CHAPTER I
INTRODUCTION

A. Background

One of the most important processes in learning a language is vocabulary mastery. Understanding vocabulary is essential to listening, speaking, reading, and writing. Without a sufficient vocabulary and an effective strategy to acquire new vocabulary, learners struggle to maximize their English learning abilities (Hamer & Lely, 2019). However, learning vocabulary is rather challenging for deaf students due to the linguistic barriers. Deaf students have less chance of contact with the spoken language than regular students. Traditional methods of teaching English vocabulary, like reading and rote memorization, are uninteresting for many deaf students because these methods are not oriented toward their preferred ways of learning visually. Limited opportunities for exposure to spoken language and the complexities of English syntax make it difficult for many deaf students to understand the grammar and vocabulary of the language (Nugroho & Lintangsari, 2022).

Other challenges to teaching vocabulary to deaf students include pedagogical complications where tutors have limited experience with sign language. A majority of the teachers usually do not undergo any proper training or experience using sign language, and this can be a tremendous block when teaching deaf students (Yusuf et al., 2023). Sign language is not merely the putting together of gestures; it is well-structured, and its grammar and syntax are included. SLs are used by DHH people in daily communication (Núñez-Marcos et al., 2023). Teachers who are unfamiliar with it may hardly manage to convey some detailed information or understand the response of students, which might result in miscommunication during the process of learning. Teachers who are unfamiliar with it can barely handle the transmission of some detailed information or understand the answer of the students, which could result in the processes of learning.

The low motivation of deaf students to learn is another important issue faced by the English teachers. Motivation is one of the major factors that contribute to guaranteeing successful language learning. In the case of deaf students, communication and teaching media become the most affecting factors in motivation (Syukri & Humaera, 2019). The lack of customized lessons to meet the requirements for learning and a regular classroom environment do not have the necessary motivating factors to continuously sustain the deaf students' motivation. Therefore, strategies that ensure inclusion in such cases to bridge this gap include the use of visual aids, real-life contexts, and means of communication such as sign language.

Some research has been carried out to cope with problems arising in teaching vocabulary to deaf students. One of those is González-Reyes et al. (2021), who conducted research on the deaf students in 5th Chile. It is stated that the use of visual aids along with sign language to engage the learning process in the classroom is one of the most effective strategies for teaching deaf students. The use of sign language in teaching English to deaf students is important because it is not their first language. Hence, when deaf students learn English, they need several communication methods to help them communicate with their hearing peers in daily conversation (Indah & Chanastalia, 2018).

In addition, to overcome the problems faced by teachers in communicating with the deaf, assistive technology is offered. From the research by Yusuf et al., 2023 to 33 SLB teachers, it is known SLB teachers need assistive technology to support smooth communication between teachers and the deaf students during the learning process. Teachers are also recommended to participate in training and internships in other schools to improve their communication competence with deaf students. There are also some efforts that can be applied by the teachers to deal with the pedagogical challenges. Providing different English vocabulary in each meeting is one of those strategies. Additionally, it's worthwhile to try drilling for pupils' attention and employing images as media (Egy Prasetya et al., 2023).

Dealing with educational and language difficulties, motivation is another matter to consider. It is thought that motivated language learners have demonstrated greater perseverance and success (Vollmeyer & Rheinberg, 2000). The contribution of technology increases students' intrinsic motivation by making learning more personalized and interactive. It is also effective to integrate video into language learning to create a conducive learning atmosphere, motivate the students, build their discipline, encourage their activeness, and affect the average student's learning outcomes (Kholis & Kustiyono, 2020). The learners with hearing impairments at the Federal College of Education have a positive attitude toward using assistive technology (Daramola, 2022).

While the previous studies have explored the use of visual aids and technology in language learning, especially for students with hearing impairments, most of these have focused on general digital tools or teacher-created media without incorporating real-time sign language support. Yusuf et al. (2023) discovered that assistive technology is needed to support proper communication among teachers and the deaf students throughout the learning process. Yuniarti et al. (2024) and Ridha & Shehieb (2021) found that the lack of comparison with current assistive applications employed in teaching English to deaf learners revealed a need to carry out more research on assistive technology (Souza & Vieira, 2020) (Krsek, 2019). Future efforts should focus on exploring effective educational practices for deaf students (Silva & Cardoso, 2021).

This gap highlights the critical necessity for focused investigations that not only examine the possibilities of assistive technologies but also confirm their efficacy in aiding deaf students to develop essential English language skills. It is essential to tackle this gap to guarantee that deaf students can take advantage of inclusive, technology-enhanced educational methods that fit to their learning needs. This study specifically targets the vocabulary development of the deaf students using a contextual and accessible tool and evaluates both learning and student motivation. The integration of the ARCS

Motivation Model further adds a theoretical depth rarely applied in similar contexts. Therefore, this study contributes a novel perspective by bridging mobile sign language technology with structured motivational theory to enhance vocabulary learning among deaf students.

Research on **"Sign and Learn: Unlocking English Vocabulary for Deaf Students with the Pocket Sign Assistive Technology"** was conducted by the researcher to determine how well assistive technology works to educate deaf students English vocabulary. The researcher considered analyzing the improvement of vocabulary for early learners while observing their motivation. It involved the deaf students from grades 4, 5, and 6 of a special needs school, namely SLBN Lutang. It is one of the special needs schools that is located in Majene regency, West Sulawesi Province, Indonesia. The assistive technology applied in the research was Pocket Sign, a mobile phone application that enabled students to learn vocabulary through visual aids and sign language. The app made it more accessible as well as suitable for the needs of deaf students. Through this research, the researcher hoped to discover some useful findings that would help in understanding the role of technology in the process of language learning in deaf students and created the groundwork for further development in inclusive education.

B. Problem Statement and Research Questions

Teaching English vocabulary to deaf students is highly challenging in terms of linguistic, pedagogic, and motivation. The language difficulties lie in their inability to acquire new vocabulary and to understand the teacher's explanation because of the limited clues in communication. This is due to the fact that, in many cases, the sign language skills of the teachers are inadequate and teaching aids are unavailable or ineffective. This factor is further aggravated by a lack of interesting resources tailored to their needs and typically low motivation levels of deaf students, which make learning vocabulary even more challenging. To solve these problems, the researcher applied an assistive technology, namely the pocket sign. The research

assessed the effectiveness of the Pocket Sign in bridging these educational gaps, making learning more inclusive and fun for deaf students.

Aligning with the problem statement above, the researcher evolved two research questions as follows:

1. To what extent does the Pocket Sign app, as an assistive technology, support the vocabulary development of deaf students?
2. What is the design of teaching English vocabulary for deaf students using the Pocket Sign app as an assistive technology?
3. How is the motivation of deaf students to learn English vocabulary using the Pocket Sign app as an assistive technology?

C. Objectives of the Research

The research focused on the following primary objectives:

1. Determining the extent to which the Pocket Sign app as an assistive technology improves the vocabulary development among deaf students. This objective identifies whether or not applying the Pocket Sign app in teaching vocabulary offers a significant improvement in the vocabulary development of the deaf students.
2. Outlining the teaching design used in this study to teach English vocabulary to deaf students through the Pocket Sign app. This includes detailing the lesson structure, learning materials, teaching strategies, and activities implemented during the intervention. By presenting the design, this study provides a clear model that can guide English teachers in integrating assistive technology effectively into English language instruction for deaf learners.
3. Investigating the motivation of deaf students to study English vocabulary using the Pocket Sign app as an assistive technology. This is targeting to ascertain how the use of Pocket Sign impacts motivation and engagement in learning vocabulary.

   In this way, such objectives provide some useful information on the pedagogical and motivational values of the app Pocket Sign for further

understanding regarding using appropriate digital tools within the frame of inclusive education.

D. Significance of the Research

Theoretically, this study enhances existing knowledge regarding the instruction of English to deaf students, particularly in the areas of assistive technology and language learning. Exploring the use of the Pocket Sign app contributes to the growing body of evidence regarding assistive technologies for deaf students by assessing its effectiveness in facilitating vocabulary learning. The study will fill the existing gap in the literature regarding the use of technology in teaching English to young deaf learners. It will provide a structured framework for the teaching methods that integrate the visual, interactive, and sign language-based. The results can act as a valuable reference for studies in the future focused on exploring innovative approaches to inclusive education.

The results of the study hold significant practical implications as well. The study will address the pressing need for effective teaching resources in the education of deaf students. This indicates the high-performance outcomes of combining assistive technology with visual and interactive teaching approaches, maximally enhancing instruction quality and communication in deaf learners. This Pocket Sign app is meant to assist students who are hearing impaired in overcoming learning difficulties through new vocabulary learning methods aided by assistive technology. Pocket Sign will make learning more engaging, accessible, and visual. The effect of the application in terms of students' engagement will also be observed because motivation is considered one key factor in sustaining learning and retention.

The research will also benefit the school and policymakers in the education sector significantly. The results form an evidence-based foundation for the integration of assistive technology into the curriculum of students with special needs in deaf education programs. This initiative

aims to create an inclusive educational environment that advances equal opportunities for the development of language skills and academic accomplishment among deaf students for years to come. On the other hand, the exact measure of the impact that the app has on motivation may inform the future of educational technology developments targeted toward the learning of deaf students. The findings can help makers of assistive technologies like the Pocket Sign app as they fine-tune and improve the features of the empirical data-grounded assistive learning tools to meet educational objectives.

E. Scope of the Research

This research explores the efficiency and motivational effects the Pocket Sign app has as an assistive technology in helping the students with hearing impairments at the center acquire vocabulary items in a specific educational context. The subjects of the study are the deaf students in grades 4, 5, and 6 of the special needs school, SLB Negeri Lutang, located in Majene regency, West Sulawesi province, Indonesia. This cover measuring the performance of the deaf students before and after the use of Pocket Sign in their vocabulary classes. During the learning process, the researcher will note the motivational results emerging from the use of Pocket Sign. This research has, therefore, been limited to the special needs school (SLB) Negeri Lutang and may not account for possible changes in the nature of instructional styles or resources at other schools. However, the scope ensures the research retains its prime focus on the impacts the Pocket Sign app will have while assessing the sample group under study in a well-defined manner, therefore making valued contributions toward the conduct of similar educations.

CHAPTER II
REVIEW OF RELATED LITERATURE

A. Previous Related Studies

1. Challenges in teaching deaf students

Teaching deaf students presents unique challenges that require specialized approaches, resources, and skills. Some researchers have conducted research regarding the challenges that teachers have to face in teaching deaf students. Mumba et al. (2022) used a qualitative approach and a case study research design to look into what teachers and students in certain schools in Zambia perceive about the things that affect the academic performance of students with hearing impairments. The sample consisted of 22 respondents. Ten of them were students with hearing impairments, and the rest were ten teachers who teach these students and two principals.

The findings showed that using sign language as the primary method of communication seriously hindered the smooth transfer of knowledge and skills in the classroom. Various problems were encountered by children with hearing impairments, which influenced their performance. Problems such as attitude toward school work, pre-academic skill inadequacies, and resource issues are faced. These challenges not only affected the students' academic achievements but also impacted their social interactions and overall confidence. The use of complicated nature of school curricula and incorrect methods of teaching and assessment is made. These issues, in addition to teachers' faulty training in the use of sign language as a medium of instruction, have negatively impacted the results for pupils with hearing impairments in their learning and social experiences at schools.

Ristiani (2018) exposed several problems the teachers faced while teaching English to students with deafness. Some of these problems were

getting students' attention and understanding some words from lip-reading. The teachers also find difficulties in providing definitions and examples, explanations of the usage of the same words in different contexts, and introducing materials that would relate to students' background knowledge. These challenges will require several strategies that include encouraging students to prepare their own dictionaries, the use of alphabetic signs, and attracting students through pats on shoulders or waving hands. This also requires an appropriate teaching model and a suitably qualified teacher who has the ability to be flexible and resourceful in teaching English to deaf students.

Prasetya et al. (2023) performed a study to identify the challenges encountered by non-special education licensed English teachers in instructing deaf pupils in English vocabulary, as well as the solutions employed by these educators to mitigate such challenges. This research employed a qualitative methodology utilizing a case study design. The data were gathered based on interviews and observations of one non-special education certified English teacher who teaches Grade X at SMALB-B Dharma Asih Pontianak. The results have shown some issues emerging in the process of teaching vocabulary to deaf students, such as students misunderstanding some words because the lip movements by the teacher appear to be the same and an apparent loss of focus in action-oriented activities in a lesson. Also, the students have problems in expressing word meanings and come across problems in pronunciation, comprehension, and retaining vocabulary in English. Further, the teacher's low sign language skills and the need for frequent repetitions aggravate these problems.

2. Strategies in teaching English for deaf students

Teaching English language to deaf students presents both unique challenges and tremendous opportunities for the teacher. If the teachers understand the special needs and communicative preferences of the deaf

students correctly, then the teacher can develop a supportive and inclusive classroom atmosphere. A crucial approach is using visual aids and technology resources in teaching for effective communication and enhanced understanding. Yasin & Mohamad (2024) have reviewed the literature related to the effectiveness of visual aids in learning English vocabulary among hearing-impaired students. This review explains the important role that visual aids play in helping children's understanding, strengthening memorization and cognitive skills, and increasing active participation. The review focuses on their utility in improving contextual understanding and learning outcomes and their use in combination with sign language for students with hearing loss.

This study also investigates the problems of the deaf students themselves. Learning a foreign language like English is challenging because they have very limited access to it and the complexity surrounding abstract concepts. Conclusions from this study stress the need for collaborative efforts to develop accurate and culturally relevant visual materials between ESL teachers and sign language experts. The final comments of the review emphasize the importance of context-based, experience-dependent knowledge and multisensory methods in responding to the diverse educational needs of deaf students. In simple words, the key to teaching English to deaf students effectively lies in a supportive and inclusive classroom atmosphere, valuing diversity and building in strategies that address divergent learning styles.

Heriyanti et al. (2023) conducted a study on the teaching strategies employed by teachers in English education at SMPLB Kota Sorong to find what strategies the English teachers used to teach the deaf students. The researchers implemented a descriptive qualitative research method. The researcher chose 8 deaf students through total sampling. The researcher identified two main strategies applied in the teaching of English to the deaf students: repetition and visualization strategies. The implementation of these strategies would be in the education environment

of the deaf students to enhance the learning of English. Otherwise, if the deaf students did not have an independent learning ability, the teacher would adjust to the individual situation and capacity of the students. This strategy enabled the teacher to direct and control the content learned to expand the comprehension of the students. Students who are deaf and learn mainly through their vision could benefit considerably from visual media or natural objects in their effort to acquire a new language, English.

Takriyanti et al. (2022) performed the literature review on teaching English for students with special needs, based on their types. There were 16 data points analyzed through a narrative method. The results of the analysis uncovered various strategies used by teachers tailored to the students' needs. Especially for students with hearing impairments, it is said that teachers also used visualization techniques, explained the texts being discussed, and applied strategies to teach students the meanings of the vocabulary through flashcards, images, and visual aids. These techniques helped in learning and made students get more involved with the content. Consequently, the levels of comprehension increased tremendously, thereby creating a more exciting and interactive learning atmosphere.

Moreover, the teachers urged the students to participate in coloring, changed the class environment, and utilized word-defining strategies by making it mandatory to use dictionaries and computer dictionary software. The learning process was enjoyable with the use of the supplementary methods used, and at the same time, students were actively participating in learning. Through the integration of creative activities with technology, the classroom turned out to be a motivating atmosphere for students to develop their vocabulary skills. Furthermore, they use spelling strategies with the help of alphabetic symbols, and, to get attention, taps on the back are given to students during instructions in English, especially designed for the hearing impaired. Such an interactive approach created an environment of inclusiveness and participation, thus

ensuring that all children, regardless of their learning needs, could fully participate in the activities.

A study by Gülengül Birinci & Sariçoban (2021) found out that teaching English vocabulary to deaf learners is more effective when the media and images are used rather than when only signs are used. In the same manner, Subasno et al. (2021) were also able to reach the conclusion that the multiplex learning method, which employs the use of picture language, sign language, printed words, written language, and spoken language, is also useful in enhancing the vocabulary mastery of deaf children. Furthermore, Hamdy Hassan & Neves (2019) examine the effect of enriched subtitling (ES) in a Total Communication (TC) context on vocabulary learning by deaf and hearing-impaired learners. The outcome displayed that the ES class was able to retain vocabulary knowledge more than any other group, making it supportive of the theory that ES, if properly embedded, can assist in the vocabulary learning by deaf students.

3. The use of information and communication technology (ICT) in teaching deaf students

The examined studies by Kalashnikov Izhevsk State Technical University et al. (2023) found that online learning for Deaf and Hard of Hearing (DHH) students has unique needs: effective communication and support, visual information presentation, and assistance with self-directed learning skills. Moreover, the DHH students face post-task exhaustion and have individual differences pertaining to preferences. Such challenges in online instruction for the DHH have been met by the use of asynchronous discussions, gamification, micro-learning, 3D models, and augmented reality.

Hameed (2007) reports having interviewed 31 hearing-impaired students in Lahore, Pakistan, concerning the application of ICT tools in the area. The insights of this study showed some degree of ICT reception among the deaf students in Pakistan, although the curriculum integration

is minimal. It was possible to communicate with hearing people through the medium of ICT dealt with without English being a constraint. Deaf students were described as responsible users of ICT who were not gaining exposure to elements of culture that were undesirable. On the other hand, the deaf communities' needs are still largely ignored by mainstream ICT providers, indicating a potential market that is yet to be tapped.

Based on the literature reviews by Atika et al. (2018), Science, Technology, and Society (STS) instruction is beneficial in improving the achievement of learners in five major STS areas. It talked about STS instruction as a remedy for poor science learning by providing an authentic context. STS instruction contributes towards the development of critical thinking skills in hearing students, positive attitudes towards science, and interest in the science profession. The study also recommends additional studies to ascertain DHH students' experiences with STS in science learning. At last, Zafar et al. (2021) applied avatar technology in English and science teaching to deaf children. The study noted that avatars allow for more accurate, efficient, and cost-effective teaching of language elements, ultimately reducing the workload for teachers.

B. Some Pertinent Ideas

1. Deafness

According to the World Health Organization (WHO), firstly, hearing loss is a reduced ability to hear sounds within the normal threshold of 20 dB or better. This may be in a range from mild to profound and might affect one or both ears, potentially making it difficult for a person to understand speech or perceive loud sounds. Secondly, "hard of hearing" refers to people with mild to severe hard of hearing. These individuals primarily use spoken language but may also utilize assistive devices such as hearing aids, cochlear implants, or captioning.

Thirdly, the term "deafness" may well reflect very hard of hearing or profoundly hard of hearing. It is crucial to detect hearing loss early in life, as it would allow a person to receive the required help.

Deafness is an etiologically heterogeneous trait with many known genetic and environmental causes (Nance, 2003). Hereditary causes account for a large percentage of hearing loss. Most frequently, genetic causes of hearing loss are attributed to malformations of the inner ear, given that this trait has been passed down from parents to children. Genetic disorders could also be a potential reason that occurs due to mutations at the time of conception when the sperm of a father combines with the egg of the mother. Various genetic disorders are known to be associated with hearing loss; for example, there is osteogenesis imperfecta, Trisomy 13, also known as Patau syndrome, and Treacher-Collins syndrome.

Prenatal exposure to certain diseases can also lead to hearing impairment. For instance, a child who has been exposed to rubella, influenza, or mumps in utero may be born deaf or with hearing problems. Other prenatal causes include exposure to methyl mercury and medications such as quinine. Yet another cause of hearing loss is noise. The sensitive mechanisms of the ear, however, can be impaired by long-term exposure to loud noises through gunfire, firecrackers, explosions, or even rock concerts. In this regard, people who work or indulge in activities that surround them with noise have a greater risk. An easy rule of thumb is to know that if you have to raise your voice to talk to someone nearby, the noise is likely well within the range of being potentially damaging. Protection through earmuffs or earplugs reduces this risk.

Trauma can also lead to hearing loss. Samples include perforation of the eardrum, fractures of the skull bones, and a sudden change in air pressure, or barotrauma. There are several diseases that can cause hearing impairment, including meningitis, mumps, cytomegalovirus, and chicken

pox. Very severe jaundice has been known to cause hearing loss. Some of the more uncommon causes are Meniere's disease and toxic chemicals. These factors, although diverse, equally indicate the need to understand and address the numerous causes of deafness as ways to better cope with and reduce hearing loss.

WHO-proposed grades of hearing impairment and presumed functional consequences as follows:

a. No impairment—better than 20 dB. There are no or very slight hearing problems.
b. Mild (20–34 dB). No problems in quiet, but may have real difficulty following conversation in noise.
c. Moderate (35–49 dB). May have difficulty in quiet hearing a normal voice and has difficulty with conversation in noise.
d. Moderately severe (50–64 dB). Needs loud speech to hear in quiet and has great difficulty in noise.
e. Severe, (65–79 dB). In quiet, one can hear loud speech directly in one’s ear and, in noise, has very great difficulty.
f. Profound impairment (80–94 dB). Unable to hear and understand even a shouted voice, whether in quiet or noise.

As it is explained, deafness can vary in degree, from partial hearing loss to complete deafness. In the context of SLBN Lutang, the school where the research will be conducted, deaf students are not classified by their types of deafness. Whether they are mild or profound, they will be clustered in the same grade due to the same age. The deaf students are admitted based on evaluation, which might be formal or informal.

Parents registering their children at the school are supposed to bring formal evaluations, such as medical records. This will serve as proof of their child's hearing impairment. However, there are some cases in which parents are not able to bring the document. They utter informal evaluation by expressing their child’s inability to hear or speak. Some of them also explain when and why this happened to their child.

The admission process is quite flexible but systematic. It ensures that all deaf students receive the education that meets their needs, regardless of their background or access to medical verification. In case there is no medical record, the school teachers conduct an assessment to validate the parents' information. The teachers usually involve simple observation in the process of the assessment, such as calling the children or whispering in their ears. If there is no response, they will be considered as deaf and accepted into the school.

2. Communication methods for deaf individuals

Hearing loss significantly influences communication. Learning of spoken language may be limited in most deaf people, especially those who are profoundly deaf, unless interventions of hearing aids, cochlear implants, or the use of sign language are used. Such conditions may give rise to difficulties in language learning and growth, literacy, and attainment in school education, especially within environments of spoken and written language prominence. Consequently, deaf students may have barriers to accessing education in those subjects reliant on phonological skills, including English. Here are some types of communication commonly used in deaf culture.

a. Sign language

Sign language is the major way of communication for people who are deaf. It becomes a primary method to express thoughts, feelings, and ideas (Varghese et al., 2021). This language, in itself, is a fully developed visual mode of communication that makes use of handshapes, facial expressions, body movements, and gestures in order to convey meaning. Whereas spoken languages rely on auditory input, sign languages are purely visual and, hence, uniquely addressed to the needs of deaf individuals. Sign languages are natural languages with their grammatical rules, syntax, and vocabulary independent of

the spoken languages used in the same geographic regions (Sandler & Lillo-Martin, 2003).

Sign languages are not universal; each developed in context to the deaf history and identity of the respective deaf community they belong to. For example, although English is the official language in both countries, American and British Sign Language bear much difference from each other (Martinez Del Rio et al., 2022). There are two sign languages widely used in Indonesia: SIBI (Sistem Isyarat Bahasa Indonesia) and BISINDO (Bahasa Isyarat Indonesia). SIBI is a borrowing from American Sign Language, now adopted and used in the context of special education schools—SLB (Aditama et al., 2021). The Indonesian government instituted this system, which is a standardized system developed to conform to the spoken form of Indonesian, known as Bahasa Indonesia.

In contrast, BISINDO is a sign language that has developed naturally among the Deaf people in Indonesia. Unlike SIBI, BISINDO is free from the spoken Indonesian grammatical constraints, allowing a much more authentic representation of the linguistic and cultural behaviors of its users (Aljabar & Suharjito, 2020). From this point, BISINDO often becomes the preferable channel of communication in both informal and formal settings in daily life within the Deaf community, since it is much closer to them in terms of experience and needs. Despite considerable support from the local community, BISINDO has not yet been granted the status of standard language for use in schools by government authorities. This creates an ongoing debate between the formal and community practices regarding which one of these two systems is best suited to cater to the needs of the deaf community in Indonesia.

In educational contexts, sign language is an important medium of instruction for developing a better learning environment for students with deafness. This approach encourages comprehension and

dialogue among students in the classroom, thereby creating greater accessibility in assimilating the knowledge being instilled. Most teachers encourage a bilingual-bicultural model, provided with the term Bi-Bi, whereby a deaf or hard-of-hearing child becomes fluent in sign language as well as the written form of a spoken language, such as English (Siran & Dettman, 2018). This approach not only promotes academic development but also provides a strong first culture for the deaf students.

b. Lip reading (speech-reading)

Lip reading is the observing of movement of lips as well as other facial and body movements to understand languages (Indah & Chanastalia, 2018). Although lip reading serves a considerable function, it's not entirely reliable since most phonemes are quite similar on the lips, so contextual information is needed in order to provide the missing pieces of information. For example, the sounds of "pat" and "bat" look almost identical, thus making accurate interpretation difficult without additional context.

c. Cued speech

Cued speech is a visual communication system that provides a set of handshapes and locations near the face to represent phonemes, the smallest units of sound in the spoken language (Bayard et al., 2014). The main goal of the system is to augment lip reading, which can be challenging due to the similar visual appearances of some sounds when spoken. This system focuses on enhancing literacy skills while developing phonemic awareness among the deaf.

d. Fingerspelling

Fingerspelling is an important component of sign languages in which handshapes are made to symbolize letters of the alphabet (Alzahrani, 2022b). Fingerspelling' is predominant in spelling out names, specific words, and terms for which signs do not exist. For

Deaf people, fingerspelling can serve as a bridge between sign language and written English (Tanzer, 2024).

e. Gestures and visual communication

Besides the regular sign systems, there are also gestures and nonverbal communication that are widely used, relatively speaking. Universally accepted movements and corporal expression are made use of in these methods in order to depict meaning, which makes them highly successful in informal or intercultural situations. Categories of gestures include pointing, change in body orientation—left-right stepping while standing and left-right positioning while seated—change in gaze direction, and change in facial expression" (Slettebakk Berge, 2023).

f. Written communication

Writing is a direct and widely available form of communication that overcomes the language barriers. The commonality of written communication has had a positive effect on the desire to create community. For many Deaf people, text-based tools like notebooks, online communication tools, or cell phone apps provide a way of participating where other forms may be less practical (Kožuh et al., 2016).

3. Assistive technology for deaf individuals

Assistive technology refers to any device, tool, equipment, or system that is designed to support individuals with disabilities. Assistive technologies (ATs) promote participation and inclusion in society and support access to health, social services, education, work, and other important life experiences for persons with disabilities, older people, and those with chronic conditions (Smith et al., 2024). According to Rodríguez-Correa et al. (2023), assistive technology is an essential device not only in meeting the communication needs of deaf learners but also in enhancing their learning. Technologies of this nature enable relatively the

deaf autistic learners to receive quality education in an inclusive environment where they are self-sufficient and confident (Alzahrani, 2022). Since technology allows deaf students many ways of communicating as well as learning, it enables them to engage actively within the context of academic situations and realize their highest potential (Aline Da Cruz Porto Silva & Aloísio S. Nascimento Filho, 2024). The capacity of technology to revolutionize the educational experience of deaf people appears to be very broad.

There is also assistive technology, which has been developed as a means of communication for deaf people. Some of them are:

a. Real-time captioning

Real-time captioning systems convert spoken words to text that is displayed on the screen, enabling deaf people to participate in conversations, lectures, or even watch a program. Real-time captioning is a useful technique for deaf and hard-of-hearing (DHH) people to talk to hearing people. With the improvement in device performance and the accuracy of automatic speech recognition (ASR), real-time captioning is becoming an important tool for helping DHH people in their daily lives (Suzuki et al., 2022). Real-time captioning that is comfortable to use, maintains nonverbal communication, and prevents incorrect recognition is necessary to achieve higher-quality communication and overcome the limitations of mobile and augmented-reality devices (Yamamoto et al., 2021).

b. Speech-to-text applications

It is a mobile and desktop tool that converts spoken language into written text in real time. This application speech-to-text based on PowerPoint has an impact on increasing comprehension of students with hearing impairments on inclusive education courses (Irdamurni et al., 2020). Teachers can rely on STT applications, as the pronunciation assessment

of these applications was found to be consistent with the pronunciation evaluation by human raters (Hirai & Kovalyova, 2023).

c. Video Relay Services (VRS)

It allows users to communicate via sign language interpreters over video calls. The VRS facilitates calls between a person using signed language via a videophone and a person who is speaking via a telephone. An interpreter handles the calls and simultaneously interprets between the users and has direct contact with both users (Warnicke & Plejert, 2021) (Warnicke & Plejert, 2012). The main features include immediate communication that promotes natural and smooth conversation, visual interaction through videophones or other terminal equipment that incorporates video, and availability of various services such as customer support and emergency calls. This service allows users greater independence and promotes inclusiveness in that it greatly reduces the communication gap between the deaf and hearing communities. On the downside, it requires a good internet connection and sometimes varies in availability depending on the region.

d. Cochlear implants and hearing aids

Cochlear implants and hearing aids can help some people, depending on how much they can hear. A cochlear implant is an electronic device that is surgically implanted in the skull with the intention of providing a sense of sound for those who are profoundly or severally deaf as a result of damage to their inner ear structures (Naples & Ruckenstein, 2020). Unlike hearing aids, cochlear implants bypass damaged parts of the ear and stimulate the auditory nerve directly. However, it is crucial that guidelines for cochlear implant assessments should maintain flexibility and consider the

developmental gains of a child (i.e., monthly gains in speech, language, and hearing abilities) and the improvement of quality of life afforded with well-fitted hearing aids (Warner-Czyz et al., 2022).

In contrast, hearing aids are non-implanted, non-invasive sound-amplifying devices intended to louden speech, thus making it more comprehensible for listeners with mild to severe hearing loss. They are most effective for individuals who still have some residual hearing (Lelic et al., 2024) (Lansbergen et al., 2023). There is substantial improvement in the listening skills of participants with hearing aids as compared to those without, with children in the moderately severe category of hearing loss benefiting the most from hearing devices (Saqulain et al., 2024). Cochlear implants and hearing aids can facilitate better communication by people with hearing problems, hence improving their lives. The choice between them depends on the kind and level of the hearing loss, besides other personal and medical factors.

e. Sign Language Application

Sign language applications are software solutions designed for instruction, studying, or communicating with the help of sign language. These apps are highly beneficial to deaf and hard-of-hearing people, their families, teachers, and anyone interested in sign language (Khan et al., 2021). They incorporate apps that facilitate learning of languages and real-time translation tools that make sign language more accessible and promote inclusivity. In educational settings, sign language apps can be used in classrooms to support acquiring knowledge, practicing with words, and enhancing communication. Such apps can also be used by teachers in

learning simple signs to improve communication with deaf students (Ranganathan et al., 2019).

Sign language technology seeks to establish clear and fair methods of proving whether the apps work for the different users. The rules generated by the method help developers, teachers, and clients choose and design excellent sign language mobile applications. Teachers can refer to the criteria as a checklist in the assessment and selection of apps that align with their teaching objectives and also meet the diverse learning needs of their students (David, 2023). The criteria encompass several aspects, such as the app's functionality, user-friendliness, accessibility, and its effectiveness in teaching (David et al., 2024). Examples of sign language applications include Lingvano, Pocket Sign, ASL Bloom, Hand Talk, and Intersign, among others available on the Play Store.

4. Pocket Sign application

Pocket Sign is an interactive mobile application designed to teach sign language through engaging and accessible features. Through intuitive interactive lessons, this tool will help users learn more about each of the signs that are useful for ASL signers all over the world (*Sign Languange ASL Pocket Sign*, 2024). It is designed for hearing people and the hard of hearing who want to communicate more easily with the deaf community or learn sign language. Pocket Sign facilitates sign learning in a simple and effective manner using its e-platform; hence, it is an important tool for education as well as communication.

Pocket Sign app developed a very simple and intuitive interface, making it a user-friendly tool for both students and teachers. The app is beautifully laid out: it contains intuitive navigation tabs and lively, colorful icons that put every action straight to the point. Among other things, features like flashcards, sign words, sign sentences, and camera

sign practice are distinguishable for users and are also organized logically in the app. For students, the Pocket Sign app provides visual support with big, colorful images and text, which would be especially beneficial for young deaf students. The features are interactive, like that of practicing signs using the cameras, so it makes the users feel interested, thus boosting sharing and engagement.

For teachers, the app offers tools that will enable them to monitor progress and to adjust the teaching process. With this simple design, teachers of all levels would easily access the app, even if they are not excellent at technology. They would be able to teach their students how to use the app without having the students undergo lengthy training, which means it can easily fit into the classroom setting. Overall, the Pocket Sign user-friendly interface makes it very well suited to getting integrated into an educational environment for both deaf students and teachers. This user-friendliness indeed increases the efficacy of the intervention and diminishes the barriers that could hinder learning.

Pocket Sign includes several features that make it a powerful educational tool:

a. **Interactive learning modules:** The software provides structured lessons for learning how to sign specific words or phrases. Users can choose the module topic or difficulty level—and an individual makes a personalized choice. These lesson units are topically designed and organized based on common academic words, greetings, or terminology, as shown in figure II-1.



Figure II- 1 Pocket Sign lessons

b. **Sign language video demonstrations:** Each module provide videos of high quality show each sign in a clear and succinct manner, allowing the student to examine the proper hand forms, facial expressions, and movements (see figure II-2).



Figure II- 2 Video demonstration in Pocket Sign

c. **Gamified quizzes:** gamified quizeez are available in every learning module. The software uses gamification concepts to increase learning, measure knowledge, and engage users (see figure II-3).

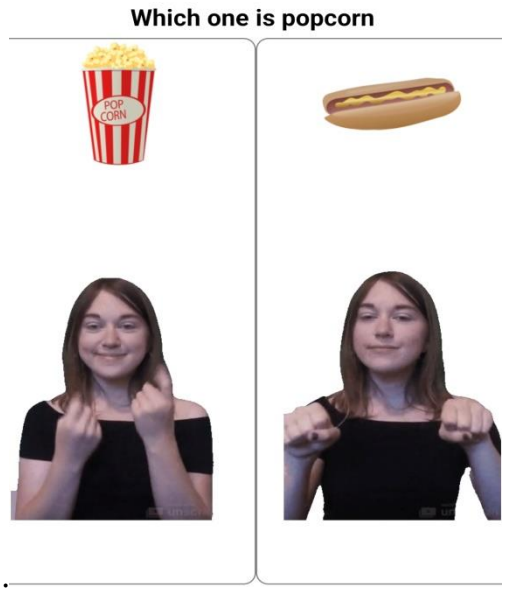


Figure II- 3 A gamified quiz in Pocket Sign

d. **Sign vocabulary dictionary**: This dictionary provides quick access to a large collection of signs, making it easy to find words as needed; see figure II-4.

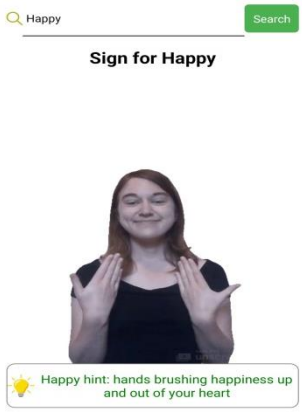


Figure II- 4 Looking up “happy” in the dictionary

e. **ASL alphabet:** Similar to the SIBI alphabet, this is a 26-handed method for representing the letters of the English alphabet. This manual communication, often known as fingerspelling, is used to spell proper names, technical terms, and words for which no conventional signs have yet been developed. Each letter has its

own unique configuration, allowing phrases to be spelled out clearly and precisely; see figure II-5.



Figure II- 5 ASL alphabet in Pocket Sign

f. **The "study" tool:** It includes 4 choices, namely flashcards, sign words, sentences, and camera sign practice. First, flashcards in Pocket Sign help users memorize signs and their meanings. Each flashcard will have a picture of a sign with the associated English word or phrase normally. In this way, the user will be able to see the signs better and understand their meanings. This is very handy for vocabulary building and gives one the capability to practice and reinforce what they have learned over and over again (see figure II-6).



Figure II- 6 The flash cards in Pocket Sign

The second is the sign words feature. It explores single words and their signs. Users browse through a list of common words that have either videos or animated directions showing the hand movements. This is partly to show how much vocabulary the users have learned; see figure II-7.



Figure II- 7 Sign words in Pocket Sign

The third is sign sentences, this feature takes it a step further than single words by showing users how to make and understand full sentences in sign language. Users can learn the proper ordering of words and the rules of grammar in sign language through

demonstrations. It is very helpful for people who want to communicate better and more clearly, not just learn separate signs (see figure II-8).



Figure II- 8 Sign sentences in Pocket Sign

The last is camera sign practice. It is a fun tool; using the smartphone's camera, it checks how well someone is signing. It asks users to sign certain words or phrases and then provides feedback via smart technology on how accurate they are. Such practice helps users improve their signing movements, ensuring that their signs are correct and simple to understand (see figure II-9).



Figure II- 9 Camera sign picture in Pocket Sign

All of Pocket Sign's characteristics make it ideal for deaf students to learn vocabulary in English. Visual learning is the major mode of instruction for deaf pupils, and Pocket Sign's video demos are appropriate for this. They enable pupils to readily connect the English word through its sign to the English word displayed in letters based on their mental images of the letters that comprise the word and its sign, respectively. Pocket Sign not only improves deaf pupils' sign language skills, but it also helps them learn English vocabulary. This takes advantage of both benefits: compensating for their primary language and providing a technique to use formal, written English efficiently, enhancing their literacy level and comprehension.

Furthermore, the app allows users to control their learning by going as fast or slow as they choose, making it ideal for self-study. This concept allows all students, regardless of ability or learning rate, to gain equally. The gamified elements and interactive quizzes make learning simpler and more entertaining. When students love the educational process, they are more likely to stay in the system and remember what they have learned. Every user, including teachers, friends, and parents, who want to interact with a hearing-impaired individual, can justify using the Pocket Sign application because it provides sign language and English vocabulary to all.

5. Vocabulary

The vocabulary contributes to each language significantly. In English, it forms the critical foundation for communication in the language: it is the words and expressions used to convey meaning in the oral, written, and signed modes (Muang-Aun, 2023). A strong vocabulary assists students in cognitive processing and learning; it lays a foundation for different language-related skills, including reading, writing, speaking, and listening (Teng, 2023). A strong vocabulary is very important to

being proficient in any language, as it will enable one to express themselves, understand others, and function with ease in the academic, social, and professional spheres (Ramzan, 2023).

Hiebert & Kamil (2005) enumerate vocabulary into specific types, telling of its intricate function in both language learning and understanding. These include oral vocabulary, print vocabulary, receptive vocabulary, and productive vocabulary—how individuals encounter words in different contexts and through different media, spoken and written. Each differs in purpose in communication and development of literacy; hence, it forms an integral part of language instruction. Each of those will be explained as follows:

a. Oral vocabulary; it includes those words that a person knows and uses in oral language; it forms the foundation of speaking ability and listening comprehension. These are the words one comes across in day-to-day talk, stories, and even sounds. The advancement of oral vocabulary is of significance to the learners, especially to the second language students and to those whose mother tongue has a language barrier, while communication is concerned effectively.
b. Print vocabulary; the same concepts in the opposite sense apply to ‘print vocabulary,’ wherein the labeled array is known and used by individuals when reading and/or writing. Further, this classification can be divided into reading vocabulary, which is the stock of words that a reader encounters in printed texts, and writing vocabulary, which is the set of words used in writing. Print literacy is the cornerstone of literacy, as it enables people to read print and write their own ideas down on paper. In addition, print literacy complements oral literacy, hence bridging both oral and written communication.
c. Receptive vocabulary; it is the vocabulary that a person understands when heard or seen, but that is not necessarily used

by that person in any form of speech or writing. Receptive vocabulary is the vocabulary that one understands when they hear or see it, but it doesn't necessarily mean that those words are used in their spoken or written speech. Typically, a person's receptive vocabulary is larger than their expressive vocabulary because it includes words that are recognized but not actively used. This category is needed in the process of understanding information, mainly in tasks in reading and listening, since it gives the basis for the interpretation of meaning without applying the vocabulary straight away.

d. Productive vocabulary; it is also called expressive vocabulary. On the other hand, it is the kind of vocabulary that people actively use in both oral and written production. Such choices manifest words used for expressing thoughts, opinions, and feelings. The extent of productive vocabulary represents the ability of an individual to go beyond just mere understanding and express words in communicative situations. Improvement in this aspect of vocabulary is crucial for becoming fluent and articulate in expression.

Vocabulary knowledge is essential for one to understand instructions, read and engage with instructional materials, and participate in classroom discussions. The possession of relevant lexical items enables the students to communicate their thoughts, needs, and feelings more effectively. This understanding of language creates a bridge between sign language as their first language and the written form of the English language. A well-built vocabulary facilitates interaction amongst the hearing impaired students and their fellows in educational institutions. The use of visual communication devices, for example, children’s picture books and signing, enhances comprehension of words with their meanings (Yasin & Mohamad, 2024). Providing students with appropriate devices and methods for developing vocabulary—through the

use of assistive devices like Pocket Sign for the purpose of learning—enables them to self-extend their vocabulary all through their lives.

The focus of the research is on print vocabulary and receptive vocabulary. It aligns closely with the implementation of the Pocket Sign application as well as the students' need. Print vocabulary is specifically relevant because the app provides visually accessible written words through flashcards, allowing students to connect text with its corresponding meaning as well as the sign language. This approach caters to the students' reliance on visual learning, the main characteristic of deaf learners. Additionally, the app's visual nature supports the development of receptive vocabulary. It is because the students are exposed to sign language demonstrations and imagery that help them understand and internalize new vocabulary.

These types of vocabulary become the focus due to the reasonable explanations. First, oral vocabulary is less applicable, as deaf students primarily communicate using sign language rather than speech. Second, the app's interactive features—such as the use of sign videos and flashcards—create an ideal environment for strengthening recognition and understanding and associating written words with their meanings. Finally, focusing on these types is related to the goal of building foundational language skills that can later support productive vocabulary development in signing or writing.

6. Motivation

In some studies, motivation is considered a pivotal variable for students in the learning process. The learning outcome that will be achieved is directly proportional to the motivation the person has (Wardani et al., 2020). Motivation plays an important role and can augment the efficacy and ability of individuals to succeed (Kiliç et al., 2021). According to Spolsky (2000) and Filgona et al. (2020), motivation is a process that is initiated with a physiological or psychological

deficiency or need that energizes a behavior or drive that is directed toward a goal or objectives. On the other hand, motivation has been described as a process that activates and sustains goal-directed behaviors (Cook & Artino, 2016). Motivation can therefore be said to lead, change, and impact human behaviors and to provide an impetus for sustainability (Moos & Marroquin, 2010; Wright & Wiediger, 2007). Motivation, at its core, can be understood within the framework of the "why" of learning activities—why students engage in, persist in, and strive to excel in academic contexts.

Motivation can be characterized broadly as intrinsic (i.e., emanating from within) and extrinsic (i.e., driven by externally observable stimuli) (Deci & Ryan, 2008), as explained in the following:

a. Intrinsic motivation

This type of motivation comes from the personal inner side of the human being, where, in fact, the activity carried out is pleasurable and fun, and the sense of doing it lies in a satisfied feeling. Intrinsically motivated people perform actions because they are satisfying and rewarding in themselves, irrespective of supplementary reward or contingent punishment (Deci & Ryan, 2008; Kotera et al., 2019). For instance: A student who learns English vocabulary because they love to come across new words. They will have a sense of accomplishment from mastering challenging concepts.

b. Extrinsic motivation

It is based on external rewards or pressures, such as excellent grades, praise, or avoiding punishment. Extrinsically motivated people are urged to do certain things because of extrinsic factors, and they gain satisfaction in the results of the action (i.e., gaining rewards or avoiding punishment) rather than process (Deci & Ryan, 2008). Thus, students who are extrinsically motivated may read and write only because of the

approaching deadlines or to avoid failing (Kotera et al., 2023). For instance: Studying vocabulary to perform well in an exam. Participating in class to earn praise from teachers or classmates.

A student can have both types of motivation, high or low (Derfler-Rozin & Pitesa, 2020). When students are interested, they will participate in various vocabulary-building activities and seek out opportunities for practice. Students who are driven to learn will remember new words because they link learning with an intrinsic or extrinsic reward. A motivated learner builds confidence from observable progress, and this feeds a positive feedback loop that keeps them looking forward to more learning. Nonetheless, an individual student can lack all of them, which is termed as amotivational. They are not motivated extrinsically or intrinsically. People with this type of motivation are unable to see that their own behavior is connected to behavioral outcomes and even have less control to learn (Ryan & Deci, 2017).

During the learning process, teachers need to know whether or not the students are motivated. There are some components to evaluate students' learning motivation. According to Aritonang (2008), students' motivation in learning can be developed into indicators as follows:

a. Perseverance in learning. The three indicators are attendance at school, engagement in classroom learning, and studying at home.
b. Resilience in facing difficulties. The indicators are the attitude toward challenges and the efforts to overcome difficulties.
c. Interest and attention factor in learning. The indicators are the habit of coming to lessons and the spirit in following the learning activities.
d. Achievement in learning. The indicators are desire to achieve and the quality of learning achievement.

e. Independence in learning. These indicators are doing homework and learning outside the class hours

.Florida State University, USA & Keller (2016) developed a metric for assessing student learning motivation known as ARCS-V. The framework comprises five components: attention, relevance, confidence, satisfaction, and volition. This model extends the previous ARCS framework. This study examines the design and evaluation of learning environments that effectively motivate learners and encourage them to sustain their motivation and take ownership of their learning (Chang, 2021). This design has been applied in numerous studies on learners' motivation.

Sulasiah (2019) established indicators for ARCS. Teachers can assess attention by observing students' willingness to seek and acquire information pertinent to learning English. The relevance is evident in the manner in which students reference English language skills in their daily lives. The investigation of confidence can be assessed by observing whether students are willing to express ideas, respond to questions, and make decisions regarding issues related to English language skills. The final component, satisfaction, can be assessed through the observation of students completing assignments, quizzes, and practice questions.

Furthermore, Moos & Marroquin (2010) visualized ARCS-V design by a figure as follows:

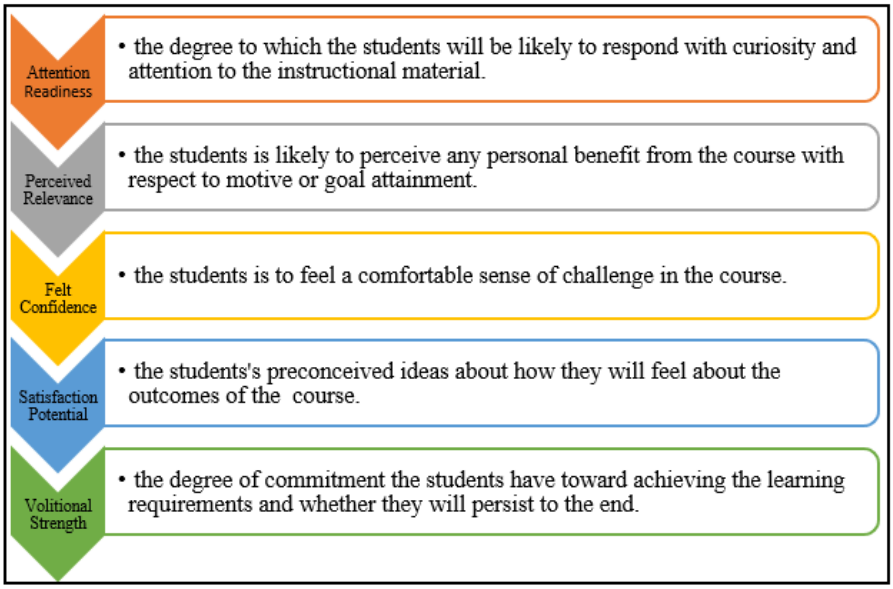


Figure II- 10 Components of ARCS-V model

Building on the prior explanation, Visser (1990) delineated the indicators for each component. The indicators of attention include perceptual arousal, inquiry arousal, and variability. The indicators of relevance consist of goal orientation, motive matching, and familiarity. Confidence is indicated by learning requirements, success opportunities, and personal control. The last but not least, natural consequences, positive consequences, and equity indicate satisfaction.

Additionally, Trianti & Hidayati (2021) and Darojati et al. (2017) referred to Sugihartono (2007) revealed that the indicators for attention are students' curiosity, engagement, and interest. Meanwhile, the indicator for relevance means that teaching method and teaching media must be relevant to the learning objectives, students' needs, and learning material. Confidence is observed by investigating the students' confidence in applying the teaching media, understanding the material as well as doing the tasks given. The last component, satisfaction, is indicated by the students' satisfactory during the learning and after the learning which will be proved by their learning out comes.

The researcher will employ the ARCS model to observe the students' motivation. It not only provides insights into students' attitudes and behaviors toward learning but also highlight areas for targeted interventions to enhance their educational experiences. However, the Pocket Sign application can compensate for these aspects with its interactive and learner-centered feature when considering the motivation of students with hearing disabilities while teaching vocabulary to them. Flashcards, sign words, and camera sign practice are some of the exciting aspects of the app that promote the idea of persistence through learning in a game-like atmosphere, inspire resilience as learners can try again if they are not successful, and spark interest and engagement through visuals and content that are relevant to what they are learning. Pocket Sign also encourages achievement by making it possible for students to see their progress and independence by allowing them to learn at their own pace, both in and out of the classroom.

C. Conceptual Framework

The Pocket Sign application as an assistive technology for deaf students will be applied in this research. It consists of six features that will be involved in the teaching design, namely learning modules, sign language video, gamified quiz, sign dictionary, ASL alphabet, and "study" tool. The utilization of pocket signs is expected to enhance the deaf students' vocabulary development and boost their motivation. The conceptual framework of the research is visualized as follows:

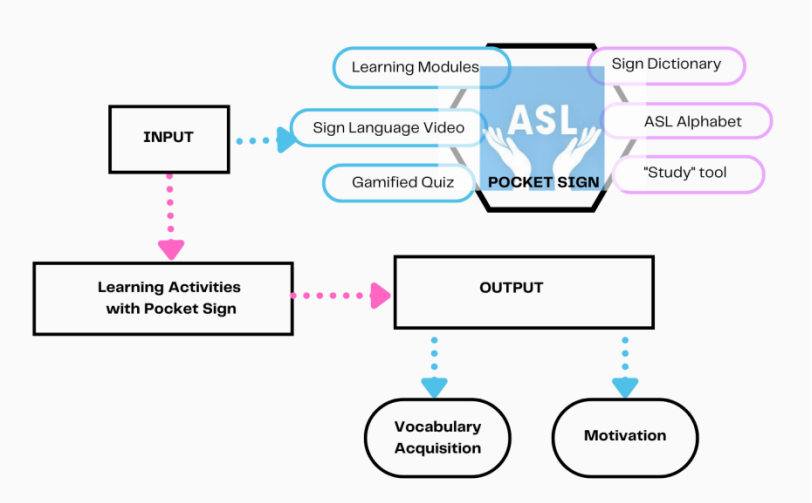


Figure II- 11 Conceptual framework

D. Hypothesis

Aligning with the first research question, the researcher evolves a hypothesis for the research as follows:

Ho: The is no significant difference in the vocabulary development of the deaf students before and after using the Pocket Sign application as an assistive technology.

H1: There is significant difference in the vocabulary development of the deaf students after using the Pocket Sign application as an assistive technology.

CHAPTER III
RESEARCH METHODOLOGY

A. Research Design

This study adopted a mixed-methods approach to achieve the first and the third objectives. A mixed-methods approach combines quantitative and qualitative research methods to provide a comprehensive understanding the research objectives. The quantitative method is concerned with the systematic and objective measurement of variables, sometimes using numerical data to uncover a pattern, relationship, or even a causal link. Quantitative methods involve structured hypothesis testing and the analysis of measurable data; hence, they are ideal to assess the effectiveness of educational interventions (Creswell, 2014). While qualitative method provides detailed, contextual insights into participants' experiences, perception, and behavior. In particular, this method was suitable to evaluate the extent to which the Pocket Sign app improve the deaf students' vocabulary development while concurrently exploring their motivation through observational data and interview.

The researcher employed a quantitative design to validate the first objective, which was to assess whether using the Pocket Sign would support the vocabulary development of deaf students. In this study, the one-group pretest-posttest design was employed, where participants took a standardized vocabulary test before the intervention and after it. The reason was that this design enabled the measurement of changes in performance across time, which provided a direct comparison of how well each of the students apply what they learned due to an intervention (Shadish et al., 2014). The pre-experimental design was considered appropriate because of the practical limits of the study environment. Moreover, the emphasis was placed on gaining an understanding of the pocket sign's efficiency within the population of the research, even though this method did not employ a control group.

The third objective of the research is to investigate the deaf students' motivation during the use of the Pocket Sign app in learning vocabulary. To

achieve the aim, the researcher employed mixed-methods approach. A quantitative method for the observation checklist, and a qualitative method for the interview. Data were collected through an observational checklist with a Likert scale that documented the attention, relevance, confidence, and satisfaction of the students during implementation. These observations helped the researcher analyze the effects of the Pocket Sign experienced by students during the learning activities. The use of Likert scales in observation ensures systematic recording and facilitates statistical analysis of trends in participant engagement (Cohen et al., 2013).

In this study, interviews were conducted to support the data by providing deeper insights into the students' experiences during the vocabulary learning using the pocket sign app. The interviews explored the students' motivation and behavior toward the learning process. To ensure effective communication and accurate interpretation of the students' responses, the researcher was assisted by a teacher who specializes in a special education and is proficient in sign language. The collaboration facilitated a smooth interview process, ensuring that the unique needs of the participants were met their perspectives are accurately captured.

By adopting a mixed-method approach for both objectives, the study seemed to provide a robust analysis of the Pocket Sign app's role and the motivation levels it fosters among deaf students. The objective nature of this design ensured reliability and replicability in measuring outcomes, which are critical for advancing evidence-based practices in inclusive education.

B. Variables in the Research

This study focused on three main variables: the use of the Pocket Sign app, which served as the independent variable. The dependent variable is vocabulary development. Additionally, another issue to consider is the motivation of the deaf students. Each of these is explained below.

1. The independent variable is the use of the assistive technology Pocket Sign application.

Pocket Sign application is a kind of assistive technology that allows users to learn sign languages (ASL) through interactive lessons. Its features, including tools like flashcards, sign words, sign sentences, and camera-based sign practice, are meant to make learning English vocabulary more engaging for deaf students. The app was an important component of the course as it was introduced during the class to help students learn, followed by its use by the students during the study.

2. The dependent variable is vocabulary development.

This variable referred to how many English words the deaf students know after using the Pocket Sign app. The researcher measured this by applying pretests and posttests. The efficacy of the Pocket Sign app was indicated by the difference in scores. In the context of the research, the vocabulary that was taught during the treatment was related to food. It aligned with print vocabulary that involves the recognition and understanding of food-related words in their written form, which was facilitated through the flashcards within the Pocket Sign app.

On the other hand, the food-related words belong to receptive vocabulary. It refers to the students' ability to comprehend these words when presented visually through sign language within the video demonstration. By integrating these two types of vocabulary into the learning process, the intervention aims to enhance the students' recognition and comprehension skills, providing a solid foundation for future productive use in communication.

3. The other variable to be observed is student motivation.

This variable includes the attention, relevance, confidence, and satisfactory experienced by the students during the learning session. The researcher observed every student by applying an observation checklist with the indicators of motivation. This observation checklist helped the researcher to have a clearer insight on how the pocket sign

were adding to their interest in learning vocabulary. Besides, the interview was supportive data to deeper insights of the students' motivation.

C. Population and Sample

The population of the study consists completely of deaf primary students at SLB Negeri Lutang, a special needs school. The school is located in the Majene Regency of West Sulawesi, Indonesia. It has three tiers of education: elementary, middle school, and high school. The school accommodates various disabilities, such as Down syndrome, physical or sensory impairments, hearing loss, autism, and additional emotional or behavioral challenges. The researcher chose the school based on her employment as a teacher there.

The participants in this study consist of deaf students from grades 4, 5, and 6. The group consists of six students, comprising 2 males and 4 females. According to the medical records provided by their parents, three individuals are classified as deaf. Student C is classified as experiencing profound hearing impairment, exhibiting a hearing sensitivity of 89 dB in the left ear and 100 dB in the right ear. Student H exhibits significant hearing impairment, as both of his ears register a hearing level of 100 dB. Student L exhibits depth as well. The left ear responds to sound levels of 100 dB, whereas the right ear reacts to 85 dB. The remaining three students—F, S, and M—have been accepted without the submission of medical records, as the school teachers have made their decisions based on their professional observations and expertise.

Purposive sampling is the sampling technique being applied in this study, whereby respondents were selected based on the attributes that the researcher thinks are very representative toward the purpose of the research (Creswell, 2014). The researcher intentionally chose these grades as the sample in these classrooms because they were already engaged in core reading and writing skills. The students were actively engaged in expanding

their vocabulary and are at an educational stage where they could effectively engage with and evaluate the Pocket Sign app. Due to the significance of vocabulary in relation to their limited resources, they were positioned to gain from the language-centric activities in this study, enhancing the relevance and potential impact of the intervention.

In this study, participants from Grades 4, 5, and 6 are placed in a single classroom during the intervention. This decision is based on both practical and pedagogical considerations. The total number of deaf students available in the research site is relatively small, making it statistically and logistically impractical to separate them into multiple groups. Furthermore, within the school's instructional practices, these students are accustomed to being taught together for certain subjects, indicating that mixed-grade grouping is not disruptive to their learning. The group-based nature of the teaching design—emphasizing collaborative activities and interactive use of the Pocket Sign app—also necessitated their participation in a single, integrated class to facilitate peer interaction, resource sharing, and mutual support during learning tasks.

D. Instruments of the Research

The researcher collected data using three basic instruments: a vocabulary test, an observation checklist, and interview questions. The first instrument was a written test consisting of multiple-choice questions (MCQs). This type of test is applied because it covers a wide range of learning objectives while making efficient use of testing time (Brookhart & Nitko, 2019). Furthermore, MCQs do bias-free scoring and hence make evaluation outcomes consistent and reliable (Haladyna et al., 2002). This is what prompted the researcher to prepare 15 multiple-choice questions under the theme "food" to assess the students' English vocabulary knowledge.

The vocabulary test was used for pretest and post-test. The pretest purposed toward the assessment of the students' proficiency in vocabulary knowledge at the time before the implementation of the Pocket Sign

application. This assessment had significance in knowing what the students were capable of doing at the beginning, as well as making sure that their current skills integrate into the use of the teaching media. On the contrary, the posttest measured changes after learning vocabulary using Pocket Sign. It provided quantitative representation about the support of the app toward the vocabulary development of deaf students. In addition, to ensure their reliability and validity, each question was connected to the vocabulary introduced throughout the study session while being directly related to the learning objectives.

The second instrument of this research was an observation checklist. An observation checklist was considered the most appropriate tool for assessing the motivation of deaf students in this study, as it effectively captures real-time behaviors within a natural learning setting (Creswell, 2017). Measuring motivation through observable behavior is way batter than self-report (Bandura, 1997). In addition to that, Marzano (2006) pointed the fact that the use of a survey is more or less irrelevant because it relies on self-report and is subject to social intentional bias whereas observation gives objective insights to student engagement and consistency. That method holds special advantage for deaf students in that it poses problems in expressing possible feelings or motivation through otherwise existing instruments like questionnaires or interviews simply because of lack of verbal communication (Deci & Ryan, 2008).

The observation was conducted throughout the learning process. The checklist addresses specific characteristics observed in children while utilizing the Pocket Sign app, including attention, relevance, confidence, and satisfaction (ARCS), which are derived from Visser (1990) and Florida State University, USA & Keller (2016). There are a total of 20 items that require observation. The items are derived from the indicators corresponding to each dimension of ARCS, as adapted from Sugihartono (2007) in Trianti & Hidayati (2021) and Darojati et al. (2017). The subsequent table will present the information.

Table III- 1 Dimensions and indicators of ARCS

ARCS dimensions	Indicators
Attention	Students' curiosity; Students' engagement; and students' interest
Relevance	Relevance between the teaching material/media and the students' real lives; relevance between the teaching material/media and students' needs; relevance between the teaching material/media and the learning objectives
Confidence	Students' confidence in using the Pocket Sign; students' confidence in understanding the material; students' confidence in doing the tasks given
Satisfaction	Students' satisfaction in using the Pocket Sign; Students' satisfaction in learning the material; Students' satisfaction in their learning outcomes

Indeed, each instrument item consisted of affirmative statements to be documented during observation throughout the class. These affirmative assertions emphasized successful instructional methods and student involvement. The observation emphasized strengths to deliver constructive feedback for ongoing enhancement. The checklist captured quantifiable insights regarding the students' behaviors in the classroom. In recording these behaviors, it was scored based on the Likert scale. Each statement was evaluated in spans from intrinsic motivation (3 points) and extrinsic motivation (2 points), whereas amotivational is given 1 point. The two instruments in the study collaborated to evaluate the students' vocabulary development and the levels of student motivation during the research period.

The third instrument of the study was an interview guide which consists of 8 questions regarding the aspects of motivation ARCS. This step was to make sure that the observation and the students' experience was related and objective. This instrument consisted of 8 yes/no questions which aligned with the research objectives and focus themes such as attention, relevance, confidence, and satisfaction (ARCS).

This study adopted close-ended interview questions by considering the students' need. The usage of yes/no format was carefully chosen to ensure clarity, reduce ambiguity, and facilitate successful participation from kids who communicate primarily through sign language. According to Marschark & Spencer (2010), deaf students often have difficulty in expressive and receptive language due to limited access to incidental language learning, making simplified and organized inquiry formats more accessible. Yes/no questions are straightforward to grasp, allowing children to respond confidently without the strain of crafting complex responses. Additionally, as stressed by Knoors & Marschark (2012), ensuring that research instruments are linguistically and cognitively appropriate for deaf participants is vital for gathering accurate and trustworthy data.

Additionally, the researcher decided to use close-ended questions because it was considered appropriate when interviewing deaf individuals, particularly children. Besides, it minimized miscommunication and reduces the cognitive processing load during interpretation. According to Marschark & Hauser (2012), deaf students often process linguistic input differently, and structured formats such as Yes/No questions help accommodate language access needs, especially when sign language interpreters or special needs teachers are involved. Furthermore, Napier et al. (2010) emphasize that closed-ended formats are especially effective when working with deaf participants who may have varying levels of proficiency in both sign and written/spoken languages. The simplicity of

the response options reduces ambiguity and ensures greater consistency in interpreting and coding responses.

E. Procedure for Collecting Data

The data collection take place during eight meetings. The data gathering approach for this project was divided into various parts. During this period, the researcher administered pretests and posttests, applied the app-based intervention, and monitored student involvement with an observation checklist and an interview.

1. Vocabulary development test
   a. Pre-test

      The pre-test is a 15-item multiple-choice vocabulary test under the theme "food" which is delivered to each student at the first meeting. The examination is designed to match the vocabulary taught through the Pocket Sign app. Before the test begin, the researcher, assisted by a homeroom teacher, explains the purpose of the assessment and provided clear instructions on how to answer each type of question. This test shows a picture of several kinds of food, and the students answer those questions by choosing the appropriate word that match with the picture. Students complete the test individually under supervised conditions to minimise the possibility of collaboration. No assistance related to the test content is given, although clarifications about instructions are allowed. The result of the pre-test serves as a baseline for testing their knowledge of the specified vocabulary prior to intervention.

   b. Post-test

      The post-test is administered at the eighth meeting, after six meetings of intervention using the pocket sign application. Its purpose is to measure the students' vocabulary acquisition after learning vocabulary under the theme "food" through the Pocket Sign app. The test contains the same items as the pre-test to allow

for direct comparison of scores and assessment of learning gains. As with the pre-test, the researcher, assisted by the homeroom teacher, provides clear instructions and ensures that all students understand the test procedures before starting. The questions are presented in written and visual form. Students complete the test individually under the researcher's supervision to maintain the integrity of the results.

2. Intervention

Following pre-testing, the intervention phase begins. The students use the Pocket Sign app to learn throughout the second to the seventh meetings during this time period. The app's interactive elements, including flashcards, gamified quizzes, and camera sign practice, is integrated into vocabulary classes. The steps of teaching procedures are explained in the following:

a. At the second meeting, the researcher begins by dividing the students into two groups. Each group receives printed flashcards containing *Food Part 1* vocabulary items (see Appendix). The researcher then displays the corresponding sign language flashcards from the Pocket Sign app on the screen and ask the students to guess the intended food items by pointing to their pictures. Once the correct matches for all *Food Part 1* items are identified, the students are instructed to record the words in their own mini dictionaries. To develop lip-reading skills, the researcher asks the students to practice pronouncing the names of the items they had written. The gamified quiz feature of the Pocket Sign app is then used to provide further practice in identifying food vocabulary. Finally, the researcher utilizes the Camera feature of the Pocket Sign app to train students in producing accurate sign language for each vocabulary item.

b. At the session of third meeting, the researcher begins by reviewing the lesson from the previous meeting. The students are asked to demonstrate the sign language for the food vocabulary they have written before. Afterward, the researcher demonstrates each sign language item, and the students responds by showing the corresponding flashcard. Then, two assessments are administered. The first is an anagram activity, in which students rearrange scrambled letters to form the names of the food items they have learned. The second assessment requires students to match each vocabulary word with the correct corresponding picture.
c. The fourth and the fifth meetings follow the same instructional steps as the second and the third meetings; however, the learning materials focuses on *Food Part 2* vocabulary. The activities, including group work, use of printed flashcards, sign language demonstrations from the Pocket Sign app, mini-dictionary writing, lip-reading practice, gamified quizzes, and Camera feature practice, are implemented in the same sequence to maintain instructional consistency.
d. At the sixth meeting, the researcher divides the students into two groups, which are different from the groups formed in the previous meeting. Each group receives printed flashcards containing *Food Part 1* vocabulary. The researcher then displays on the screen a video demonstration from the Pocket Sign app showing sign language in complete sentences related to food, such as "I want ice cream." The students are asked to write several sentences using the food vocabulary, after which they demonstrate the sentences they have written in sign

language. The session concludes with an assessment, which required the students to complete fill-in-the-blank sentences related to food. These series of activity repeats in the seventh meeting using the *Food Part 2* materials.

3. Students' motivation

   a. Observation checklist

      In observing the students' motivation during the learning process, there are two participant observers involved, the researcher and the homeroom teacher. In this period of time, the observers investigate the students' motivated behavior utilizing an observation checklist referred to ARCS dimensions. This stage is critical to determining how the pocket sign application influences their engagement and readiness to learn.

   b. Interview

      The interview session is held at the end of the intervention. In this study, the interview is conducted with the assistance of a special needs instructor who is competent in sign language, ensuring that each question is clearly presented and replies appropriately interpreted. This strategy not only honours the students' communication preferences but also minimizes misinterpretation and maximized data accuracy. Therefore, the decision to employ yes/no interview questions accords with inclusive research approaches that stress accessibility and equity in data collecting. Following these processes, data from all pretests, posttests, observations, and the interview was prepared for analysis.

F. Techniques of Data Analysis

Students' vocabulary development data was treated using quantitative methodologies to ensure comprehensive targeting of study objectives. The first aim, which studies the effect of the Pocket Sign

application on students' vocabulary development, employs both descriptive and inferential statistical techniques. The individuals' pretest and posttest scores were summarized using descriptive statistics such as mean, standard deviation, and percentage. The assessments evaluated students' performance and how much their vocabulary improved or expanded. A paired sample t-test by SPSS 26.0 will be used to examine whether the improvement is statistically significant. As noted by Pallant (2020), the t-test is a reliable and important instrument for examining changes in dependent measures over two time points. It is consequently appropriate for this type of study's quasi-experimental design.

Furthermore, to better comprehend the results, the mean score of the students' posttest scores was classified in qualitative categories such as Excellent, Very Good, Good, and so on, using the following proprietary scale, adapted from Arikunto (2010):

Table III- 2 Classification score for vocabulary development

Scale	Category	Description
90-100	Excellent	Outstanding performance and able to master skills.
80-89	Very Good	Strong understanding and application with some minor room for improvement.
70-79	Good	Sufficient competency; meets expectations but with obvious holes.
60-69	Satisfactory	Meets minimum standard; showing potential for improvement.
50-59	Poor	Below expectation; requires serious improvement.
Below 50	Very Poor	Does not meet the very basic requirements; little or no understanding or engagement.

That is, the pretest and the posttest results will be statistically analyzed using the paired-sample t-test, through which the comparison of

the scores would be done to determine if improvements made were statistically significant. This would indicate and reveal whether the Pocket Sign app can help promote vocabulary development in the deaf students.

During the intervention, the researcher observed the students' behavior to obtain the data about motivation. The result of the observation checklist was analyzed quantitatively using Microsoft Excel. Each checklist question on a Likert scale was examined by calculating the mean ratings using excel to find patterns in student motivation during intervention. Overall, motivation levels were classified into specified levels as follows:

Table III- 3 Classification score for motivation

Scale	Category
84-100	Very high
68-83	High
52-67	Moderate
36-51	Low
20-35	Very low

In this regard, the current study used statistical methods to assess the Pocket Sign's potential usefulness in language learning and motivational enhancement. Such a method ensures that the findings are reliable, objective, and contribute to the growth of evidence-based assistive technology in inclusive education.

The data from the interviews was evaluated using descriptive analysis. This is a statistical method employed to summarise and clarify the fundamental characteristics of a dataset. Educational research frequently includes the presentation of frequencies, percentages, averages, or basic graphs to illustrate trends and patterns in participants' replies. Creswell and Creswell (2018) assert that descriptive statistics are frequently employed in quantitative research to encapsulate trends and

patterns in data, including answer frequencies or percentages, particularly when examining closed-ended questionnaire or interview topics.

In deaf education research, where communication modalities can differ, such as sign language or simplified responses, descriptive analysis provides a versatile and easy-to-use strategy. To analyze the results of the close-ended interview questions (Yes/No format), descriptive statistical analysis was used. This involved calculating the percentage of students who answered “Yes” or “No” to each item. According to Creswell and Creswell (2018), descriptive statistics are appropriate for summarizing trends in response data and are frequently used to present results of closed-form questions in educational research. In this study, the interview responses are quantifiable and straightforward (e.g., “Yes” = agreement, “No” = disagreement). Rather than interpreting language or identifying themes (as in qualitative content analysis), the responses were calculated by frequency and percentage to assess student motivation.

Using descriptive analysis in this study makes sense because of some basic reasons. The first reason is that the interview data consists of close-ended questions (Yes/No), which are best evaluated through frequency counts and percentage distributions. Secondly, it enables the researcher to stay objective, reducing interpretation bias sometimes evident in open-ended responses. The last, it helps detect distinct trends that demonstrate the students’ levels of motivation or engagement with the Pocket Sign app. Thus, the application of descriptive analysis matches both the structure of the data and the communication styles of the participants.

CHAPTER IV
RESEARCH FINDINGS AND DISCUSSION

A. Research Findings

This chapter shows the findings of the study based on the data obtained through quantitative and qualitative methodologies. The findings are organized in accordance with the research objectives which are to determine the extent to which the Pocket Sign app improve the students' vocabulary development through a pre-test and post-test design, the design of teaching English vocabulary to the deaf students using the Pocket Sign, and to describe students' learning motivation as observed and interpreted from observation checklists and interviews. The results are followed by a discussion that connects the findings to relevant theories and previous studies.

1. The students' vocabulary development

To examine the students' initial vocabulary knowledge before utilizing the Pocket Sign app, a pre-test was provided to six deaf students from grades 4, 5, and 6 at SLB Negeri Lutang. The pre-test was conducted at the first meeting. The test focused on vocabulary connected to the theme "Food" and assessed the students' ability to recognize and understand English words through visual cues. The following figure shows the result of the students' pre-test:

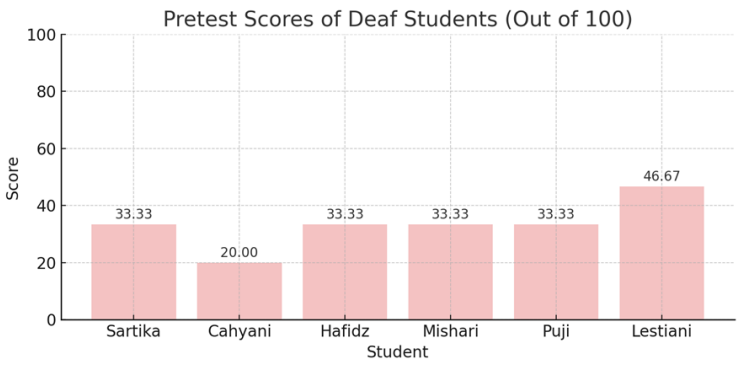


Figure IV- 1 The result of the students' pre-test

The figure presented above depicts the pre-test scores of six deaf students at SLB Negeri Lutang, each assessed on their comprehension of English vocabulary pertinent to the theme of "Food." The scores were derived from a total of 15 questions, subsequently transformed into a scale of 100. The chart illustrates that the majority of students achieved scores below 40, suggesting a constrained level of vocabulary proficiency prior to the implementation of the Pocket Sign app. Student C achieved the lowest score of 20.00, while students S, H, M, and P each attained a score of 33.33. The students L attained the highest score of 46.67, which, however, remains beneath the midpoint threshold. The findings indicate that a significant number of students encountered challenges in recognizing and comprehending English vocabulary previously. This underscores the necessity for accessible, visually-oriented educational resources to facilitate vocabulary development among deaf learners.

At the last meeting, the post test was taken place. The result of the post-test is shown in the following

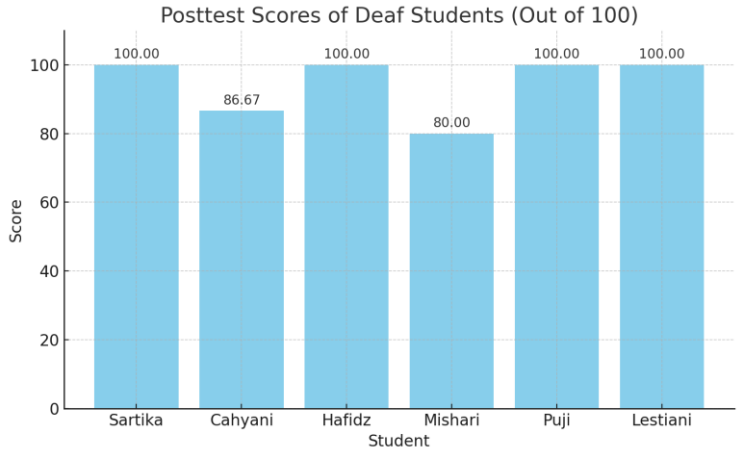


Figure IV- 2 The result of the students' post-test

Figure IV.2 shows the post-test scores of the six participating students after the intervention using the Pocket Sign app. Four students—S, H, P, and L—achieved a perfect score of 100.00, while the students C and M scored 86.67 and 80.00, respectively.

Here is the Comparison between the pre-test and the post test result

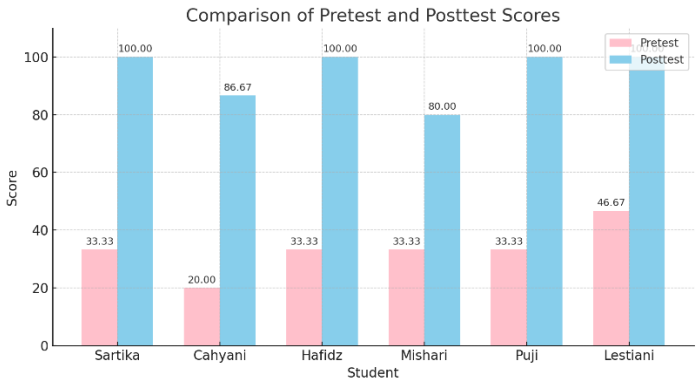


Figure IV- 3 The comparison between the pre-test and the post-test

Every student has shown a notable improvement when compared to the pre-test. Six deaf students who took part in the Pocket Sign app-based vocabulary acquisition intervention had their pre-test and post-test results compared in Figure 4.3. The graph demonstrates a distinct and steady progress for every student. Student L received the highest score of 46.67 in the pre-test, while student C received the lowest score of 20.00. The pre-test results showed inadequate prior knowledge of the language, with an average of 33.00, which is considered very weak. On the other hand, post-test results significantly improved, with two students (C and M) getting 86.67 and 80.00, respectively, and four students (S, H, P, and L) earning a perfect score of 100.00. After the test, the average score increased to 94.45, which is considered good.

To determine whether there was a significant difference in students' vocabulary development before and after the intervention, a statistical analysis was conducted using SPSS version 26. The analysis involved a paired sample t-test comparing the pre-test and post-test scores of six deaf students who participated in the study. This test was chosen because it is appropriate for measuring the difference between two related samples—in this case, the same group of students tested before and after the treatment.

The results of the analysis are presented in the following table

Table IV- 1 Descriptive statistics of the pre-test and the post-test

	Mean	N	Std. deviation	Std. Error Mean
Pre-test	33.0	6	7.86	3.21
Post-test	94.45	6	8.22	3.35

Paired sample t-test result is presented in the following table

Table IV- 2 The result of paired sample t-test

	Mean difference	Std. deviation	T	Df	Sig. (2-tailed)
Pretest – post test	61.45	5.36	28.49	5	0.000

Meanwhile, the comparison between the t-count and t-table is presented as follows

Table IV- 3 The comparison between the t-count and t-table

Description	Value
Number of Students (n)	6
Degrees of Freedom (df)	5
Significance Level (α)	0.05 (2-tailed)
t-Table (Critical Value)	2.571
t-Count (Observed Value)	28.49
Comparison Result	28.49 > 2.571
Conclusion	Reject H_0; accept H_1. There is a significant difference.

Based on the paired samples t-test analysis in table IV.2, the significance value was less than 0.001 ($p < 0.001$), indicating a statistically

significant difference between pre-test and post-test scores. Moreover, table IV.3 above shows that the observed t-value (28.49) is much higher than the critical t-value from the t-distribution table (2.571) at α 0.05 significance level with 5 degrees of freedom. This confirms that the improvement in students' vocabulary scores after using the Pocket Sign app is statistically significant. Thus, the null hypothesis (Ho) is rejected, and the alternative hypothesis (H1) is accepted.

2. **Teaching design**

Before beginning the learning process, the researcher designed a teaching plan to ensure the process was well-organized and goal-oriented. Here is the design of teaching English vocabulary to deaf students using the pocket sign app as an assistive technology.

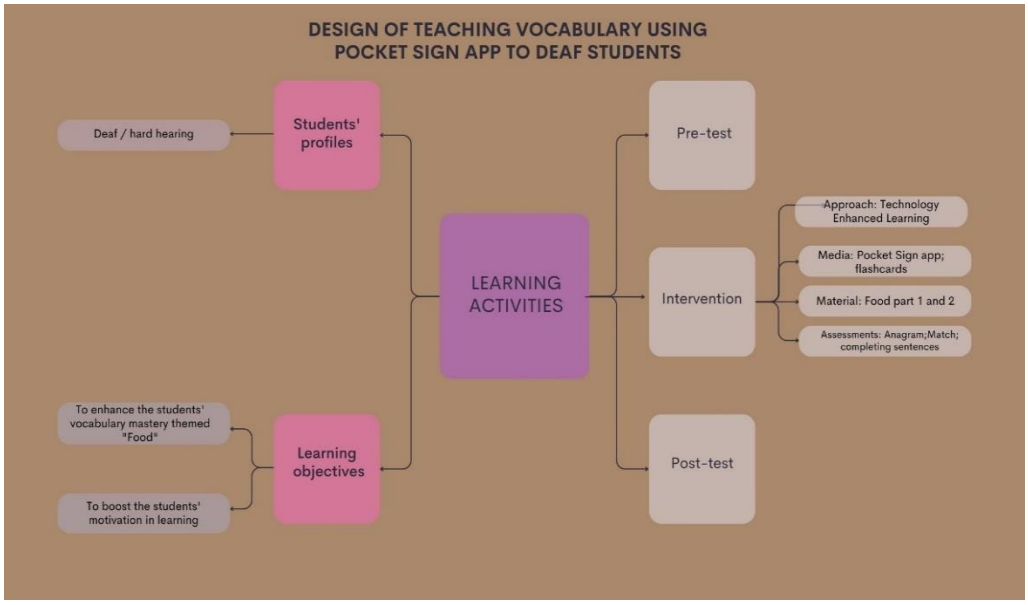


Figure IV- 4 Design of teaching vocabulary using pocket sign

The design of teaching vocabulary using pocket sign app to deaf students consisted of:

a. Students' profile: This study involves a group of deaf students from the fourth, fifth, and sixth grades. The group is made up of six students,

including 2 males and 4 females. The medical records submitted by their parents indicate that three individuals are identified as deaf. Student C is identified as having a significant hearing impairment, demonstrating a hearing sensitivity of 89 dB in the left ear and 100 dB the right ear. Student H demonstrates a profound hearing impairment, with both ears measuring a hearing level of 100 dB. Student L demonstrates considerable depth as well. The left ear exhibits a response to sound levels reaching 100 dB, while the right ear shows a reaction to 85 dB. The three students—F, S, and M—have been granted acceptance without the need for medical records, as the educators have relied on their professional observations and expertise to make their determinations.



Figure IV- 5 The sample of the research

b. Learning objectives: The primary objective of this intervention was to enhance deaf students' mastery of English vocabulary through the integration of the Pocket Sign application in a technology-enhanced learning environment. Specifically, the intervention aimed to support students in recognizing, understanding, and recalling English vocabulary related to the theme "Food," using visual, contextual, and sign-based learning resources. By utilizing the app's multimodal features—such as flashcards, sign words, sign sentences, and interactive camera practice—the intervention sought to provide a more accessible and engaging learning experience tailored to the needs of deaf learners.

Additionally, the intervention was designed to foster intrinsic motivation among students, guided by the ARCS Motivation Model (Attention, Relevance, Confidence, and Satisfaction). Through visually appealing content, meaningful vocabulary contexts, supportive feedback, and interactive tasks, the learning process was structured to capture students' attention, relate the material to their everyday experiences, build their confidence in using new vocabulary, and create a sense of accomplishment. Overall, the intervention targeted both cognitive and affective learning outcomes, aiming not only to improve vocabulary acquisition but also to boost students' enthusiasm and motivation for learning English.

c. Learning activities

The learning activities included three steps, namely pre-test, intervention, and post-test. The pre-test was conducted at the first meeting. In this session, students completed a vocabulary pre-test on the theme "Food" to assess baseline knowledge.

The next step is the intervention. This process occurred over six sessions, each lasting roughly 30 minutes. The teaching strategy utilized was technology-enhanced learning, incorporating the Pocket Sign application as the primary instrument for facilitating vocabulary development among deaf pupils. The intervention was segmented into two theme components centered on the subject of "Food."

In Meeting 2, students were exposed to "Food Part 1," which encompassed a curated selection of vocabulary items showcased through the app's Study feature, including flashcards, sign words, sign phrases, and camera-based sign practice. Meetings 3 focused on practice and reinforcement activities for Food Part 1 through interactive exercises and guided tasks within the application. Meeting 4 presented "Food Part 2," accompanied by a fresh array of vocabulary items, succeeded by more practice and application sessions in Meetings 5. Meanwhile, Meeting 6

and 7 focused on constructing simple sentence using the vocabulary from "Food Part 1 and 2."

During the intervention, the researcher and a special education facilitator aided enable students to interact with the app proficiently, comprehend the sign language representations, and do the activities with motivation and enthusiasm. Some important items of the intervention include:

1. Approach: This teaching design implemented a Technology-Enhanced Learning model using the Pocket Sign application to support English vocabulary acquisition among deaf students. The students were divided into two groups consisted of three to build collaboration in learning. The meetings were designed to promote visual learning, interaction, and independent practice through digital tools tailored for deaf learners.

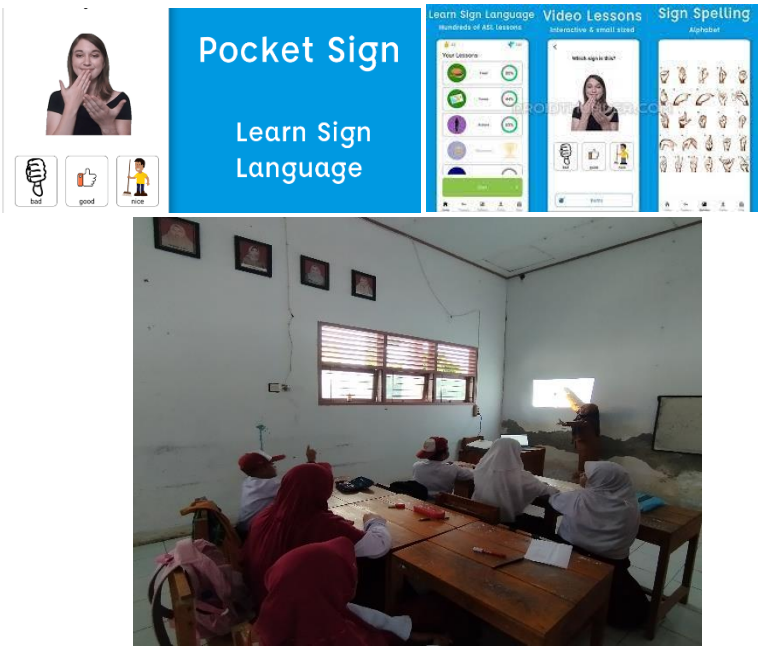


Figure IV- 6 Technology-enhance learnig approach

2. Media: In group, the students were introduced to food-related vocabulary using the feature of Pocket Sign. Flashcards, camera sign pictures, and gamified quizzes in group were used. Each group of students was given a smartphone with the pocket sign

app in it. Together, they practice using it by looking at the screen showed by the teacher.



Figure IV- 7 The use of pocket sign app as teaching media

3. Material: in first session, they were given 8 vocabularies as food part 1, while the second session they had 8 vocabularies. As food part 2. Each group had printed flash cards as additional media. This flash card later was used in quiz activity where the teacher showed the video demonstration of the pocket sign app and the students guess the word by showing the flashcards. Besides, the students come forward individually in turn to do the gamified quiz.



Figure IV- 8 The material “food” in pocket sign flashcard

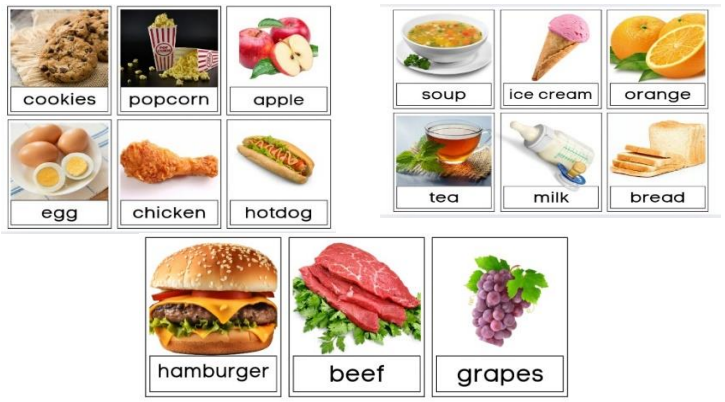


Figure IV- 9 The material "food" in printed flash cards

4. Assessments: Tasks focused on rearranging the jumbled letters of food and Continued reinforcement activities including matching the pictures with the word food and sentence writing.



Figure IV- 10 The assessment of the pocket sign app

After doing 7 meetings, this meant that the intervention session was over. At the last meeting, the researcher conducted the post-test. It was a vocabulary test administered to measure improvement and learning outcomes. It would be the reference to know whether or not the students' vocabulary improved after using the pocket sign app.

3. **Students motivation in learning vocabulary using Pocket Sign application**

a. Observation checklist

To assess students' motivation during the intervention, an observation checklist was employed based on the ARCS motivational model developed by Keller (1987). This model focuses on four key

components of motivation: Attention, Relevance, Confidence, and Satisfaction. The checklist comprised 20 observable items, each signifying behavioral indicators corresponding to the four components.

Attention was evaluated using 9 items, Relevance with 4 items, Confidence with 4 items, and Satisfaction with 3 items. Each item was assessed utilizing a three-tiered motivation framework. The checklist was completed throughout each therapy session (Meetings 2–7) by the researcher, with assistance from a special education instructor, to guarantee precision in interpreting student behavior. This tool offered quantitative insights into the impact of the Pocket Sign app on students' engagement and motivation throughout various learning phases.

The observation checklist was created to assess the motivation of deaf students in acquiring English vocabulary through the Pocket Sign app. The framework was based on the ARCS Motivation Model, comprising four essential elements: Attention, Relevance, Confidence, and Satisfaction. Each student was evaluated on 20 items with a Likert scale, and the aggregate scores were classified accordingly.

Table IV- 4 The result of the students' observation checklist

The students' names	Score	Category
S	90	Very high
P	85	Very high
L	91.67	Very high
H	88.33	Very high
M	81.67	High
C	83.33	High
Mean score	86.67	Very high

The mean score of 86.67 falls under the "very high" category, indicating that, on average, the students were highly motivated throughout the intervention. This strong level of motivation can be interpreted through the lens of the ARCS model as follows:

1. Attention: The visual and interactive features of Pocket Sign—such as flashcards, sign animations, and camera sign practice—helped sustain the students' focus. The consistent high scores suggest that the app successfully captured and maintained their attention during each session.
2. Relevance: The vocabulary materials were contextualized around the theme "Food," which is both familiar and meaningful in the students' daily lives. This likely contributed to high relevance scores, showing that students saw value and purpose in what they were learning.
3. Confidence: The organized assignments and prompt feedback from the app's sign recognition functionality certainly enhanced the students' sense of accomplishment and mastery over the content. The majority of kids seemed progressively inclined to interact with new language and practice it again.
4. Satisfaction: The elevated ratings in this domain indicate that the students had pride in their achievements and derived pleasure from the learning process. The utilization of technology seems to enhance the process, fostering more engagement and ongoing participation.

Overall, the observation data clearly indicates that the Pocket Sign app not only supported vocabulary learning but also enhanced students' motivation across all four ARCS components. This motivational aspect

plays a crucial role in sustaining engagement and improving learning outcomes among deaf students. This high level of motivation aligns closely with the significant improvement observed in the students' vocabulary acquisition, as indicated by the pretest and posttest results. The substantial increase in the posttest scores indicates that the intervention using Pocket Sign was effective in enhancing students' English vocabulary. The very high motivation likely played a crucial role in supporting this outcome. Motivated students are generally more engaged, willing to practice, and open to challenges—all of which contribute to better learning results.

By integrating the ARCS motivation model into the teaching approach through engaging and relevant content (i.e., themed vocabulary on "Food"), the Pocket Sign app fostered an environment where students were both interested and confident in their learning. This is consistent with educational research that suggests high motivation correlates positively with academic achievement, especially in learners with special needs. In conclusion, the high motivational levels observed during the intervention served as a supportive factor that contributed to the significant vocabulary improvement shown in the post-test scores. This confirms that assistive technology, when paired with motivational learning strategies, can be highly effective in enhancing language learning for deaf students.

b. Interview

To further explore the students' motivation in learning English vocabulary using the Pocket Sign app, interviews were conducted with six deaf students who participated in the intervention. The interview process was conducted with the assistance of a special needs teacher who is skilled in sign language and has experience teaching deaf students, ensuring that all questions were communicated clearly and appropriately interpreted.

The interview consisted of eight yes/no questions, each aligned with one or more components of the ARCS Motivation Model. The following table shows the result of the interview.

Table IV- 5 The result of the students' interview

Questions	Yes (n)	No (n)	Yes (%)	No (%)
Q1	6	0	100	0
Q2	6	0	100	0
Q3	6	0	100	0
Q4	6	0	100	0
Q5	3	3	50	50
Q6	6	0	100	0
Q7	6	0	100	0
Q8	6	0	100	0

The interview findings were evaluated using descriptive analysis, focusing on the frequency of students' responses to yes/no questions. This strategy was designed to suit the communication demands of deaf pupils and to enable proper interpretation of their motivated answers. Out of eight interview questions, seven earned unanimous "Yes" answers from all six students, demonstrating a high level of passion and engagement throughout the ARCS components. Under the Attention category, all students reported that they often asked the teacher questions (Q1), actively participated in group discussions (Q2), and stayed focused during class activities (Q3), suggesting that the Pocket Sign app successfully captured their interest and sustained their attention throughout the learning process.

In terms of Relevance, the students verified that they employed the signs from the Pocket Sign app in daily life (Q4) and found the language

relevant for real-world scenarios (Q6). However, responses to Q5— “Have you downloaded the Pocket Sign app on your phone or your parents’ phone?”—showed some variation: only 3 out of 6 students (50%) answered “Yes”, while the remaining 3 students answered “No” because the app had been installed on their parents’ phones rather than their own. This does not necessarily suggest a lack of importance, but rather reflects constraints in access to personal devices.

For Confidence, all students (100%) reported they felt confident learning English vocabulary using the app (Q7), which implies the program helped minimize learning anxiety and fostered a sense of competence. Lastly, under Satisfaction, all participants reacted favorably to the statement about enjoying the learning experience (Q8), emphasizing that the Pocket Sign app provided a relevant and entertaining method to acquiring vocabulary.

Overall, the constant “Yes” replies across most questions support the conclusion that the usage of Pocket Sign favorably improved students’ motivation, particularly in terms of attracting attention, creating confidence, and ensuring satisfaction in the learning process. The interview findings are highly similar with the observation checklist results, where all students indicated high to very high motivation. Furthermore, these motivational factors certainly led to the large gain in vocabulary learning, as demonstrated by the pretest–posttest analysis. Taken together, the results of the pretest-posttest analysis, observation checklist, and student interviews collectively suggest that assistive technology—when designed appropriately—not only improved the students' English vocabulary but also enhanced their learning motivation, confirming the effectiveness of technology-enhanced learning for deaf students.

B. Discussion

1. Students vocabulary development

The results of this study suggest a considerable improvement in students' vocabulary development after the intervention utilizing the Pocket Sign application. The mean difference between the pre-test and post-test scores was 61.45, with a standard deviation of 5.36. The t-test gave a t-count of 28.49, which is significantly more than the t-table value of 2.571 at the 0.05 significance level with 5 degrees of freedom. This statistical finding leads to the rejection of the null hypothesis (Ho) and the acceptance of the alternative hypothesis (H1), demonstrating that the Pocket Sign application had a significant beneficial impact on students' vocabulary achievement.

This conclusion accords with the primary purpose of the intervention, which was to promote vocabulary acquisition among deaf children through a technology-enhanced learning strategy. The utilization of visual aids, sign language representation, and interactive features within the Pocket Sign app effectively aided students in understanding and memorizing new English terms. The clear improvement in test results implies that the multimodal style of the software catered well to the visual learning preferences of deaf learners.

This conclusion is congruent with Ullah and Tabassum (2021), who reported that multimedia-based training greatly enhanced vocabulary memory among hearing-impaired pupils. Similarly, a study by Wicha et al. (2012) stressed that combining sign language in digital learning materials can considerably boost students' receptive vocabulary. However, while both studies validated the benefits of multimedia, this study adds innovation by explicitly using the Pocket Sign application, which mixes sign language, contextual words, and camera-based sign practice in one

platform. This multimodal strategy appears to have a larger influence on both comprehension and recollection.

Furthermore, our results parallel findings from Yasin (2024), who reported that structured vocabulary acquisition with repetitive visual input enhances memory reinforcement in deaf learners. The design of the six intervention meetings in this study followed a similar logic, progressively transitioning from exposure (by flashcards and sign words) to application (via sign sentences and camera sign), giving repeated, contextualized practice. In contrast, several prior research such as by Karal and Silbir (2010) focused on the use of paper sign language dictionaries, which revealed more limited advances in vocabulary learning compared to digital apps. This distinction illustrates the enhanced benefit of interactive and technology-based solutions, especially in giving immediate feedback and compelling material. The Pocket Sign app's user-centered design likely contributed to the higher learning gains in this study compared to non-digital or less interactive alternatives.

The results of this study are also well in line with other studies focusing on how important visual aids and sign language are when it comes to teaching deaf children. Birinci and Sariçoban (2021) explained how the utilization of visual aids like pictures, charts, and videos alongside sign language could help deaf learners acquire new words and understand what they read better. Likewise, González-Reyes et al. (2021) discovered that the utilization of multimodal resources, specifically those with sign language and image representation, makes learning more effective and interesting. These approaches allow people to convey meaning to each other better and give them cues on word meaning that make them easier to remember. These research studies validate the findings of the current study, which revealed that the Pocket Sign application, with its visual flashcards, sign demonstrations, and interactive options, enabled the students to learn new vocabulary significantly. The application rendered

learning vocabulary fun and easy through the use of sign-supported visual modes of learning. This is also consistent with what previous research has advocated for in multimodal approaches.

Likewise, Prasetya (2023) created LetSign, an Android app that helps users learn English vocabulary by showing videos of sign language. His study also validated the effectiveness of the app for teaching and retaining new words among deaf children, citing classroom engagement and student happiness. Such findings strongly support the outcome of a similar study, in which the Pocket Sign app, offering the same combination of visual flashcards and sign language videos, greatly enhanced students' vocabulary performance. Pocket Sign's multimodality, like that of SignText and LetSign, covered the language and cognitive needs of deaf learners by exposing vocabulary in a clear, visually enriched format. That each of these platforms works successfully testifies to the benefit of sign-supported assistive technology in language teaching for deaf learners. It also shows that Pocket Sign is a successful tool for use in instructional settings in inclusive classrooms.

The present study supports the findings of Krsek (2019), who underscored the reality that assistive technologies play a crucial role in enabling learners with hearing disabilities to access and retain language content efficiently. Through an investigation of pedagogical practice, Krsek discovered that technology, which incorporates the use of visual input and sign language—such as visual dictionaries and sign-integrated mobile apps—helps overcome communication barriers and enhance language learning. Findings to date also resonate with Nasir et al. (2021), who investigated the use of mobile technologies among hearing-impaired learners of English as a second language. The study underscored that mobile apps designed with visual and interactive features considerably improved both accessibility and student motivation. Similarly, the Pocket Sign application—with its sign demonstrations, flashcards, and learner-

friendly interface—was found to be effective in supporting vocabulary learning of students, as evidenced in this research through the vocabulary test. These parallels suggest that when mobile learning applications are designed with careful consideration for deaf students, they can be utilized as effective assistive technologies to enable inclusive and successful language learning.

The current findings are also heavily corroborated by Syamsuddin et al. (2023), who designed a mobile dictionary application founded on the Indonesian Sign System (SIBI) to facilitate the learning of words by deaf students. Their research strongly highlighted the fact that sign-supported digital technology is an explicit, replicable, and accessible means of enhancing language development in children with special needs. Although Pocket Sign uses ASL, its function and design are the same—providing sign-based visual input to aid English vocabulary acquisition. Like the SIBI dictionary app, Pocket Sign showed a beneficial effect on students' vocabulary acquisition and engagement. The convergence of findings establishes that sign language mobile learning apps are not just effective across diverse sign systems (SIBI or ASL) but also sensitive to deaf students' particular needs in inclusive classrooms.

The research findings of this study support the implications drawn by Al Siyabi et al. (2022), who explored the realities and attitudes of utilizing assistive technology in English language classrooms. Their findings affirmed that when used with caution, assistive devices have the potential to enhance greatly vocabulary development, comprehension, and independence among learners with disabilities. The findings of the present study also validate this premise in that the Pocket Sign app—in virtue of its sign-supported visual features—was able to enhance the acquisition of vocabulary among deaf students. Also, just like the perceptions of teachers in Al Siyabi et al.'s study, this research recognizes the relevance of accessibility, ease of use, and pedagogical alignment in determining the

success of technology-enhanced language learning for deaf students. Thus, this study not only supports earlier research on the utility of visual and digital supports for special education, but also adds new information on the actual rollout of mobile sign language technologies in structured classroom interventions.

2. Teaching design

Rosmala (2023) developed a design of teaching vocabulary for secondary deaf students. This design share the same objective of enabling English learning among deaf students through the use of visual digital technology. The two designs are comparable in the sense that they both acknowledge the significance of multimodal and visually accessible content in meeting the needs of hearing-impaired students. The two designs also integrate direct instruction with interactive and participatory activities to enable active engagement and skill development.

Yet another major difference lies in the focus, scope, and execution. The previous researcher's design is likely contextual teaching and learning in terms of its underlying approaches, i.e., gamification, project-based learning, and work-based learning. It encompasses various thematic materials such as kitchen utensils, sewing utensils, fruit salad preparation, and fashion workshops, which are presented through different media platforms (Bitmoji, Quizlet, Canva, and media realia). Learning environments vary from classrooms to specialized laboratories, and activities include a wide range of cognitive, affective, and psychomotor activities such as ice breaking, questioning, presenting, modelling, and teamwork.

In contrast to this, the instructional design in the present study is shorter and more focused, with a single theme—food—being used and delivered through a technology-enabled model of learning with the Pocket Sign app being the central instructional tool. The instructional flow is

linear, with a pre-test, six intervention sessions, and a post-test. The intervention is modelled on specific features of the Pocket Sign app, such as flashcards, quizzes with gamification, camera-induced practice of sign language, and sentence completion exercises. The targeted design allows for systematic acquisition of vocabulary and recycling of the same vocabulary items, allowing for receptive as well as productive control.

The novelty of the present design lies in its exclusive use of a single assistive technology platform—Pocket Sign—that combines sign language demonstrations, interactive practice, and gamification within one app. While the previous researcher's model demonstrates breadth through the inclusion of multiple themes, media, and settings, the current design offers depth by focusing intently on a specific vocabulary set and maximizing the capabilities of one digital tool. This targeted specification ensures that students with different grade levels but similar communication needs can interact together in a combined, group-based learning environment.

3. Students' motivation

Beyond vocabulary development, this research also studied students' motivation in learning English by observation and interviews, assessed using the ARCS Motivation Model: Attention, Relevance, Confidence, and Satisfaction. Based on the observation checklist, most students displayed high levels of motivation during the intervention. Their willingness to utilize the Pocket Sign app and their participation during each meeting indicated great attention. This agrees with the findings of Hong et al. (2020), who highlighted that interactive and colorful learning apps are beneficial in sustaining attention among special needs students. The visual attractiveness and engaging tasks—especially the camera-based sign recognition—kept students actively involved and reduced distraction.

The results of this study are in line with other studies that show how interactive and colorful learning technology might help deaf students. Alias, Harun, and Kamaruddin (2022) said that multimedia-based teaching aids help deaf students pay attention and understand better because they are visual and interactive. In the same way, Ningsih et al. (2022) said that multimedia learning improves student results in elementary school because deaf students respond well to content delivered through engaging and structured images. The sustained attention seen in this study backs up what Djesmedi et al. (2022) said: that interactive apps that combine sign language, text, and bright graphics helped deaf students remember things better and kept them interested.

Malzkuhn and Allen (2013) also said that deaf kids stayed very interested in multilingual storybook apps that had interactive and visually rich content. The sign videos, flashcards, and camera-based features of Pocket Sign all work together to keep students' attention and make them more eager to learn. This could be because deaf people have certain cognitive skills, such being able to pay more attention to things in their peripheral vision, which is a result of neuroplastic changes (Bavelier & Neville, 2006). These results not only show that using assistive technology like Pocket Sign can be motivating, but they also show how careful visual design can make learning better for students with hearing problems.

The food-related vocabulary theme was familiar and practical in daily life, which helped students relate new English words to their real-world experiences. This is in line with what Marschark and Knoors (2021) found: deaf students are more motivated to learn when the knowledge is helpful and relevant to their lives. The students mostly think it's interesting to learn things that are closely related to their daily lives because making connections between ideas and real-life examples makes it easier for them to understand the material. As stated by Gail K. Oura

(2001) that authentic, task-based materials—those generated from real-world contexts—significantly boost learner motivation and engagement, because students perceive the activities as materially relevant and purposeful. The research shows that when learners discover clear linkages between language material and real-life use, their attention and investment in the session improves.

Additionally, the Pocket Sign app's utilization of sign-language films mixed with written words greatly boosted motivation among deaf students—more so than typical static flashcards with images and text alone. This aligns with findings that deaf learners benefit from instructional content that aligns with their visual-spatial learning preferences and includes dynamic sign-language input. Research by Mat Yasin & Mohamad (2024) and Luckner et al (2001) reports that combining visual aids with sign-language videos substantially improves comprehension, vocabulary retention, and learner engagement, by leveraging dual modalities that resonate with deaf students' cognitive strengths because they align with the visual memory strength.

Students also exhibited improved Confidence over the later sessions, as they learned to utilize the app more independently and repeated signs with more assurance. This mirrors study by Andyani et al (2022), who found that mobile-assisted sign language tools help enhance student confidence by offering private, low-pressure practice before public demonstration. In this study, the self-paced and supportive atmosphere provided by LetSign allowed students to grow without fear of failure, contributing favorably to their self-efficacy.

In addition, Flemimg (2024) indicates that well-designed digital narratives favorably enhance learner engagement and intrinsic motivation by harmonizing with users' language preferences and emotional requirements. This finding correlates with the finding of this study that

deaf students demonstrated heightened motivation when using the Pocket Sign app, which blends sign language video demonstrations with written words—surpassing standard flashcards that show simply pictures and text. The multimodal narrative and visual structure of Fleming's digital design principles mimics how Pocket Sign mixes video sign, visual signals, and textual vocabulary, creating a richer, more natural learning experience that sustains attention and generates meaning.

In terms of Satisfaction, both observational data and interviews demonstrated favorable emotional responses. Students were eager when completing vocabulary assignments and gratified when praised for correct responses or sign performance. This finding aligns with Dewi & Rizk, J., & Hillier (2022), who explored how digital technology promotes engagement among students with disabilities through interaction rituals and the accumulation of digital capital. In their study, students who confidently utilized assistive technologies such as tablets and smartboards gained symbolic credibility and became more actively involved in classroom interactions. Similarly, the present study reveals that the Pocket Sign app played a significant influence in enhancing students' motivation and active engagement during vocabulary learning.

Furthermore, just as digital capital helped students in Rizk and Hillier's study receive recognition from teachers and peers, the students in this research similarly experienced a rise in confidence and competence as they became more fluent in English vocabulary through digital sign language instruction. These analogies underline the transformative potential of assistive technology—not simply in enhancing academic achievements but also in transforming how students with disabilities engage with their learning settings. This echoes accessibility concerns identified in the study of Palomino (2020), who concluded that mobile learning is an effective instructional strategy for facilitating inclusive education by supporting the learning of students with functional diversity.

In accordance with that, Saman et al (2019) observed that applications that include gamified, sign language movies and interactive visuals—such as the i Sign app—have been demonstrated to dramatically boost focus and user satisfaction among deaf learners. It revealed that over 91% of participants responded positively to multimedia learning settings featuring sign movies and gamification, claiming that these factors made learning both interesting and clearer compared to typical static content.

Based on the discussions on students' vocabulary development and students' motivation in learning English vocabulary using pocket sign as an assistive technology, it can be stated that the findings indicate that Pocket Sign improved students' vocabulary outcomes and offered motivational advantages in line with the ARCS paradigm. The introduction of visually interesting, topical, and confidence-enhancing learning experiences provides a more inclusive and dynamic English learning environment for deaf students. This study's findings have significant practical implications, especially regarding inclusive education, English language training for deaf students, and the integration of assistive technology in classroom environment.

The first improvement in vocabulary knowledge displayed by the Pocket Sign app demonstrates that mobile-based assistive technology can operate as an effective instructional resource for deaf students. Teachers of students with hearing impairments may employ similar digital tools to assist visual and contextual learning, particularly in vocabulary education, where sign picture aids in word recall and retention. The application's multimodal elements, including sign animations, contextual words, and interactive practice, efficiently enhance the visual learning capacities of deaf learners, giving an inclusive alternative to standard text-based materials.

Second, the positive motivating outcomes, framed within the ARCS Motivation Model, demonstrate that learning apps like Pocket Sign do more than supply content—they may ignite interest, boost confidence, and drive engagement. Educators and curriculum developers should therefore consider integrating motivational design concepts when selecting or constructing learning resources for students with special needs. The app's user-friendly design and fascinating tasks demonstrate how technology may deliver a more meaningful and tailored learning experience.

Third, this study stresses the requirement of teacher engagement and aid in insuring the success of digital interventions. Although Pocket Sign is designed for self-paced learning, the presence of a special needs teacher throughout the sessions played a vital role in teaching the kids and scaffolding their use of the technology. Thus, professional development for teachers in implementing assistive technology should be a priority in inclusive classrooms.

Lastly, the incorporation of contextually relevant topics (e.g., food) suggested that linking learning content to real-life occurrences could increase both understanding and motivation. Future English language programs for deaf children should focus practical, everyday terminology augmented by sign language integration. While this study gives useful insights on the use of Pocket Sign in vocabulary learning and motivation development among deaf students, it also has numerous limitations that should be acknowledged.

However, the research has certain drawbacks. First, the study utilized a tiny sample size of only six youngsters from a single special education school. While the results are promising, they may not be generalizable to all deaf children, especially those in varied educational

contexts, age groups, or areas with variable degrees of access to technology.

Second, the duration of the intervention was exceedingly brief, consisting of only six sessions over a limited time frame. A longer intervention time may provide deeper insights into long-term vocabulary retention and maintained motivation. Future studies should examine increasing the intervention duration and incorporate follow-up testing to determine long-term effects.

Third, the study depended primarily on gadget availability, which provided a barrier for certain students. As indicated in the interviews, three kids utilized devices belonging to their parents, which limited their access to the app outside the classroom. This highlights the digital gap and raises questions regarding accessibility and equity in technology-based teaching for adolescents from different socioeconomic backgrounds.

Fourth, the inclusion of yes/no questions in the interview may have constrained the depth of students' responses. Although acceptable for the communication needs of the participants, the simplicity of the format hampered the richness of qualitative data. Future studies may study various approaches, such as guided interviews with visual prompts or sign language video responses, to gather more detailed information.

Lastly, the study focused exclusively on one language skill—vocabulary. While vocabulary is vital, language learning is a multifaceted process that incorporates listening, reading, speaking, and writing. Further research should investigate the potential of Pocket Sign or equivalent apps in enhancing broader language competencies for deaf learners.

CHAPTER V
CONCLUSION AND SUGGESTIONS

A. CONCLUSION

This research evaluated the utility of the Pocket Sign software in enhancing English vocabulary knowledge and learning motivation among deaf students in grades 4, 5, and 6 at SLB Negeri Lutang. A mixed-method approach was chosen, using a pre-experimental one-group pretest–posttest design for the quantitative component and observation checklists and interviews for the qualitative component. The study was led by the ARCS Motivation Model to interpret students' motivation. The results demonstrated a substantial rise in students' vocabulary development after using the Pocket Sign app as described in the findings. This reveals that the Pocket Sign software effectively enhanced vocabulary growth among deaf children.

Integrating the visual, interactive, and sign language-based components of the pocket sign app into the technology-enhanced learning design fit the particular learning demands of the children, allowing them to process, retain, and apply English vocabulary in a meaningful and contextual way. Additionally, the study of students' motivation through the observation checklist and interview responses indicated that students demonstrated a high to very high level of motivation across all four ARCS components: Attention, Relevance, Confidence, and Satisfaction. The software was successful in catching the students' interest, giving knowledge that was relevant to their lives, building their confidence in studying, and generating a joyful and fulfilling learning experience. These motivational effects likely contributed to the cognitive gains indicated in the post-test results. In summary, the Pocket Sign app functioned not just as a pedagogical tool but also as a motivational support system, supporting

the value of assistive technology in fostering inclusive, engaging, and effective learning environments for students with hearing impairments.

B. SUGGESTIONS

Based on the findings of this study, numerous suggestions are provided for instructors, schools, parents, technology developers, and future researchers:

1. For Teachers

   Teachers of deaf pupils are urged to integrate visual and sign-based tools like Pocket Sign into their vocabulary training. These tools can make learning more accessible, participatory, and motivating. Teachers could also explore employing contextual themes (e.g., food, animals, daily routines) that relate directly with students' everyday experiences.

2. For Schools

   Special schools should promote the adoption of assistive learning technologies by providing the required infrastructure, training, and digital resources. Schools can also offer workshops or professional development sessions to familiarize educators with the appropriate use of apps created for students with special needs.

3. For Parents

   Parents have a critical role in reinforcing learning at home. They are advised to assist their children's learning by enabling the use of learning apps like Pocket Sign on shared devices and by engaging with their children to review vocabulary outside of the classroom.

4. For App Developers

   Developers of educational apps should consider upgrading the accessibility aspects of their products, including support for Indonesian Sign Language (SIBI), localized material, and offline use to address the special needs of deaf learners in different places.

5. For Future Researchers

To maximize the usability of the results, future study should employ a bigger sample size and integrate a control group. Moreover, subsequent research could investigate the retention of language gained using the Pocket Sign software over time. It would be good to explore the impact of assistive technology on other aspects of language development, such as sentence structure and grammar. Furthermore, evaluating the efficacy of Pocket Sign in relation to other educational tools or conventional pedagogical approaches inside special education environments could enhance our comprehension of its advantages.

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