

E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025



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DESIGN COMPETITION 2025

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SAPA: INTERACTIVE WEB APPLICATION FOR INCLUSIVE SIGN LANGUAGE LEARNING

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ABSTRACT

This study discusses the communication barriers faced by the general public and the deaf-mute community, which are often caused by limited understanding and access to sign language education. According to the World Health Organisation (WHO), over 360 million people worldwide experience hearing impairment, with approximately 34 millions of them being children. To address this challenge, we developed SaPa (Sign Language Literacy/Training Application), a web-based application designed to facilitate sign language learning for the general public. This application provides interactive lessons that allow users to independently learn and practice sign language. SaPa aims to promote inclusivity and improve communication between deaf and hearing individuals. Additionally, SaPa contributes to sustainable development by encouraging social inclusion and equal opportunities for individuals with hearing impairments. By providing accessible sign language education, SaPa plays a key role in creating a more inclusive society where everyone can communicate without barriers.

Keywords: sign language learning, education technology, language accessibility, inclusive communication

1. INTRODUCTION

Hearing and speaking are natural human abilities. Unfortunately, not everyone possesses these abilities, making communication with others challenging. According to the World Health Organisation (WHO), approximately 70 million people worldwide are deaf-mute. Additionally, around 360 million people suffer from hearing loss, including 32 million children. By 2050, it is estimated that one in four people will experience some degree of hearing loss.

One of the main challenges faced by the deaf-mute community is the difficulty in communicating with the general public. Common methods, such as lip-reading and sign language interpreters, have limitations. Lip-reading can be ineffective in certain situations, such as when wearing face masks. On the other hand, hiring sign language interpreters can be costly, with rates ranging from \$50 to \$70 per hour in places like New Jersey. Furthermore, learning sign language is not easy and requires time and professional training.

Therefore, two-way communication between deaf-mute individuals and the general public remains a challenge. This situation calls for greater attention from researchers in the fields of information systems and information technology to develop innovative and accessible solutions. One such solution is an educational application that facilitates the learning of sign language for the wider community.

South Asia leads the regions with a high percentage of people with disabling hearing loss and contributes 27 per cent to the total number; it is followed by East Asia, where 22 per cent of the hearing-impaired live.

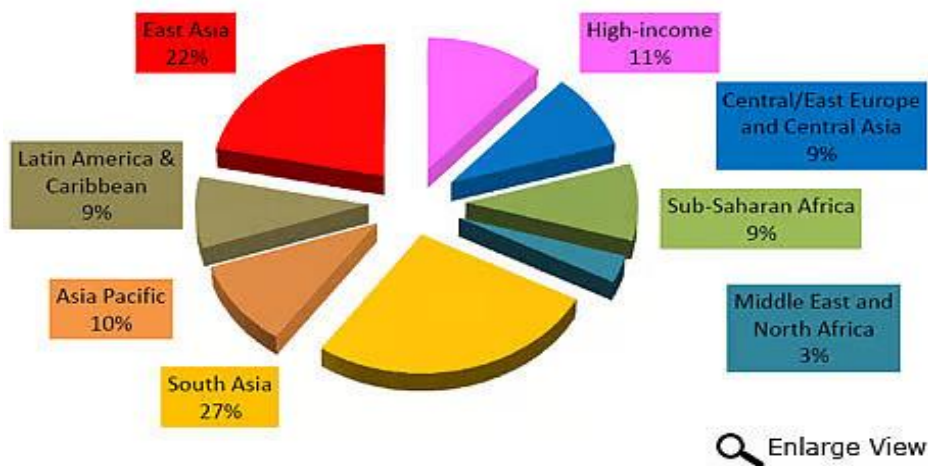


Figure 1 Disabling Hearing loss distributed in the world

2. METHODOLOGY

The writing method used in this project is literature study, which involves analysing relevant sources such as scientific journals, previous research findings, and web-based electronic media. The outcome of this planning stage is the design and development of an application called SaPa (*Sarana Aplikasi Pelatihan Literasi/Isyarat*), or Sign/Literacy Training Application Platform.

The application development follows the prototype model, a software development approach that begins with the creation of an initial application model. This model serves as a preliminary representation of the system, allowing both developers and users to better understand and identify the required features and functionalities. The prototype model consists of several stages, including requirement analysis, system planning, and application testing.



Figure 2 Prototype Model

3. FINDINGS

Recent studies in the ASEAN region have shown various technological innovations used to facilitate sign language learning for individuals without hearing impairments. In Indonesia, the use of technology in sign language learning applications has proven to enhance users' understanding. Research by Cabanillas-Carbonell et al. (2022) shows that technology-based applications help non-deaf users more easily memorize and execute sign language gestures by increasing visual engagement in the learning process.

In Malaysia, the integration of speech recognition technology with markerless AR, as developed by Sugeng et al. (2022), also shows promising results. This application allows people without hearing impairments to learn sign language interactively by converting speech into 3D sign language gestures. Additionally, gamification in sign language learning applications, as studied by Samsudin et al. (2020), has been implemented in several ASEAN countries, including Malaysia and the Philippines, to enhance the motivation of non-deaf individuals in learning sign language. The gaming elements in these applications make learning more enjoyable and encourage user engagement, especially for children and teenagers interested in learning sign language. Countries like Thailand and Vietnam have also developed applications to make it easier for the general public to learn sign language in a more flexible and independent way. These findings highlight the significant potential of technology in creating more inclusive learning solutions, allowing the general public in ASEAN to communicate more effectively with the deaf community and bridge the communication gap between the two.

4. CONCLUSION

The result of this research is the design of a system application named SaPa (*Sarana Aplikasi Pelatihan Literasi/Isyarat*), which aims to facilitate sign language learning and enhance communication between the deaf-mute community and the general public. This application is designed to provide an accessible platform for anyone who wishes to learn sign language through smartphones. SaPa features several key components, including interactive lessons, quizzes, video tutorials, and community forums, enabling users to learn and practice sign language independently.

SaPa is expected to assist the general public in better understanding sign language, thereby fostering improved communication with the deaf-mute community. By simplifying access to sign language education, SaPa contributes to creating a more inclusive society where everyone has equal opportunities to communicate without barriers. Furthermore, this application supports sustainable development by promoting social inclusion and equal opportunities for individuals with hearing impairments.

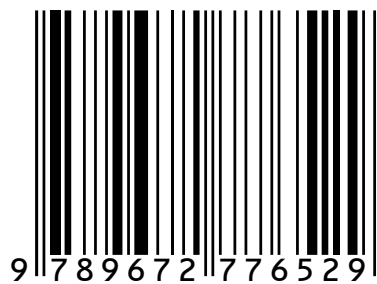
Historically, communication barriers between the deaf-mute community and the general public have often been due to a lack of understanding of sign language. Many people still perceive sign language as a difficult skill to learn. SaPa aims to change this perspective by providing a user-friendly platform that is accessible to everyone, regardless of hearing ability, thereby creating a more connected and inclusive society.

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