Development of Computer Aided Instruction for Speech Impaired Individuals

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ABSTRACT

This study explored the issues and challenges encountered by speech-impaired individuals, highlighting the complex array of barriers impacting their social interactions, education, employment prospects, and overall well-being. This study isn't entirely about understanding, it's about empowerment, support, and building a better future for the speech-impaired community. The researchers utilized the Descriptive - Developmental approach that provides information about relevant variables without hypothesis testing. The researchers gathered the data through online mode via electronic methods in 50 respondents. This study identified key challenges in communicating with speech-impaired individuals, such as difficulty engaging with them, limited use of alternative communication methods, and low participation in learning opportunities. This leads to limited sign language knowledge among others, creating communication barriers. The study developed an application with its official name “Signbuddy” . It was evaluated about its effectiveness and found it significantly reduced these communication difficulties and serves as an educational tool and improvement of sign language skills, thus mitigating communication challenges.

Keywords: speech-impaired inclusivity sign language computer aided instruction capstone

INTRODUCTION

Nature and Background of the Study

Speech-impaired individuals encounter various challenges. It can range from difficulties such as effective communication, limited access to education and employment, barriers to healthcare, and inadequate support and resources, which may also lead to more drastic underlying problems such as stigma and discrimination, emotional distress, and social isolation. Based on a study conducted by Chapple (2019), Individuals with speech impairments are often subjected to marginalization within society. The probability of experiencing further marginalization increases when social workers who are responsible for helping these groups exhibit a lack of cultural awareness, encounter difficulties in communication, have inconsistent availability of translators, or hold misconceptions about culture. These challenges can significantly impact their overall well-being and inclusion in society, varying in severity based on individual circumstances and the extent of available support.

A problem that disability affairs offices commonly face is the difficulty of accommodating applicants within the speech-impaired spectrum. Most applicants are poorly accommodated because of the employees' inadequate understanding and familiarity with utilizing Filipino Sign Language (FSL) or American Sign Language (ASL). This problem can be similarly seen within the barangay offices. These offices tend to refer applicants to other offices within the local government units for better accommodation. Another factor is the lack of resources. Currently, there are no assistive devices or other necessary equipment to aid applicants.

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The said factors lead to a poor quality of accommodation for speech-impaired applicants. Poor quality of accommodation leads to extensive transaction periods and delayed assistance.

Understanding this community's experiences and challenges is a matter of empathy and crucial for spreading inclusivity, accessibility, and support systems that can enrich their lives. By recognizing these issues, the researchers came up with the idea of developing an innovative mobile application to address these challenges. This mobile application would serve as a sign language learning and communication tool that features learning modules and dictionaries of ASL and FSL.

This research explores the challenges the speech-impaired community faces, shedding light on the intricate web of obstacles that affect their social interactions, education, employment opportunities, and overall quality of life. By understanding these challenges at a deeper level, the researchers aim to pave the way for more inclusive policies, technologies, and societal attitudes that can empower and support this community on its journey toward self-expression and meaningful participation in our society. Through this exploration, the researchers would foster a greater appreciation for the resilience and determination of the speech-impaired community and contribute to a more inclusive and equitable world for all.

Researchers aimed to identify the strategies that can be implemented to address the issue of communication with speech impaired individuals and from these strategies the researchers developed an application for the speech-impaired individuals

METHODOLOGY

Research Design

Quantitative research focuses on quantifying attitudes, opinions, behaviors, and other defined variables and generalizing the results from a larger sample population by generating numerical data (Mohajan, 2020). The study was conducted under a Descriptive Developmental approach. The researchers used this approach which is a non-experimental type of approach, whereby a set of variables are measured using numerical terms; however, the variables under interrogation are not manipulated by the researchers. Descriptive designs focus on obtaining detailed information about relevant variables without the intention of testing specific hypotheses. To achieve this, the researchers utilized quantitative data gathering tools such as questionnaires that were distributed to the respondents, enabling structured responses to assess their perspectives and experiences. This quantitative method emphasized objective measurement and enabled the statistical, mathematical, and numerical analysis of data, to support the objectives of the study.

Research Locale

The study emphasized mainly in the community of Biñan City, Philippines. This community was thoroughly chosen due to the significant challenges, distinctive demographics, and academic settings. The respondents were selected properly with the help of Persons with Disability Affairs Office (PDAO) and Biñan Child Development Center (BCDC). The localized methodology certifies that the findings were not only relevant but also sensible and applicable to the specific challenges and opportunities faced by speech-impaired individuals and non-disabled individuals in this specific community.

Research Participants

Data in research comes from diverse sources, each chosen to address the research inquiries effectively. Primary sources involved questionnaires to gather data from the respondents. Secondary sources draw from existing knowledge archives such as published works, journals and articles.

In order to determine the results of the respondents, the researchers gathered the population of speech-impaired in Biñan City. As of 2022, there are 736 speech-impaired individuals residing in the City of Biñan. The researchers used the purposive sampling technique which is a non-probability sampling method. The

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue III March 2025

researchers selected certain and specific respondents that are suitable and appropriate for the study. It allowed the researchers to extract information from the data they had collected. This enabled the researchers to convey the broad impact of their results to the general public.

In this study, certain individuals who are fit to participate in this study were asked to represent as respondents. The researchers selected 30 speech-impaired and 20 non-disabled individuals from Biñan City as a basic criteria for the study. Overall, there are 50 respondents in the study.

Research Instrument

In this research, the researchers used survey questionnaires to collect essential data from the respondents. Questionnaire, as the primary tool for data collection. It was thoroughly examined to verify the reliability of the information presented by the researchers. The researchers utilized survey questionnaires to gather the necessary information from the respondents. The respondents answered a survey questionnaire in which consists of 10 questions for speech-impaired and 10 questions for non-disabled individuals. This was used to obtain the data and information that will be used in the study.

Data Gathering Procedure

In this study, survey questionnaires were mainly used to gather data from respondents who are speech-impaired and non-disabled individuals. The survey questionnaires consist of questions formulated by the researchers. The mode of survey is electronically administered through online survey forms. The data were collected through a series of structured questions that tackle the current situations of speech-impaired individuals, as well as how non-disabled individuals communicate and deal with speech-impaired. The internet presents a vast collection of information that can be utilized to collect data across various topics. The researchers also conducted online research using search engines and databases to retrieve academic papers, reports, government publications, and other relevant sources.

To effectively analyze the data and formulate conclusions, The choices of "Never," "Rarely," "Sometimes," "Often," and "Always" were used to help clearly define the frequency of the experiences and actions described in each question. The table includes a row for each question, identified by its question number. The researchers counted the responses from each survey question in a row, with separate columns for the responses from each group of respondents, and the total column that summarizes the number of responses to each question. Finally, the counts in each response category clearly demonstrate the distribution of responses from different respondents. This tabulation process allows the researchers to identify patterns and trends in the data, such as the frequency of accessing services, and the extent of support received from PDAO Biñan.

Ethical Considerations

The researchers are mindful of the importance of protecting the rights and interests of the respondents. To ensure informed consent, the researchers used alternative forms of communication, such as writing on a piece of paper, to explain the study and allow respondents to ask questions and clarify any points of confusion. To maintain confidentiality, the researchers used aliases and pseudonyms in the data and stored all personal information securely. All aspects of the research process will consider ethical principles such as autonomy, fairness, and justice. The researchers took care to minimize potential harm to respondents and disclosed any conflicts of interest. Finally, the researchers ensured the integrity of the data collection and analysis methods to accurately represent the findings.

The data collected by the researchers were handled and disposed of in accordance with ethical and legal guidelines. All paper documents will be securely shredded, and all digital data will be permanently deleted using secure wiping techniques. All equipment used in the collection and storage of data will be thoroughly sanitized to ensure the confidentiality of respondents and their information. The proper disposal of data in our study was of utmost importance and was carefully planned and executed to ensure the protection of sensitive information.

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RESULTS AND DISCUSSION

Strategies mitigating the challenges faced by speech-impaired individuals

The researchers conducted a survey through an online platform via google forms. The survey concluded with the respondents of 30 speech-impaired and 20 non-disabled individuals.

Non-verbal Communication of Non Disabled to Speech Impaired

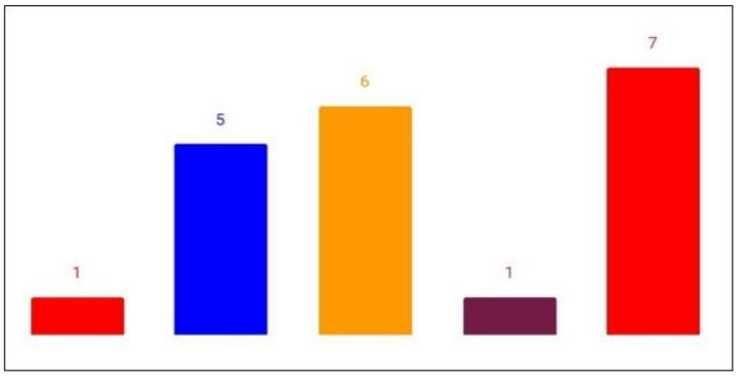

Fig 1. Integrating non verbal communication of non disabled to speech-impaired

The results of the survey showed that out of 20 respondents, 35% answered “Never”, 30% answered “Sometimes”, 25% answered “Often”, and 5% answered “Rarely” and “Always”. A connotation can be conceived wherein some portion of the respondents have in some cases used non-verbal communication, some used it more often to help in communicating with the speech-impaired, but a greater part of the respondents have not once used non-verbal communication.

The findings from the analysis of the responses to the question yielded a weighted mean average of 2.6, suggesting that respondents sometimes use non-verbal communication while engaging with those who have speech impairments. According to the research conducted by Upadhya et al. (2020), it was shown that individuals tend to favor sign language or visual means of communication over the use of written or printed forms when engaging with individuals who have speech impairments. It highlights the significance of having the knowledge or skills in utilizing sign language and obtaining access to formal sign language education since the use of sign language is heavily favored as the norm for communicating with speech-impaired individuals, and devising other methods would more likely lead to misunderstanding.

Visuals as Non Verbal Communication of Non Disabled to Speech Impaired

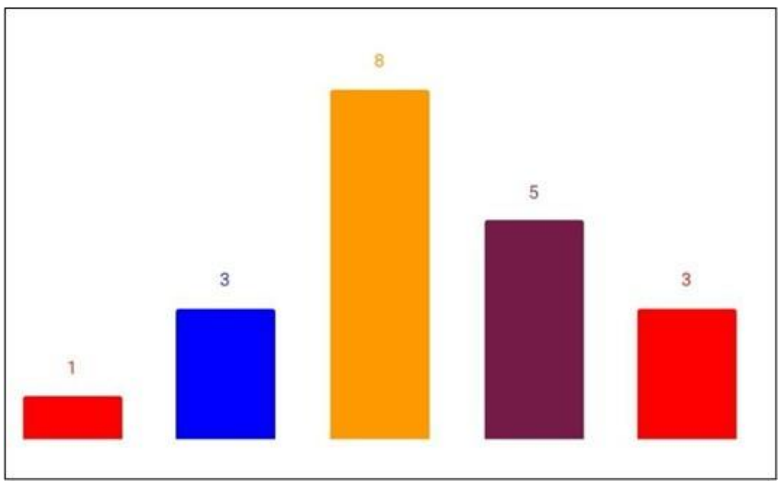

Fig 2. Use of nonverbal communication of non disabled to speech-impaired (e.g. Visuals)

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The figure representation above depicts that amongst the 20 respondents, 40% answered “Sometimes”, 25% answered “Rarely”, 15% answered “Never” and “Often”, and 5% answered “Always”. A notion can be implied that the occasional use of non-verbal strategies on interactions with the speech-impaired is prevalent amidst the majority of the respondents.

The findings from the analysis of the responses to the question produced a weighted mean average of 2.7. This value suggests that the participants sometimes utilize specific non-verbal techniques when engaging with those who have speech impairments. According to the research published by Upadhya et al. (2020), it was shown that while engaging with those who have speech impairments, people tend to favor sign language or visual means of communication over the use of written or printed forms. It is yet another justification of the importance of the use of sign language, since non-verbal communication mainly consists of gestures and body language, which is heavily harnessed by individuals with speech-impairment.

Learning Sign Language thru Mobile Application

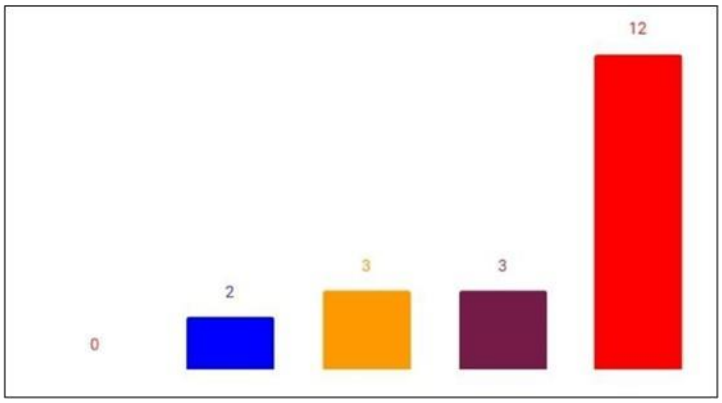

Fig 3. Use of Mobile Application for learning sign language

The visual chart above demonstrates that from the 20 respondents, 60% answered “Never”, 15% answered “Rarely” and “Sometimes”, and 10% answered “Often”. It can be seen that most respondents mainly never used an app to learn sign language, only a few responses have stated occasional or frequent use of apps to learn sign language.

The findings from the analysis of the responses led to a weighted mean average of 1.75, suggesting that the respondents generally exhibited rare usage of sign language learning applications. Following the research carried out by Siong et al. (2021), it revealed that the emergence of the need for an interactive mobile application for learning sign language is evident as the majority of participants in the study expressed a preference for video-based learning due to its enhanced dynamic and engagement compared to learning through photos and books.

Unique Hand Gestures

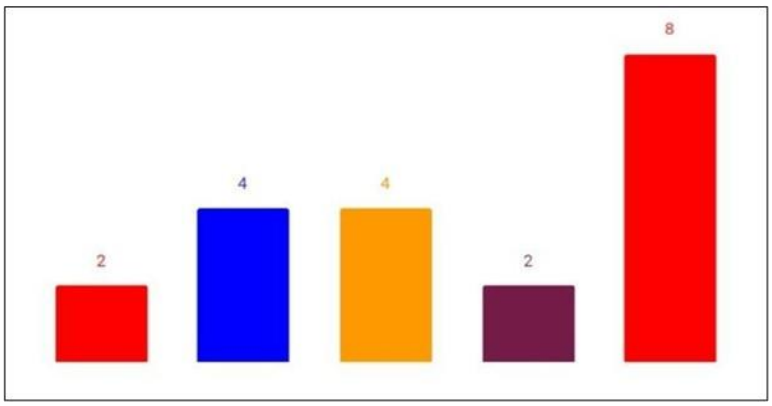

Fig 4. Use of Unique Hand Gestures in communicating with Speech-Impaired

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The information above shows the results of the responses from a total of 20 respondents. 40% answered "Never", 20% answered "Sometimes" and "Often", and 10% answered "Rarely" and "Always". It can be exemplified that the majority of the respondents did not use their own gestures or symbols when interacting with speech-impaired individuals.

The results gathered from the analysis resulted in a weighted mean average of 2.5. This value suggests that participants generally tend to rarely use their own non-verbal cues and symbols while interacting with those who have speech impairments. Upadhya et al. (2020) conducted a study that revealed a preference among individuals to utilize sign language or visual modes of communication when interacting with those who have speech difficulties, as opposed to written or printed forms of communication. This research study presents tangible evidence of the use of sign language in communicating with the speech-impaired.

Assistance of Sign Language Interpreters

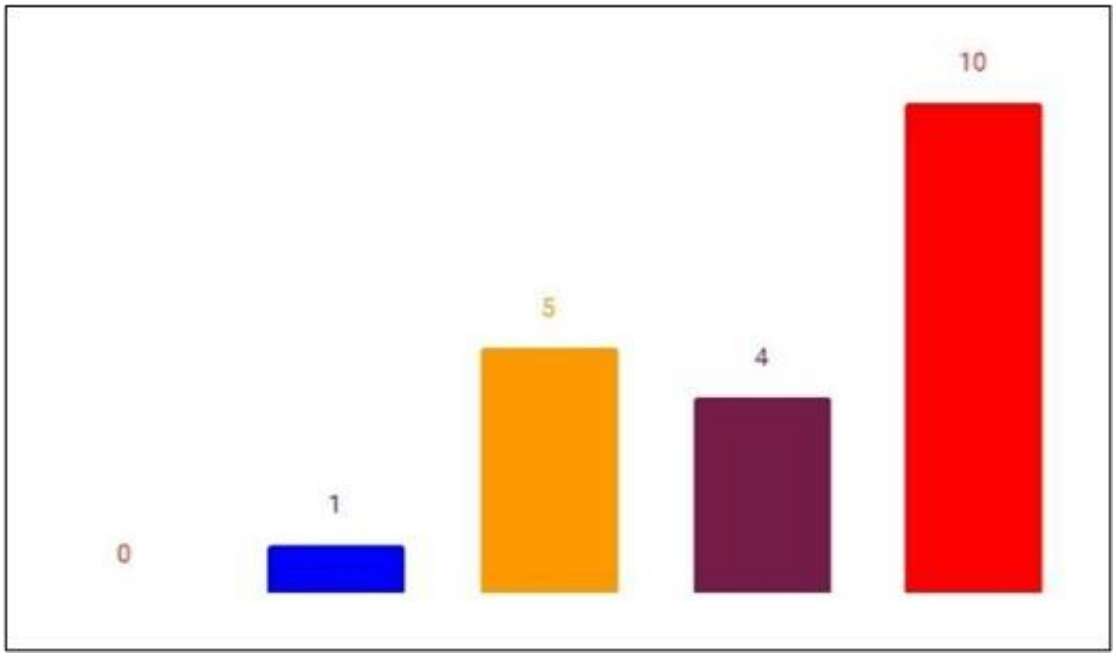

Fig 5. Assistance of Sign Language Interpreters in communicating with Speech-Impaired

The figure above presents the responses of 20 respondents. 50% answered "Never", 25% answered "Sometimes", 20% answered "Rarely", and 5% answered "Often". A conclusive observation can be inferred wherein the greater part of the respondents on no accounts seek the help of sign language interpreters to help them communicate with individuals with speech-impairment.

Findings from the analysis of the responses results in a weighted mean average of 1.85, suggesting that participants usually tend to rarely seek support from sign language interpreters while engaging with those who have speech impairments. According to the study conducted by Chapple et al. (2019), the probability of experiencing further marginalization is heightened when social workers who cater to these populations show a lack of cultural sensitivity, encounter difficulties in communication, have inconsistent availability to interpreters, or hold misconceptions regarding culture. This study provides evidence for the concerns on the lack of interpreters readily accessible for everyone. It is problematic as practitioners of sign language are vital for promoting sign language learning.

Development of an Application for Speech-Impaired Individuals

The following are the main features of the proposed and developed application for speech-impaired individuals

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Fig 6. Welcome (Landing) Page

Fig 7. Lesson Page

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Sign Language Lessons is a key feature of SignBuddy, offering various instructional content on FSL and ASL such as Alphabet, Numbers, Animals, Colors, Family, and Greetings. Users can easily access these lessons by tapping the desired category, followed by a series of activities within each lesson. Notably, users progress through the activities sequentially, being able to access the next only after successfully completing the previous one. The activities involve introducing a specific letter or word, accompanied by instructional images or videos. Users engage in multiple-choice tasks, selecting the correct letter, word, or image corresponding to the given question. Additionally, there are straightforward Yes or No questions. The design emphasizes repetition, with errors prompting a restart of the activity until successfully accomplished. The structured and interactive nature of these lessons aims to facilitate effective learning in sign language through engaging and repetitive exercises.

Fig 8. Other Features of the System

In the Sign alphabet, the user can tap any specific letter of their choice. Upon tapping their desired letter button, the application responds by dynamically presenting the corresponding image of the hand sign associated with that particular letter. The finger spell feature allows the user to type in a word they want to fingerspell, and upon typing the desired word, they can proceed by tapping the “Translate to Sign” button. Subsequently, the application dynamically generates and displays the corresponding fingerspelling of the entered word, presenting a visual representation of each letter through sign language gestures. Lastly the Word Fusion feature allows users to explore and understand sign language by combining two specific words within the application. The user can type in two words of their choice. Once the user has inputted the desired pair of words, they can proceed by tapping the "Search Sign" button. The system then initiates a dynamic process, combining the selected words and presenting the corresponding hand sign of the two specific words.

CONCLUSION

The studies supporting the current situation of speech-impaired individuals without knowledge or skills in sign language are consistent with previous research, particularly Patil et al. 's work highlighting the

challenges faced by those with speech impairments in participating in communication that is customized to their particular needs. In addition, Singh's ASEAN research project report emphasizes the structural obstacles that hinder inclusive education, specifically pointing out gaps in support systems and governmental initiatives. These combined observations indicate a need for extensive measures that address obstacles in communication, promote inclusive settings, and advocate for strong governmental backing to enhance the well-being and opportunities of individuals with speech impairments in the community.

The findings also emphasize a preference towards sign language or visual methods of communication, as highlighted in the studies conducted by Upadhya et al. This preference corresponds to the difficulties encountered by those with speech impairments, highlighting the importance of promoting better education in sign language and having access to skilled interpreters to facilitate effective communication. Moreover, the lack of involvement in official sign language courses and the absence of participation in seminars or programs dedicated to sign language learning indicate the presence of obstacles that hinder inclusive communication practices. These findings highlight the urgent need for improved access to technology-based learning platforms, greater awareness, and broader educational efforts to facilitate effective communication with individuals facing speech-related difficulties.

Lastly, the research conducted by Battistoni et al. highlights limited proficiency in sign language among non-deaf individuals, which may result in communication barriers for the deaf community. Furthermore, the research conducted by Siong et al. and Auqui et al. emphasizes the significance of incorporating Information and Communication Technologies (ICTs) into sign language teaching. This integration provides interactive and captivating learning opportunities, primarily through video-based platforms. The findings underscore the urgent need for increased awareness, assistance, and implementation of technology-driven methods to enable accessible and efficient sign language learning opportunities. This will promote inclusivity and boost communication accessibility within communities, benefiting speech-impaired and deaf individuals.

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