Asian
Journal of Instruction
Asya Öğretim Dergisi

2019, 7(1), 54-63

dergipark.gov.tr/aji
ISSN:2148-2659

Accepted: 26/06/2019 Published: 31/06/2019

Implementation of Malaysian Hand Signal Codes into Applications for the Hearing Impaired

Diyana Kamarudin[1], Yasmin Hussain[2]

Abstract

Hearing-impairment is one of the topics within special education. This disability is one of the factors contributing to difficulty in learning. Unable to effectively communicate is one of the reasons why employment continues to be an elusive goal for people with disabilities. In Malaysia, the Bahasa Melayu subject is compulsory and utilizes Bahasa Melayu Kod Tangan (BMKT), which deaf children have a harder time grasping. They are used to the informal communication, using Bahasa Isyarat Malaysia (BIM). Creating a teaching-aid to translate and back translate between BMKT and BIM would help deaf children adapt better in class, thus improve their communication and learning ability. This research was a preliminary study on getting information from subject matter experts on what they need and what should be implemented into the teaching tool. Two themes were derived from this study, which are students not being able to grasp Bahasa Melayu and technology as a teaching aid. Two subtheme were found for students not being able to grasp Bahasa Melayu are short attention span and BIM as support. A subtheme was found under technology as a teaching aid which is used materials from other sources.

Keywords: Bahasa Melayu Kod Tangan, Bahasa Isyarat Malaysia, technology, education, deaf students

1. Introduction

Hearing impairment is one of the topics within special education. This disability is one of the factors contributing to the difficulty of learning in school, which could result in these students being left behind, which could also lead to societal problems later on. Understanding the hand signals or codes is extremely important as this is the main way of communication in class. Not understanding of the sign language could lead to problems for the students as all the teachings would be conducted in sign language (Wilbur, 2013). Studies have also shown that deaf children who were not provided with sign language early on in their development are at risk for linguistic deprivation (Humphries, Kushalnagar, Mathur, Padden, Rathman & Smith, 2016).

To the hearing impaired, sign language is one way of communicating with others that are used within their community. Signing has been said to be the most effective form of communication for the hearing impaired, compared to other modes of communication. Signing could be used by people who have hearing problems, those who cannot talk, and those who have problems with talking (Wilbur, 2013).

[1] Dr. Diyana Kamarudin, Head of Program, University Malaysia Pahang, yanakamarudin@ump.edu.my
[2] Dr. Yasmin Hussain, Ministry of Education, Special Education Division, Malaysia, yasmin.hussain@moe.gov.my

1.1. The Importance of Sign Language (SL) for Deaf People

In our everyday lives, we use our hands to express our feelings through gestures. Deaf people use their hands to communicate and express their feelings through sign language. Sign language helps to bridge the gap between the deaf people and those who can hear. Using a collection of hand gestures and symbols, sign language is an effective means of communication that provides the deaf and those hard of hearing a way interact with the world around them. According to statistics, over 120, 000 deaf adults and about 20,000 children in the United Kingdom use sign language to communicate with other people. Additionally, Gallaudet University (2017) conducted research on the number of deaf people in the United States and found that out of every 1,000 people in the United States, 37 to 140 people would have some form of hearing loss. Therefore, sign language is needed for deaf people to be able to effectively communicate with people surrounding them, and enables deaf people to communicate with hearing people who are not familiar with sign language. Sign language, thus, is also used by their families and relatives as well as sign interpreters.

Sign language is a combination of movements and gestures which are used in place of the spoken word to convey meaning. Sign language combines hand, arm, body and facial expression to express the deaf people's ideas just as spoken language expresses the speaker's thoughts. Sign language is most commonly used by a deaf person or a person who cannot speak, and it is the main way for individuals in the deaf community to communicate with each other. Simply put, ear is to hearing people as eye is to deaf people where they need it to access to their own languages, and develop literacy skills via different means (by eye or by ear). Each sign language has its own distinct vocabulary and grammar, where the deaf community of a particular country and region use it to express their own unique culture (Debbie, 2014).

In America, sign language is referred to as American Sign Language (ASL), but it goes by different names in other countries. For example, in Britain, it is Britain's Sign Language (BSL). Every word has its own unique sign in each country, similar to other languages around the world. ASL is a complete, complex language that employs signs made by moving the hands combined with facial expressions and postures of the body. It is the primary language and the visual language used by many North Americans and Canadians who are deaf or hard-of-hearing. To note, the National Association of the Deaf (NAD) calls ASL as the "backbone of the American deaf culture". Furthermore, ASL is built upon a wide ranging vocabulary of signs that represent specific concepts, and it enable people to express themselves visually opens up many opportunities for deeper meaning and emotional expression in their statements. Every sentence looks like art. It also opens up the opportunity to be introduced to deaf culture, which is such a beautiful culture with a rich history and vibrant present. Additionally, approximately less than 10% of Deaf children are born into a culturally deaf home, thus sign language plays a major role in developing deaf identity. Deaf community is the "home" for deaf people, so when sign language is removed unjustly from a deaf people, it's the community that suffers and the deaf people undergoes double oppression.

Although the United Kingdom and the United States share English as the predominant oral language, BSL is quite distinct from ASL. BSL is a complete language that has a unique vocabulary, its own construction and grammar, which is different from English. To note that many children will be fitted with hearing aids or cochlear implants soon after they are identified as deaf, giving them the opportunity to develop spoken language. However, using BSL can help deaf children in understanding speech and can also be particularly useful at times when a deaf child is not using hearing aids or cochlear implants, such as before their hearing aids or cochlear implants are fitted; whilst establishing consistent use of hearing aids in the early years; at bedtime, bath time and when swimming. For some deaf children, it may be natural to stop using

sign language as their spoken language develops. However, for many deaf children, sign language remains their primary means of communicating, or retains an important role in their lives (Word Federation of the Deaf, 2016).

Deaf people are just like everybody else, except that they have a hearing impairment (Word Federation of the Deaf, 2016). The use of sign language technology such as voice recognition module, which relates to conversion of sentence to fit the grammar of sign language, and sign recognition, which refers to the automatic machine translation system to create spoken language translation, can greatly help deaf people in interactions and learning. Moreover, applications including video chat software, online dictionaries, speech-signal translators, automated sign language generation system, and smart phone applications, can help the Deaf as well. For example, popular video chat apps such as Facetime and Skype are useful for communicating via sign language and lip reading. Another example of application is Transcense, an application currently in development, where it will transcribe conversations with multiple participants in real time. Group conversations are especially difficult for deaf and hard of hearing people, who have a much easier time one-on-one using sign language or lip reading. The Transcence application, when installed on several mobile devices, essentially turns them into a distributed microphone system. It transcribes multiple voices simultaneously and assigns each speaker a different colour bubble in a single scrolling readout (Meadow, 2005).

However, the major barrier in using ICT for deaf people is the assumption that English/Hindi/State language is their first language, and their capabilities are often measured against understanding the written word. In fact, the most effective ICT for the deaf is visual rather than based on the written word or sound. This is because text message are limiting since it does not convey emotions, voice inflections or body language. For example, the smart phones with front-facing cameras for videoconferencing can be used for video chat but are too much of a bandwidth hog. Suggestions for future directions in helping the Deaf such as development of the sign language sign set; development of software for converting Hindi/regional language words to sign language through online dictionary; interactive learning software using the NBT book series for shapes, measures, colours, time, money for 2-3 year olds; newspaper and adult education for Deaf adults; video transmission over both 3G and Wi-Fi networks at a very low bit rate; optimization of compressed video signals by increasing image quality around the face and hands to bring data rate down (Meadow, 2005).

To sum it up, there is no doubt that if t deaf people are to communicate effectively with hearing the world, he/she must acquire facility in speech, speech reading and writing. Moreover, if the people is to communicate effectively within the Deaf community, he/she must acquire both receptive and expressive facility in fingerspelling and sign language (Meadow, 2005). The use of technology can greatly help both the deaf community as well as the hearing people. Today, smartphones, tablet computers and various apps let deaf people and hard of hearing people do almost everything the hearing community does, from ordering pizzas to calling Uber drivers.

1.2. Signing in Malaysia

Sign language used by deaf people have their own grammatical structures unlike those to the spoken ones (Grove & Woll, 2017), which shows why students have a harder time processing the formal sign language in class, which utilizes Bahasa Melayu Kod Tangan or BMKT, as they are used to Bahasa Isyarat Malaysia. Bahasa Isyarat Orang Pekak (BIOP) or Bahasa Isyarat Malaysia is the informal way of communication between teachers and students. Bahasa Melayu Kod Tangan or BMKT is the code used by teachers to construct sentences using formal Malay language (Yusoff & Mohamed, 2004). In order to fully utilize this code, teachers and students need to have a good understanding of the topics and subjects. BMKT is the formal language of

use in school because it conforms to the nouns and pronouns found in regular sentence structure, which also conforms to reading text. Nowadays understanding of written text is extremely important and crucial ability that children would need to acquire. This is because deficits in reading comprehension would have negative consequences in their future (Potocki, Sanchez, Ecalle & Magnan, 2015). Studies by Potocki et al. (2015) have also found that one of the main reasons why students have a hard time understanding written text is because they are unable to decode those texts.

Researchers have found that there is a huge difference in the way deaf and hearing student's process information (Marschark, Leigh, Sapere, Burnham, Stinson, Knoors, Vervloed & Noble, 2006). It is important for teachers to know what type of method is suitable to teach students with hearing impairment or deaf children as this affects their future, but there little known on the best method to use in teaching these students (Marschark et al., 2006). Being able to communicate through reading and writing is challenging, especially to those with sensory impairment (Abdullah & Eng, 2012). It is not easy for hearing impaired students to read as these require certain skills along with them, such as being able to recode certain written symbols into correct sounds or the proper signing (Holmer et al., 2016). These skills are especially crucial when it comes to employment (Abdullah & Eng, 2012). Not being able to effectively communicate is one of the main reason why employment continues to be an elusive goal for people with disabilities. A study conducted by Abdullah and Eng, 2012 also found that there is a higher number of unemployed compared to the employed, where the unemployed have rated their reading skills as very weak. This could be due to the fact that there are different hand signal that they need to master, such as the American Sign Language, Bahasa Melayu Kod Tangan, and Bahasa Isyarat Malaysia (Abdullah & Eng, 2012). Deaf/ hearing impaired students also have a harder time grasping abstract concepts, and have limited cognitive ability to understand what was taught (Zainuddin, Zaman & Ahmad, 2010).

Abdullah and Eng's (2012) study found that those who were employed had a higher rate in reading, writing and communicating. This is due to the fact that people with hearing impairment depends on their other skills as there are no or very little auditory information that could be processed. When people with hearing impaired have better writing skills, they are better equip at communicating with others such as through social network. The study also found that better communication skills would benefit the hearing impaired by connecting them to other successful people with the same condition and learn to better themselves (Abdullah & Eng, 2012).

Sign language were found to be an extremely important communication tool for people with hearing impairment, as they prefer to sign over writing. In Malaysia the main signing used in schools is the Bahasa Melayu Kod Tangan (BMKT), which is similar to Sign Exact English when it comes to learning the English language (Zainuddin et al., 2010). Outside of the classroom though, students with hearing impaired very rarely use BMKT, as there are a lot of nouns and pronounces. These students prefer using the Bahasa Isyarat Malaysia (BIM), where everything is simplified (Zainuddin et al., 2010). This creates a conflict in understanding for these children, as nouns and pronouns are not present in BIM.

Studies have found that deaf students learn significantly less than those of hearing children. This is because deaf students do not comprehend as much from lectures (Marschark et al., 2006). Marschark et al., 2006 argued that lectures and class structure are more in tuned with hearing children compared to deaf children, as the learning styles of deaf children are quite different to those of hearing children. Trussel and Easterbrooks (2017) also mentioned that deaf students constantly need to struggle to attain grade equivalent grades and that interventions are almost always needed to help these students. Now, more and more technology has emerged to help deaf

children in learning, as more deaf children has been integrated into the mainstream classrooms. Students have reported that there is more understanding in real time captioning compared to interpretations. Students have also reported that it is quite hard for them to process things that are quite fast, compared to if they were able to control it themselves (Marschark et al., 2006). A study by Francisco, Groen and McQueen (2017) found that there is a relationship in audiovisual processing to reading in an intervention program, showing that an application utilizing visual could help improve deaf student's understanding and help with their reading abilities. This would prove to be useful when the learning materials are implemented into applications.

1.3. Problem Statement

There has been very little studies (Abdullah & Eng, 2012) conducted on hearing impaired students and their achievement in Malaysia. According to the Labour Department of Malaysia, there are 31,377 people with hearing impairment that have registered under them for 2016 (Labour Department of Malaysia, 2017). The number of people with hearing impaired being employed is also significantly lower than those who have completed school, which shows that not many people with hearing impaired are recruited into the workforce (Yusof, Yasin, Hashim & Itam, 2012). A study by Abdullah and Eng (2012) have also found that there is a correlation between those employed and those who have a higher understanding of both BMKT and BIM sign language usage.

In Malaysia, the Bahasa Melayu subject is a compulsory subject for students. This is because in order for them to obtain their Sijil Pelajaran Malaysia (SPM) or General Certificate of Examination, they would need to get a passing grade in the Bahasa Melayu paper in order for them to pass the SPM (Yusoff & Mohamed, 2004). Deaf or hearing impaired children in Malaysia not only have to master the other subjects, but would also need to master the codes for Bahasa Melayu subject as well. Linguistically, deaf children have a harder time grasping Bahasa Melayu which uses Kod Tangan Bahasa Melayu (BMKT) as they are used to the informal way of communicating, using Bahasa Isyarat Malaysia (BIM) (Yusoff & Mohamed, 2004). As a result of this, deaf children in Malaysia do not perform as well in their subjects due to not fully understanding the uses of nouns and pronouns found in BMKT compared to the BIM, where there is no noun or pronouns.

Teachers teaching the Bahasa Melayu subject using Kod Tangan Bahasa Melayu (BMKT), sometimes would have a harder time explaining to students what certain words are if students do not understand affix words. Teachers would then need to explain to students what certain words mean in order for them to transition from Bahasa Isyarat Malaysia (BIM) to BMKT as it is a new body of language and the combination of both languages is a new product, where teachers would need to spend a huge chunk of their time. This fundamental study would take into account the problems students have in transitioning between the two sign language to develop a theory of linguistic transition for deaf/hearing impaired children.

This study is the first phase from a three face design. It looks for problems that teachers and students face before creating a teaching tool that has functions to explain meanings of BMKT words into BIM, and vice versa. It also looks at what teachers and students (end users) need in the application. The tool can help teachers by saving them time as students would be able to use this teaching aid themselves, giving teachers more time to focus on student learning in the classroom and also giving students the confidence to interact socially as they would be able to communicate on their own (Abdullah & Eng, 2012).

The purpose of this study is to explore the problems that teachers and students are facing now within the world of hearing impairment in classrooms and examine the features that would be

required of the product development in the form of an android and iPad application for Kod Tangan Bahasa Melayu and Bahasa Isyarat Malaysia. The significance of this study is that by creating an interactive teaching tool, hearing impaired children would be able to adapt better to the classes, making them feel more comfortable and confident in what they are doing, thus improving their ability not only in terms of the Bahasa Melayu examination, but also in their communication skills.

The research question that guided this study are:

- ✓ What components should be implemented into creating the application?
- ✓ What are the problems that teachers, parents and hearing impaired students face with Kod Tangan Bahasa Melayu and Bahasa Isyarat Malaysia?
- ✓ What sort of functions for the teaching tool would be useful for teachers, parents and hearing impaired students?

2. Methodology

There will be three phases to this study, where phase one involves utilizing qualitative methodology to understand what is lacking and how building a teaching tool can help teachers, students and parents of the hearing impaired. Observations, semi structured interviews, focus group interviews and market research workshop were conducted for the participants. Phase two will involve the creating the teaching tool, based on the findings from phase one. Phase three will be the implementation phase where data would be collected from six different schools to see whether or not there is a significant difference in student's Bahasa Melayu achievement. This research would only focus on phase one and phase two.

2.1. Research Design

This is a qualitative research, utilizing the grounded theory approach where it looks to understand the process of what is needed for deaf children to succeed in school, and it also looks at the overarching theme, where the researchers would like to create an application to help deaf children in school. Utilizing grounded theory approach, the researcher is able to see what components could be inserted and utilized into the application from collecting data from subject matter experts (Kamarudin, 2017).

2.2. Research Group

As this research utilizes qualitative research, purposive sampling was chosen as the sampling method of choice. This is because purposive sampling allows the researcher to select the participant based on those who are subject mater experts and are able to yield relevant information to the researcher. The sample or participants of this research were teachers of special educational needs, the subject matter experts of special educational needs such as lecturers of special education, and the South East Asian Ministers of Education Organization Regional Centre for Special Educational Needs (SEAMEO SEN) and the Malaysian Federation of the Deaf (MFD).

2.3. Data Collection

Observations, semi structured interviews, focus group interviews and market research workshop were conducted for the participants. Some teachers were more comfortable with one on one interviews, whereas others were more comfortable being interviewed as a group. There was also a focus group interview with the lecturers of special education, teachers of special education,

SEAMEO SEN and the MFD. Existing data were also examined such as the existing tools available today and how it was used and perceived. Existing books and other relevant materials for the deaf were also examined.

2.4. Trustworthiness

As this was a qualitative research, reliability and validity were not measured for this particular research. Instead, four trustworthiness which are credibility, transferability, conformability and authenticity was utilized due to the naturalistic nature of the research (Mertens, 2005). Credibility is when there is saturation in data collection (Kamarudin, 2017). This was achieved when the research utilized a triangulation method, looking at the research from multiple different angles. It was also achieved when semi structured interviews were used to prompt for deeper understanding of the topic. Transferability is similiar to generalizability in quantitative research, but rather here, it is how one study could be replicated to another study (Shenton, 2004). This is achieved to in depth description of the data collection method and sample inclusionary criterias. Conformability shows that the data and themes found from the study are not a figment of the researcher's imagination, but rather it came from the data and that it could be traced back (Mertens, 2005). Here, the themes are linked to the original data where chunks of the interviews are lifted from the transcriptions. Authenticity is when there is a balanced view of the research, and that the researcher controlled for bias during data collection and analysis (Kamarudin, 2017). During this research, while conducting observations, the researcher practiced epoche or bracketing, where they separated out what they "see" to how they "feel" when jotting down observation notes.

3. Findings

To analyze the data, manual thematic coding were conducted on the transcriptions of the interview sessions along with the market research workshop. Participant interviews were arranged as a case by case, to lift out "chunks" of data. Then salient points were extracted from the chunks before coding were implemented to start analyzing (Creswell, 2007). Salient points were then put into groups, before the groups were named. The names of the groups were then used as the new salient points to put into new groupings. This is to compress the data into as little as possible to extract themes. Two themes were derived from this study. In descending order the two themes are *students not being able to grasp Bahasa Melayu* and *technology as a teaching aid.* Two subtheme were found for *students not being able to grasp Bahasa Melayu* are *short attention span* and *BIM as support.* A subtheme was found under *technology as a teaching aid* which is *used materials from other sources.*

From the data, a majority (90%) of the teachers describe their students as not being able to understand what they are trying to teach. Some teachers attributes this to the non-standardize usage of language that students use at the initial stage of study. They also relate this to students having a short attention span where they would remember certain things when being taught, and forget it the day after. Most of the teachers who attended the interviews collectively agreed that they use BIM as a support language to help explain certain concepts.

All (100%) of the participants agreed that having technology as a teaching aid would help them tremendously. Four teachers described how they sometimes switched on the computer and this would help gain student's attention more. Students are also more likely to remember what they see on the computer to what the teachers have taught or the books they were asked to read. Five teachers talked about how they looked for materials online to help them teach the class and the one that they liked to use was a website from Brunei, which is insufficient as it is not proper Bahasa Melayu. The teachers talked about how having technology could not only help them

with lessons in class, but could also encourage parents to utilize the technology at home with their children.

In the workshop conducted, a majority of the participants agreed that an application for the special education children is needed, but the functions needs to be specified and that it should suit the purpose. One of the findings were to have communication sentences integrated into the application where students would be able to structure sentences and not just understand what one word meant.

4. Discussions and Recommendations

From the preliminary study, it was found that there is a need for a teaching tool to supplement in class teaching as teacher are short of time to explain and elaborate words to students. During the observations, one of the techniques used by teachers to have students remember words were to copy of the dictionary words to help them understand better, but was ineffective and that teachers mentioned that technology usually get the student's attention. In order for special education to keep up with the technological era nowadays, the study found that it is quite helpful to create applications with multiple functions and features to help engage students such as short stories, a translation feature to translate between the two hand signal codes, game functions to help them with learning and make it enjoyable were some of the features that were suggested to implement into the application. The findings in this research were in line with some other special educational research on integrating technology in the classroom such as Anderson and Putman (2019) research where they found that implementing technology in special education classroom offer differentiation, making learning fun for students with special needs, although there are benefits and challenges to using technology that teachers would need to get used to. Their study found that there were higher engagement and motivation in class when using technology (Anderson & Putman, 2019).

Research in early childhood also advocates for the use of technology as a teaching aid in the classroom, as technology were found to increase children's academic performance (Brown & Englehardt, 2018). iPads were among the technologies used in the classroom. It was also used as a reward factor to those who behave. It was also to make learning fun for the students, which was similiar to what the current research found. Ludlow (2001) mentioned in their study that it was extremely important for teachers of special needs to learn and know how to use assistive technology in the classroom. This is because technological innovation has impacted our daily existence, that it would be quite difficult for a child or student to learn without using technology. Ludlow (2001) also mentioned that there are benefits and drawbacks with these assistive technologies. Teachers might be too dependent on technologies that there could be less hands on applications, or interactions. As a recommendation, it is important to use assistive technologies in the classroom such as applications, on the laptop, iPads, or mobile phones to keep students interested in the course content, but it is also important that there are hands on approach, as to not bore students with too much technology. Alternatively using technology with interactive teaching in class could help foster student teacher interactions better.

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