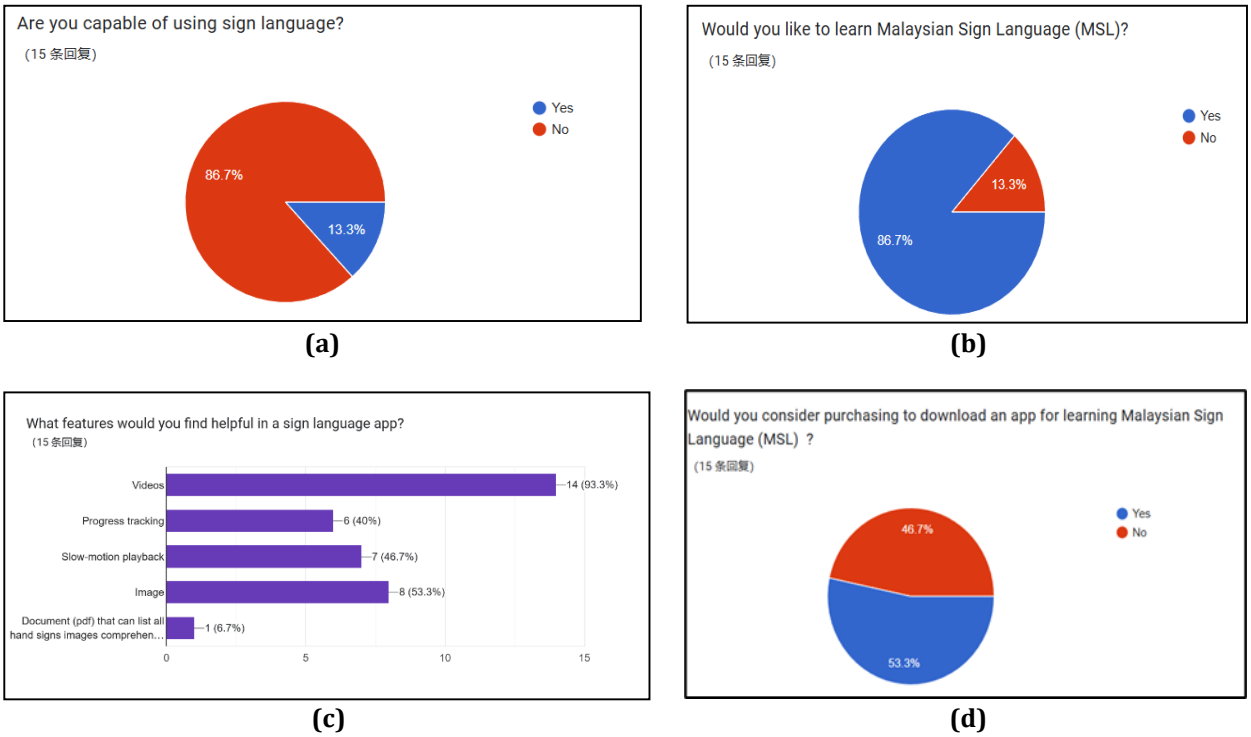

Fig. 3 *Results of the conducted survey (a) Sign language proficiency among respondents, (b) interest in learning MSL among respondents, (c) preferred features for a sign language app, (d) interest in purchasing the apps*

3.2 Results of Initial Design and Prototype

Fig. 4 shows two versions of the dashboard. Fig. 4(a) is the initial design, and Fig. 4(b) is the prototype. The prototype introduces some improvements aimed at improving the user experience. First, the course method in the prototype was modified. In the greeting lesson shown in Fig. 4(c), the prototype changed to a sliding up and down method to select the greeting video to watch, while the initial design did not have this method. Another modification is the "Take the Quiz" button, which is displayed as active in the initial design but is disabled in the

Fig. 4 *Initial design and prototype of the UI (a) Initial Design, (b) Prototype, (c) Greeting Lesson, (d) Take a Quiz, (e) MSL word translation function, (f) Quiz, (g) Alphabet Lesson, (h) Number Lesson*

prototype as shown in Fig. 4(d). Fig. 4(d) shows all the lesson videos that must be completed before the quiz can be activated. Finally, the prototype adds a new function, "MSL word translation function", which allows users to

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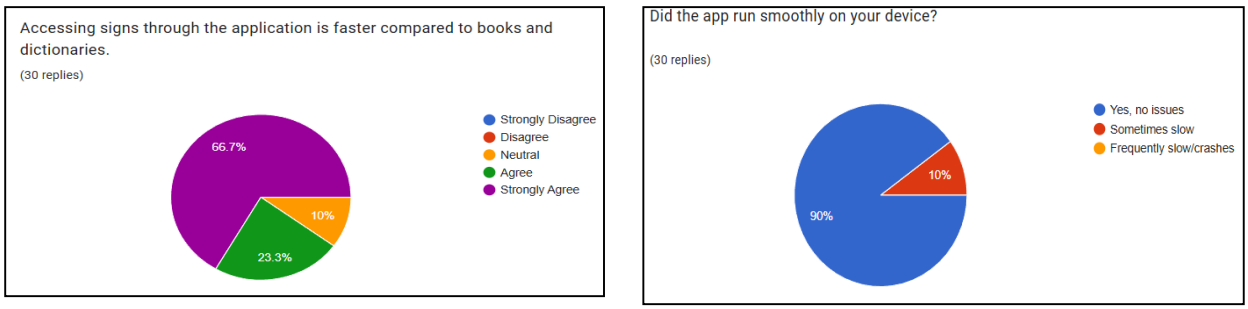
enter words related to Malaysian Sign Language and then display pictures related to Malaysian Sign Language, which was not in the initial design as Fig. 4(e).

Fig. 4(f) shows that the users can scroll up and down to view the complete list of answers. In Fig. 4(g) and Fig. 4(h), a video teaching in Malaysian Sign Language can be opened by clicking on it. The user can play, pause, adjust the speed from 0.25x to 2x, and watch it in full screen. Once completed, the dashboard will show the progress and mark the completed lessons with a check mark.

3.3 Results of User Testing on the MSL Mobile App

Fig. 5 shows that the user testing was conducted with 30 users, and the results showed high satisfaction. Fig. 5(a) shows that 66.7% of users are delighted with the app's overall functionality. Fig. 5(b) shows that 90% of users said the app ran smoothly without bugs. In addition, all users said they would recommend the app to others.



(a) **(b)**

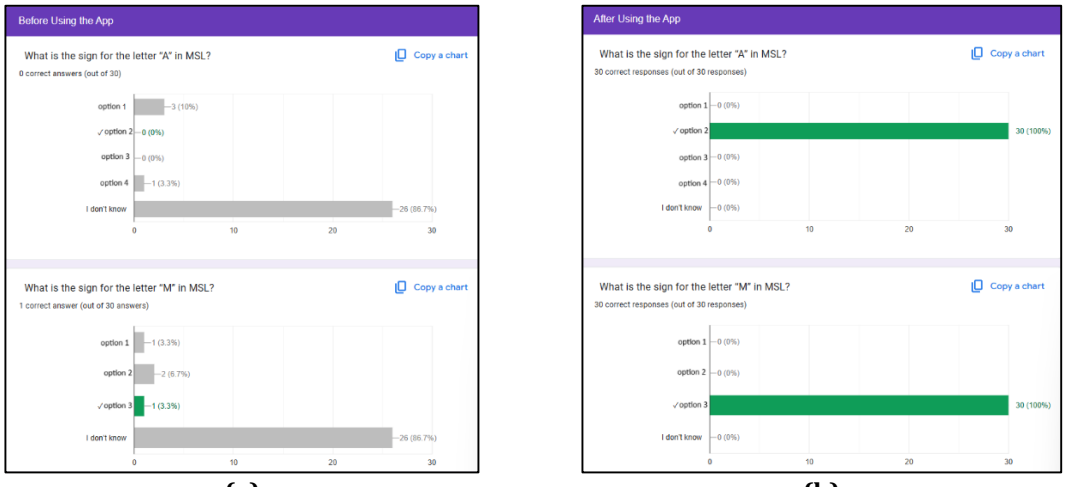
Fig. 5 *User's feedback (a) Survey on App signs faster than books and dictionaries, and (b) User Feedback on Application Performance and Stability*

Despite the positive feedback, some users also suggested improvements, such as offline access, multi-language support, and community features. These findings indicate that the app effectively meets user needs and has excellent potential as a tool for learning Malaysian Sign Language, while also identifying opportunities for further improvement.

3.4 Results from the evaluation before and after using mobile apps

This study evaluated the users' understanding of Malaysian Sign Language (MSL) before and after using a mobile application and promoted its effectiveness in inclusive education. The pre- and post-evaluation questionnaires were conducted using Google Forms and focused on the recognition of specific Malaysian Sign Language (MSL) alphabets, such as "A" and "M".

Most users had minimal knowledge of Malaysian Sign Language (MSL) before using the application. As shown in Fig. 6(a), when asked about the hand sign for the letter "A", 86.7% of the users answered "I don't know" and none of them answered correctly. For the letter "M", only one user chose the correct answer, while most users again admitted that they did not know. These results indicate that the users had no prior experience with Malaysian Sign Language (MSL), highlighting the need to develop accessible learning tools.



(a) **(b)**

Fig. 6 *Pre- and Post-Use Evaluation (a) Before using the Apps, and (b) After using the Apps*

After using the application, the users' performance improved significantly. As shown in Fig. 6(b), all 30 users correctly recognised the hand signs for these two letters. This indicates that the application improved users' ability to identify and recall MSL hand signs through visual and interactive content. The app effectively transforms a user from being clueless to one who can recognize the correct MSL gestures.

4. Conclusion

This work successfully developed a Malaysian Sign Language (MSL) application to assist the hearing and Deaf communities as a communication bridge. With target users aged between 18 and 24, the application utilises video tutorials, quizzes, and user-centric progress tracking from user feedback. In testing, this showed 90% consistency, 100% accessibility, and high user satisfaction. All study users would have recommended the app. Despite the success, enhancements such as offline mode, language options, and community features were suggested. The app's acceptance and performance reflect its potential for promoting MSL literacy. Public awareness must be raised further, and learning MSL must be incorporated into mainstream education nationwide.

This study evaluated the users' understanding of Malaysian Sign Language (MSL) before and after using a mobile application. Most users had little to no knowledge of MSL before using the application, as reflected in their inability to identify simple hand gestures such as "A" and "M". After using the application, all users showed significant improvement, being able to identify the correct hand gestures. The findings highlight the app's effectiveness as an educational tool, especially for beginners, supporting inclusive learning, and demonstrating the potential of interactive technologies in MSL education.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Lim Yun Chao, Zarina Tukiran;* ***data collection:*** *Lim Yun Chao;* ***analysis and interpretation of results:*** *Lim Yun Chao;* ***draft manuscript preparation:*** *Lim Yun Chao, Zarina Tukiran. All authors reviewed the results and approved the final version of the manuscript.*

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