

# **MALAYSIAN SIGN LANGUAGE (MSL) DICTIONARY FOR HEARING IMPAIRED CHILDREN IN MALAYSIA**

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## **Abstract**

Learning process for hearing impaired (HI) children is different from the normal children. The required communication medium is also different. They used nonverbal communication such as sign language to communicate with others. Hence, hearing impaired children need to have hearing aid devices to amplify and modulate sound to help them listening. Besides, their learning problems are mostly due to specific learning methods and using techniques that are less effective in enhance their understanding, often associated with their performance in their learning. In order to enhancing their learning and communication using sign language, a tool such as sign language dictionary is required.

Accordingly, developing a sign language dictionary application is important because the number of hearing impaired children who need assistance in improving their skills of using sign language. Therefore, the research investigates the issues related to HI tool support / sign language learning tools and explores the elements of learning sign language for HI children. Besides that, the research increases the features of the sign language dictionary and evaluated its effectiveness.

This research provides the platform with the criteria such as sign language video for words and example sentence, present of real voice, use of features such as colour and font have been considered. This learning dictionary is able to meet the requirements of the hearing impaired community and thus, can be applied as teaching aids for teachers, especially for integration schools which hearing impaired students and normal students learn together. In addition, this dictionary can help normal people learn sign language to communicate with HI people.

**Keywords:** Hearing Impairment, Sign Language, Dictionary

## **Introduction**

Communication that includes voice and sound is a fundamental requirement in the process of human interaction. Hearing is the ability to hear voice and sound through the vibration that occurs in the ears that translate sound into a form that allows the brain to understand (Hudspeth et al., 1989; Harris, 2002). Frequently asked to repeat the words being spoken, having difficulty in following instructions and frequently misunderstanding of such information are the symptoms that should be taken seriously because that person may have a hearing problem. Hearing problem can occur not only amongst adults, but might happen to children as early as newborn.

Hearing loss may be due to many different factors. A hearing loss can be categorized in three major types: i) Sensorineural hearing loss, ii) Conductive hearing loss, and iii) Mixed hearing loss. Sensorineural hearing loss involved damage to the structure inside the cochlea (sensory part) or hearing nerve (nerve part), conductive hearing loss caused by damage or blockage in the outer and/or middle ear and mixed hearing loss is a combination of sensorineural and conductive hearing loss (Moore, 2007).

Hence, hearing impaired people need to have hearing aid devices to amplify and modulate sound to help them hear or need to learn a non-verbal communication medium such as sign language to communicate. Indeed, to enhance their learning and communication using sign language, tool such as sign language dictionary is required.

HI children often associated with their ability in studies. This is due to specific learning environment, learning methods and learning tools that are less effective in enhancing their understanding. Learning process is also the requirement to be considered to ensure the children future. HI children have no exception to get a quality education as other children. In contrast to normal children, learning to mastery knowledge is an important aspect to HI children because it is an unmitigated problem in terms of their proficiency language and speech (Kennedy et al., 2006).

As stated by Briggie (2005) living in the normal surroundings is a factor that delayed the language learning of children hearing impairment. Besides, the lack of knowledge to use effective techniques and teaching aided tools amongst teachers is another factor contributing to this problem.

Teachers must use various types of strategy and technique to educate the HI children. The main technique commonly used during the learning process of these children is using sign language.

Sign language is a gesture where people use hand language, movement and facial expression in communicating (Stokoe, 2005; Solina et al., 2001). Another technique is written / drawing language that can be used to enhance the understanding while communicating (Kim and Gilman, 2008).

Futhermore, they also can use visual aids as a technique to visualize speech and audio (Watanabe et al., 2000). There are various types of speech and audio that include human interaction / communication or technical devices such as telephone, television

and alarm signal. But, they mostly prefer to use projector to display a large-scale visual of picture and text in visualizing ambient sound (Matthews et al., 2005).

Besides, face detection component that consists of face, tongue and teeth display in computer interface of system developed to visualize speech help HI children to enhance their understanding (Beskow et al., 2008; Hong et al., 2010).

Aware that education is an important requirement in life for all children including HI children, Malaysia government has set up special education schools which include of primary, secondary and vocational schools for the students with hearing impairment. They can also can be placed in the integration programme in the mainstream schools (Ali et al., 2006). This programme to provide proper education for hearing impaired children.

Recently, there are a small number of sign language dictionary developed due to this problem in Malaysia. The tools that are developed basically to facilitate the hearing impaired children in gaining knowledge of Malay Sign Language. The use of multimedia elements such as graphics, sign language, animation and attractive interface can facilitate understanding of hearing impaired children in their learning (Savita and Athirah, 2011; Lim, 2008).

Most of the tools focusing on the sign language to display words entered in animation and medium are in either Malay or English. Problems occur when the sentence of the word entered are not displayed in sign language. This will be difficult to the user, who does not understand some words used in the program. Audio is also an important element should be provided with the application. The user such as normal person or mild hearing impaired person can get the benefit of the voice to improve understanding and skills from the program developed.

Therefore, there is still a need to have an improvement from the existing program with additional selection of searching types, present of sign language for sentence and audio. This improvement will make it easier for users to understand sign language. These elements will be the major focus of this research.

The objectives of this research are to explore the elements of learning sign language for HI children and to increase the features of the sign language dictionary and evaluate its effectiveness.

### **Hearing Impairment and Sign Language Dictionary Development**

Nowadays, technology developers in various disciplines have carried out a number of researches and studies to develop or improve products to meet the requirement of disabled community. One of the studies is the development of sign language dictionary for hearing impaired student to learn sign language. In developing sign language dictionary, the elements that have been concerned about are sign language display type, multimedia elements used such as animation, video and picture.

#### *Overview of Hearing Impairment (HI)*

HI and deafness are often associated with problems which related with hearing. However, there is a major difference between these two hearing problems. HI refers to

the obstacle in fully hearing sound through one or both ears while deafness means a total loss of hearing for any kind of sound (WHO, 2012).

There are people in every country in the world who have hearing problems. Malaysia is also facing this problem. According to Social Welfare Department of Malaysia (SWDM) statistics, the number of hearing impaired individuals registered with SWDM increases every year. There are in average of 5% to 10% hearing impairment rise every year in Malaysia which 14,266 registered as HI (SWDM, 2012). Children do not exempt from being exposed to the hearing problems started as early as newborn. Today, the sophisticated of medical technologies are able to detect hearing problems among children.

#### *HI Student Learning Process*

Learning process is an important requirement to ensure the children future. HI children have no exception to get a quality education as other children. In contrast to normal children, learning to mastery knowledge is an important aspect to HI children because it is an unmitigated problem in terms of their proficiency language and speech (Kennedy et al., 2006).

This statement is supported by Briggles (2005) stated that children who have hearing problems require a different technique of language learning because it depends on their surroundings, especially at home. Educators must use various types of strategy and technique to educate the HI children. The main technique commonly used in sign language learning is a gesture where people use hand language, movement and facial expression in communicating (Stokoe, 2005; Solina et al., 2001). There are visual aids used as a technique to visualize speech and audio (Watanabe et al., 2000). Besides, face detection component that consists of face, tongue and teeth display in computer interface of system developed to visualize speech help HI children to enhance their understanding (Beskow et al., 2008; Hong et al., 2010).

#### *Sign Language and Visual Communication*

Communication such as sign language is a method used by hearing impaired person to communicate among themselves and among normal person. Sign language typically used by hearing impaired people may vary between country. For example there are Malaysian Sign Language, American Sign Language (ASL), British Sign Language (BSL) and others sign language used in different countries. According to Lewis (2009), in Malaysia, there are three sign languages formerly used which are, Malaysian Sign Language (MSL), Penang Sign Language (PSL) and Selangor Sign Language (SSL) which is also known as Kuala Lumpur Sign Language. MSL is the standard sign language using Malay language for hearing impaired in Malaysia while Manual Coded Malay (MCM) also known as Kod Tangan Bahasa Melayu (KTBM) used as teaching at the national school. MCM is used in teaching because it has spoken Malay language of grammar syntax (Savita and Athirah, 2011). Both MSL and MCM are borrowed from the ASL and mixed with local sign (Hurlbut and Hurlbut, 2000).

Meanwhile, visual communication is another type of non-verbal communication, which is created through videos, pictures, maps and graphs to organize information. According to Stokoe (2005), the most effective methods of visual communication are beneficial to humans in order to process information visually. Thus, the presence of

visual in communication among hearing impaired person are effectively helps peopleeffectively to understand the whole view and get an accurate message.

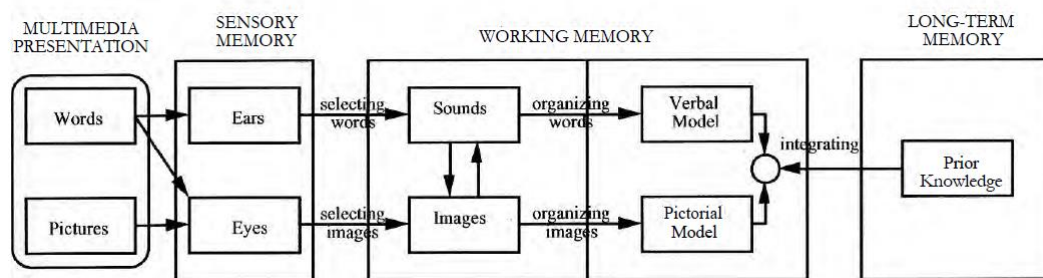
In other word, visual can also facilitate the understanding for the hearing impaired compared with the form of sentences. Visual communication is considered as the most efficient method in HI learning process. Furthermore, HI requires a visual to view sound and improve understanding of subject presented (Beskow et al., 2008).

### *Proposed Technique*

There are two methods that have been proposed which are Cognitive Theory of Multimedia Leaning (CTML) and Computer Aided Instruction (CAI). CTML is one of the cognitive learning theories that was leaded by Richard E. Mayer. The main fundamental of this theory is based on the human mind which is more attractive with words and pictures rather than words alone (Mayer, 2005b). The combination of the element makes the dictionary more interesting and pleasurable.

In Mayer (2005a) and Sorden (n.d.) discussed at length where CTML is based on the three cognitive perspectives of study; how human organize information the dual channel for visual and verbal processing; the limitation of processing capacity of the channel and active learning that involves coordination of cognitive learning process. For example, the presentation of data analysis will be more understandable if it can be represented as a visualization diagram such as graph, chart and combination with text explanation of the diagram.

Furthermore, (Mayer, 2005a) also explained the five cognitive processes in CTML includes of selecting relevant words, selecting relevant images, organizing words, organizing selected images and integrating word-based and image-based representations. The best way of presenting the multimedia learning is the learner can supervise and coordinate all five processes in CTML as shown in Figure 1.



*Figure 1 - Cognitive Theory of Multimedia Learning (Mayer, 2005a)*

As been discussed before, the main tools used in CTML contain words and pictures. Words actually include the printed or spoken words which represent as visually and auditory, while pictures can be represented as static illustration or dynamic graphics such as animations or video clips (Mayer and Moreno, 2002).

The other technique use in this research is Computer Aided Instruction (CAI). Nowadays, the conventional techniques of teaching and learning environment have been transformed. The use of CAI technique in developing learning tools gives good impact

toward the understanding and creative thinking for the students (Muda and Mohamed, 2006).

Computer Aided Instruction is similar to Computer-Aided Learning (CAL), Computer Based Training (CBT), Computer Based Learning (CBL) and Computer Based Instruction (CBI). CAI software is called a dictionary and is designed with interactive instructional technique (Tabassum, 2004).

The use of multimedia technique such as text, graphics, sound and video in learning process is the main element in CAI. Using computer with interactive instructional technique in learning process has many advantages especially in distance learning and as learning aids to help students in study (Tabassum, 2004).

Visual communication with multimedia elements such as animation, video and picture is one of the CAI techniques. Visual communication principles can be divided into three which are harmony, balance and simplicity in order to develop a good visual interaction, informative information and usability.

#### *Contents and designs of Sign Language Dictionary*

The developed sign language dictionary consists of words and sample sentence of each word listed in the database. The language used in this dictionary is Malay. Contents are importance in order to have a good quality of dictionary. Total of 268 words in 32 categories taken from the Standard Curriculum of Primary School (Special Education), Ministry of Education (KPM, 2011) used in this dictionary. Next, the sample sentence for every word in the dictionary is based on discussion between researcher and the sign language model. Lastly, the videos include with voices which have been recorded and edited for the use of dictionary.

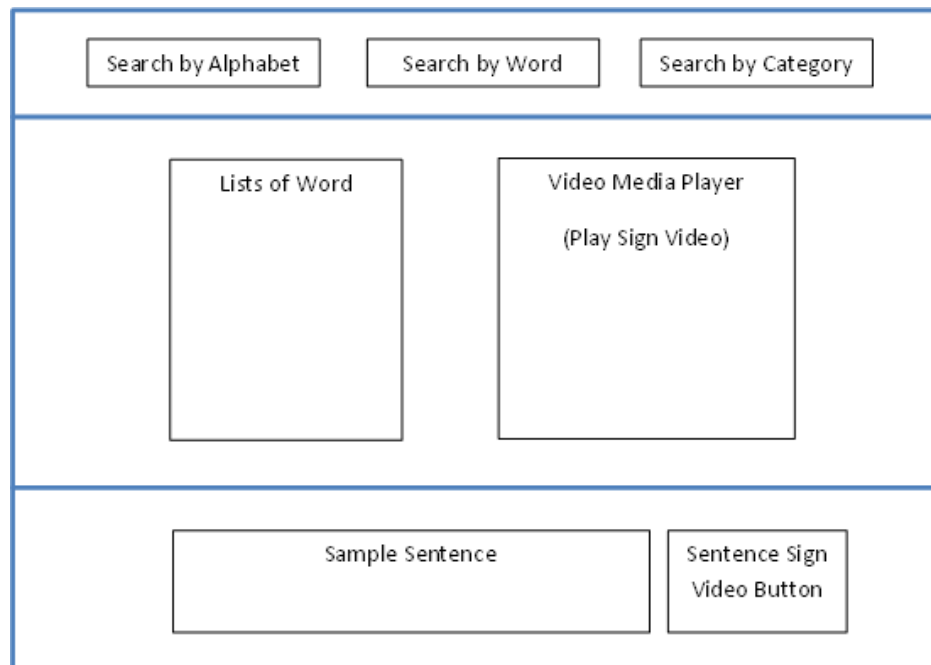
Dictionary development requires a special emphasis on the appropriate user interface and meaningful to the users. The use of adaptive techniques allow users feel comfortable and easy to interact between the user and the system (Muda and Mohamed, 2006). In addition, this technique also helps users adapt the content accurately and gain the quality after using the software. Indirectly, it can help users to understand and learn the content and information provided.

The user interface used in development of this system emphasizes all the aspects discussed where the application of multimedia elements such as video, image and text as well as an attractive colour combination in accordance with the user needs.

In the dictionary, the way of designing the user interface is to adopt from the development process, storyboard is used to illustrate the interface design and also the sequence of interactions among the series of interfaces. Hence, a dictionary prototype with the plan user interface was developed using Visual Basic 6.0. This software prototype was then being refined to meet the requirements.

Sign language dictionary designs have been divided into two main modules which are searching module and sign language module. The design is the combination of the interface that can perform the function in the module and responsible to achieve the overall objective of the dictionary.

There are three main functions have been identified. All the modules being represented in a Visual Basic form. As shown in Figure 2, the storyboard of the dictionary being defined the modules separately which are implemented in the dictionary. The search type module consists of sub-modules - Searching By Alphabet, Searching By Word, and Searching By Category.



*Figure 2 - Storyboard for Sign Language Dictionary*

## **Results and Discussions**

In this chapter, the discussion geared to the process of evaluating a dictionary against the requirement specifications in terms of usability and usefulness of the system. The method of evaluation chosen is the questionnaire because it is flexible and considered to be the economy method for data collection in a large number of populations due of time constrain and it is able to elicit much information for analysis.

### *Respondents Detail*

A total of fifty (50) sets of questionnaire have been distributed to the respondents using random sampling. All the questionnaires collected are the mixed of direct relationship and indirect relationship with students with hearing and vice versa for analysis. A total of forty three (43) sets of questionnaire (86%) used for data analysis and the remaining seven (7) sets of questionnaire (14%) could not be used due to incomplete data.

All the respondents were given a testing session of the dictionary. The aim is to expose and introduce to the respondent of using the dictionary and thus answer the questionnaire based on the dictionary. Total of forty percent (40%, 17) who participated in the questionnaire were male and sixty percent (60%, 26) respondents were female. Further, there are thirteen (13) of respondents (30%) involved have a direct relationship with the hearing impaired student which are teachers, family members and others.

For the male respondents, there were five (5) out of seventeen (17) respondents have a relationship with the hearing impaired student compared with eight (8) out of twenty

six (26) have a relationship with hearing impaired student for female respondents as shown in Figure 3.

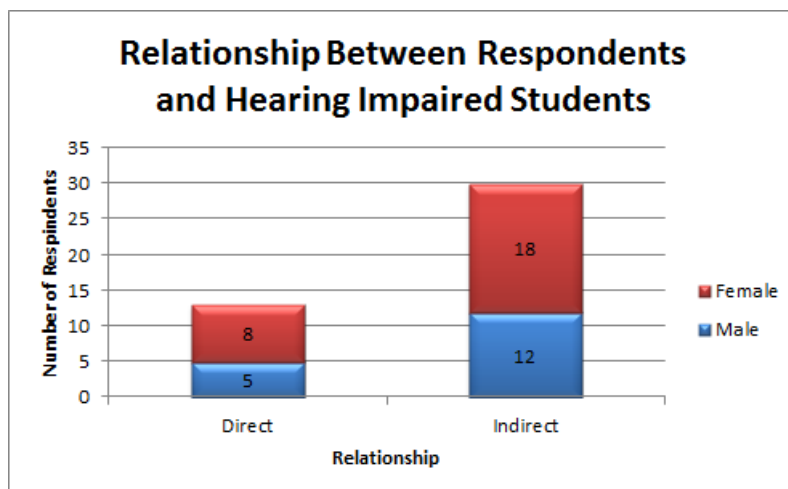


Figure 3 – Relationship Between Respondents and Hearing Impaired Students

#### *Respondents Knowledge of Sign Language*

This section discussed on the respondent's knowledge of sign language. Thirty five percent (35%) show that percentage of respondents who are exposed to sign language. The percentage of respondents shows significant high to learn sign language (86%), even though they are exposed to sign language. It shows that the Malaysian society cared and concerned about the disable especially hearing impaired. More, there are none of the respondents ever used any software in their sign language leaning. It supported by (Efthimiou and Fotinea, 2007) where there are limited of educational material of learning sign language.

#### *Evaluation of Sign Language Dictionary Dictionary*

The evaluation have been divided into four (4) parts which are the technical, presentation, communication and arrangement between user interfaces and balance of the design. Every segment represents the CTML and CAI elements which adopted in the development phase of sign language dictionary.

For the technical part, all respondents agree and totally agree that the sign language dictionary dictionary is easy to use and recommend to be used by others. This complements the need of CAI fundamental which is simplicity.

In the presentation part, questions are based on the CTML elements which are include of multimedia elements such as the represent of the graphics, text, video and audio that have included in sign language dictionary dictionary. Overall evaluation of the respondents can be summarized that the use of multimedia elements in sign language dictionary is helpful in the learning process of hearing impaired children. For the communication and arrangement the evaluation is based on the harmony element in CAI fundamental. Most of the respondents indicate that the communication and arrangement of sign language dictionary dictionary are well displayed and organized. Balance is the visual element used in dictionary that gave users the feeling of comfort and stability of the design which is one of the CAI fundamental. The questions are based on the dictionary is focus on the main content of the sign language dictionary,



contrast and colour combination used are attractive and interfaces size are suitable and interfaces size are suitable. For the overall evaluation by respondents, in average of 96% respondents expressed their satisfaction with the sign language dictionary dictionary.

Researcher used Cognitive Theory of Multimedia Learning (CTML) and Computer Assisted Instruction (CAI) as a guide to the system development. The summary results from the questionnaire were based on the research objectives where respondents agree with the sign language dictionary dictionary development based on the multimedia elements, sign language and an interactive interface technique. The respondents also agree the dictionary is helpful in the learning process of hearing impaired children. From the evaluation by respondents, the elements and features in dictionary of CTML and CAI accelerate HI children in understanding the meaning of words. The used of these methods are effective and useful as shown in figure 4 where above 90% agree of the overall evaluations.

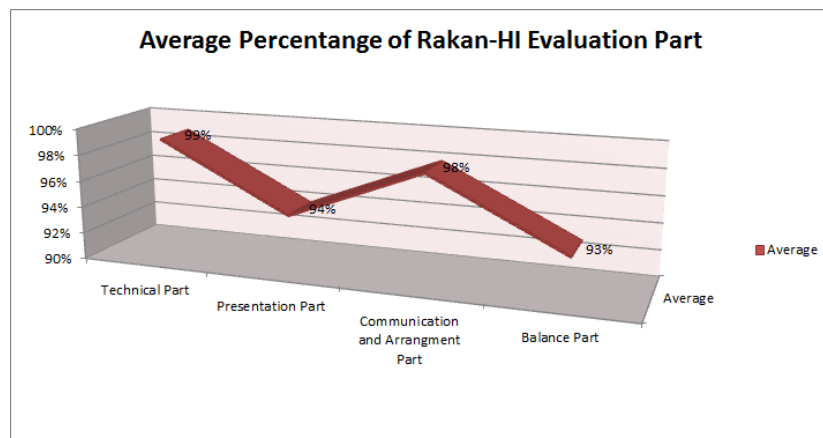


Figure 4 - Average Percentage Sign Language Dictionary Evaluation Part

#### *Respondent's Comment and Recommendation*

Some positive comments from respondents on the sign language dictionary developed is very interesting, useful, creative and suitable for hearing impaired children. There are also recommendations from the respondent for improvement and useful to hearing impaired children. Respondents suggest insert more words that can be used by the children in their daily life. Other useful suggestion is to enlarge the size of the video and slow down the movement of the video in the dictionary especially for nearsightedness users. Respondents also recommend adding more graphics to attract the children to use the dictionary. Hopefully, all the comments and suggestion can be as an input for the future researchers to carry out research on Malaysian sign language. This could possibly lead to the standardization of Malaysian sign language.

#### **Conclusion**

Sign language dictionary dictionary which has been developed to assist hearing impaired children in their learning. This dictionary consist of words (and signs) based on Malaysian sign language. This sign language dictionary also displays sample sentence and signs for sample sentence to illustrate each word. It is a useful tool for users to enhance the learning of Malaysian sign language.

The development of the dictionary has fulfilled the system requirements. It has been fully tested to ensure that it is error-free and meets the requirements defined during the requirements analysis phase.

The proposed dictionary, which is the combination of CTML elements and CAI elements, can be used and suitable, attract and encourage students on their self-learning. An evaluation for the dictionary was also carried out. The evaluation gathered the feedback from the respondents towards the functions, features and applications used in this dictionary. Based on the respondent's comment and recommendation, it is an interactive tool, helpful for and easy-to-use system.

In conclusion, this sign language dictionary enables the users to learn sign language at their own pace and convenience. On the other hands, it enhances the learning of sign language and helps to bridge the communication gap with the hard-of- hearing community.

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