

*A Design of an Interactive Multimedia Learning Environment for Supporting Reading Skills of Deaf Individuals*

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Abstract

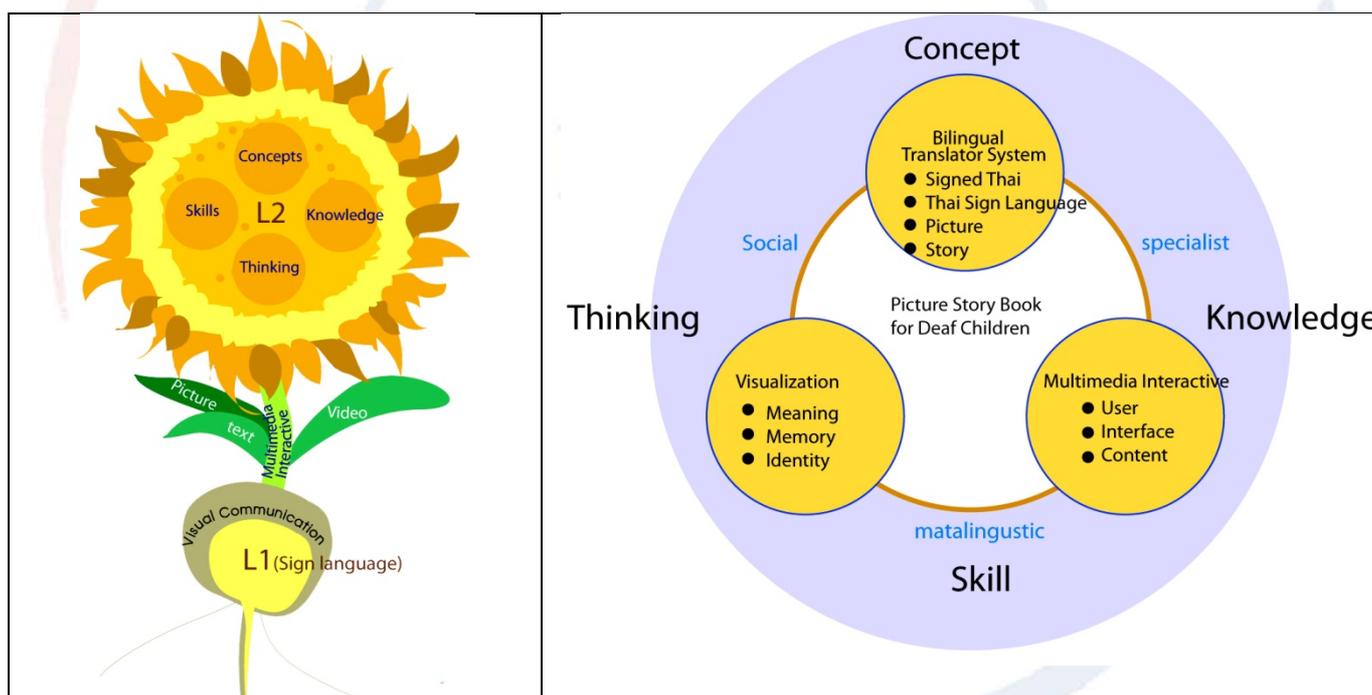
Language learning is a process related to the skills in speaking, listening and learning to read and write. Reading is an activity in which humans acquire information and is therefore essential for deaf children. The purpose of this paper is to develop an interactive multimedia learning environment to promote reading skills for deaf children based on see and learn. The authors of this study focus on the idea that children should have the potential to develop learning to read based on the conceptual framework of see and learn which provides a framework for multi-media learning tools for deaf individuals. The main goal of this study is to incorporate first (sign language) and second spoken language skills as bilingual programs adapted from the hearing population model. Of particular interest is the nature of visual communication in relation to meaning, memory and identity. The study combines bilingual, visual and an interactive multi-media learning environment (tool) to improve individual - performance for deaf children. One mode uses text graphics to read Thai language by signing and with pictures. A second mode is used to recognize meaning from sign language and pictures.

This paper posits that deaf individuals can learn Thai written language and Thai sign language at the same time. The researchers found that deaf individuals can learn to read using the sign language picture story technique. The context of the story can be perceived through the text meaning and help children learn another language through picture and sign language. This current paper studies deaf children aged 10-13 years. The results confirm the expectation that deaf individuals can learn Thai-written language and Thai sign language at the same time.

**Keywords:** Deaf Individual, Picture Story Sign language, Interactive Multimedia

## Introduction

A deaf child begins life with a high potential for language learning. This child needs a bountiful learning environment that will enable the language germ to grow into a mature language sun flower (see Figure 1). This sun flower illustrates the process of language learning that includes picture text (stories) and sign language (visual). The initial core of the sun flower continues to grow, to time release growth hormones that simulate root and leaf development as the stem, branches and leaves of plant are shaped by the plant's ecology (Schirmer, 1994). Sign language and visual communication are the origin and the innate core for establishing a language for the deaf. As the root of the sun flower grows, language becomes stronger and more mature. This study used observation and a literature review and found that deaf children are capable of learning visually (Chamberlain, Morford, & May berry, 2000). This is consistent with the nature of a visual language like sign language for deaf children (Hattal & Mandes, 1995). Thus, educators can provide support and nourishment for developing the sun flower. Learning sign language or a first language for the deaf child should be the same process as when a hearing child learns a second language. (Mueller & Hurtig, 2009) This study focuses on the "See and learn" technique in which children learn Thai sign language and Thai language in a multi-media learning environment. (see Figure 2)



**Figure 1** "See and Learns" Conceptual **Figure 2** A model of learn to read for deaf children

The growth of language is shaped by a bilingual translator system; visualization and a multi-media interactive learning environment (see Figure 2). This paper has been on the development of reading skills in deaf children. Many educator according, Sign language such as American Sign Language (ASL) (Jr, 2005), Thai Sign Language (TSL) (Lam-Khong, Suksakulchai, & Kaewprapan, 2011) is well established as the LI, then literacy in written English (L2) can be achieved by means of reading and writing (Cummins, 1984). We have attempted to apply the theory of interdependence

language of bilingual-bicultural models of literacy education for deaf students (Hermans, Ormel, Knoors, & Verhoeven, 2008).

The authors have observed and a pilot test of the conceptual frame work with deaf children in the classroom found that the most children need to be encouraged to read, specifically deaf children. We provide user interface and content multimedia tools to support deaf children learning to read using the same approaches as teaching any new material. New learning has to be in manageable amounts, with the teacher using modeling, guiding student practice, helping student when they made errors (immediate error correction), providing for sufficient practice, and reviewing the basic material. (Marshall, M, & D, 2004/2005) This study suggests that strategies for reading skills practice need to focus on meaning, especially for deaf children. Learning to read increases the knowledge of spoken and written language and the knowledge of the topic of the text (Robertson, 2009).

This study found that, a) Many parents and caregivers haven't learned sign language and few use sign language. The result is that parents can't communicate with their deaf children. b) There is a lack of opportunity for both parents and their deaf children to learn sign language. c) Vocabulary learning in the classroom is difficult because deaf children need a great deal of individual education and classrooms and they have different levels of hearing. d) There is lack of material to practice reading skills in and out of the classroom with deaf children's parents. Moreover their parents and hearing peers can share learning in each language and make connections using the same tools and same time together.

This paper reports on research on "A design of an Interactive Multimedia Learning Environment for supporting reading skills of Deaf individual". This study is designed based on the characteristics of deaf individuals whose main focus is visual and sign language. This concept supports the development of a prototype learning environment for increasing reading skills of deaf children. This study combined three concepts: bilingual, visual communication and multi-media interactive learning environment using sign language picture stories. This prototype contains an environment that supports reading skills in two modes. Mode one is about understanding meaning in Thai writing stories using Signed-Thai. Mode two environments help the reader to understand Thai vocabulary based on Thai sign language. This environmental tool can also help deaf children understand the meaning and understanding Thai language sentences at the same time. How do children learn to read a second language, using visual sign language and stories story on their own? This paper will help deaf children and hearing people learn to read a second language together. Although each language has differences in form and characteristics, it can become on language environment with the "see and learn" concept.

### **A model of learn to read for deaf children based on "See and Learns" Conceptual**

Deaf children develop reading skills at a slower pace in comparison to normal children. This is because deaf children lack direct experience in the learning of language by hearing sounds emitted by their parents and others from the time of birth (Johnson, Liddell, & Erting, 1989). Accordingly, Deaf children cannot learn language through the oral-acoustic-auditory nexus like those who can hear sounds (Ramsey &

Padden, 1999). As such, Deaf children use sign language for communication in lieu of oral speech (Chamberlain, Morford, & May berry, 2000); (Reeves, Wollenhaupt, & Caccamise, 1995). The spoken language differs from the written language (Hermans, Ormel, Knoors, & Verhoeven, 2008). Accordingly, all of these factors cause deaf children to have significant reading difficulties (Paul, 1996).

The reading problems of children who are deaf are thought to be linked to second language learning. Thus, if children cannot learn sign language, they often withdraw early from learning Thai spoken language, and also other associated linguistic deficiencies. Literacy skills have been essential concerns of educators of deaf children for decades. Regardless of learning how to apply language teaching techniques, educators' expertise is still delayed for deaf children (Schirmer, 1994), (Marshal, M, & D, 2004/2005). Children who are born deaf often do not have the cognitive and the language skills required to achieve reading fluency higher than the fourth grade level. A report published by The Center for Assessment and Population of Gallaudet University focused on the achievement of Stanford test scores from 1989 to 1990. The report compared the academic year scores of 15 year old deaf students with the same aged hearing students. This comparison indicated that the average of a hearing 15 year old students reading at the 10<sup>th</sup> grade level and the average for a deaf or hard of hearing student was only the fourth grade level (Johnson, Liddell, & Erting, 1989). Deaf children grades 2-4 take a reading standard test of Thai language and the Ordinary National Education test (O-Net) .These children had scores below 50 percent which were lower scores than typical hearing children. (Lam-Khong, Suksakulchai, & Kaewprapan, 2011).

This paper applied the concept of learning to read in a second language, a bilingual, visual and multimedia interactive ideal based on concept of "see and learn" (SAL) of word-meaning. That is deaf students learn based on seeing the meaning not hearing (Chamberlain, Morford, & May berry, 2000). The author's Specific ASL Picture Story technique has a relation to reading skills in an environment that promotes reading skills and focuses on the characteristics of learners with visual perception not voice recognition or auditory perception (McAnally, Rose, and Quigley, 1987). This current study believes that the Hearing aid might do not fully compensate for deaf children's loss of sound. Deaf children, who lack of access to spoken language, do not hear and learn to read presumably by visual means (Reeves, Wollenhaupt, & Caccamise, 1995). This paper does not focus on the sound process. Deaf children are visual learners and communicate with gestures, which require vision. (Reeves, Wollenhaupt, & Caccamise, 1995) (Jr, 2005). Some deaf children do not understand the visual perception from their parents when acquired language (Nikolarazi & Vekiri, 2011). Basic visual perception needs to develop a sequence and a sound. (Kauffman & Hallahan, 2004). Infants with hearing losses are sensitive to early visual experiences that form the basis of later language acquisition (Scherer, 2004). As hearing infants are particularly sensitive to the sound of language in the first few months of life they can become aware of the sentence (Klein, Learning: Principles and Applications (6th ed.), 2012).

This present study examined the literature and found that low literacy rates of deaf children affect their ability to learn in the classroom. Many studies have pointed to evidence that educators can compensate the loss of hearing by the adjusting materials (for example, by rewriting the textbooks to a lower vocabulary level) (Johnson,

Liddell, & Erting, 1989). Some reviews studied related literature and a preliminary survey of the development of deaf children indicated that they lack linguistic skills because they cannot adequately learn how to use language from their parents and others in their environment (Mueller & Hurtig, 2009). More importantly, more than 90 percent of H-I children have hearing parents who do not learn sign language on par with the natural language they learned as they matured (Swanwick & Watson, 2007). Moreover, Deaf children of hearing parents sometimes acquire ASL skills at school, although this is more prominent among native signers. This state of affairs also shows that learning language in the family setting and at educational institutions is discontinuous for these deaf children (Johnson, Liddell, & Erting, 1989).

The study of sign language commences at an early childhood level with practicing sign language vocabulary concurrently with practice using the Thai language. Children also practice speaking, writing and spelling in a manner duplicating the process of language learning which begins at an early age (Scherer, 2004). This study found that development for these deaf children is slow paced and so required guidelines and tools that can be used to widen the experience of these children in language learning. Although research has not yet guaranteed a success that this can make deaf children better readers. These factors are related to the ability of deaf children to learn to read. Sign language is necessary for reading and writing development in deaf children but sign language is not sufficient for teaching deaf children read (Chamberlain, Morford, & May berry, 2000).

Consequently the authors found that hearing parents lack interaction in the learning process of their deaf children. However, we believe deaf children's hearing parents need to connect, communicate learn together with their children (Mueller & Hurtig, 2009). Some research found deaf children and deaf parents have the ability to learn together similar to hearing parents with hearing children (Swanwick & Watson, 2007). Both deaf children and their hearing parents need to participate in language learning and learn how to use a shared communication system (McAnally, Rose, & Quigley, 1987). The author found there are some gaps that are essential for deaf children who are learning to read. Deaf children who started learning a first language (sign language) from a non-native language (hearing parent) need to master interpreting or translating using sign language (Klein, Learning: Principles and Applications (6th ed.), 2012).

### **Multimedia process with reading and deaf children**

This paper explored the potential use of computers for implementing effective reading instruction found in the report of The National Reading Panel (2000). Various topics studied included the use of computer technology in instruction of vocabulary, word recognition, comprehension, and spelling (Marshall, M, & D, 2004/2005). The National Reading Panel suggests that computer technology can be used to guide the teaching of reading, especially in speech to computer-presented text. At the very least, computers can offer students the opportunity to interact with text more frequently than with conventional instruction alone (Trezek, Wang, & Paul, 2010). Although the multimedia programs are designed to support the teaching of reading with children, if these methods lack guidelines that support experiencing language for the reader they won't motivate children to learn to read (Mueller & Hurtig, 2009).

The research found that as indicated above, computer technology alone cannot be considered an effective reading instruction strategy; the effectiveness of computer technology in reading instruction should be examined within the context of how well it facilitates instruction such as vocabulary comprehension (National Reading Panel, 2000). Most research has recognized that in order to stimulate deaf children to learn to read, visual information and sign language used together can motivate deaf children to become better readers (Nikolarazi & Vekiri, 2011). On the other hand, studies have found that using picture stories simultaneously with sign language and emotion can help deaf children learn more efficiently, especially when deaf children learn to read with parents (Epstien & Wolfson, 2005) (Yoon & Kim, 2011). Another study relating to technology-enhanced shared reading with deaf and hard of- hearing children examined the role of a fluent signing narrator creating reading experiences for deaf children (Mueller & Hurtig, 2009).

### **The role of the development of continued models of environment interactive multimedia in support reading for deaf children**

This present paper explores the areas of reading that are associated with forming written words on page and not the entire sentence (Olson, 1994). The children's literacy experience refers to creating a conjecture or imaginative reading of a single word or phrase to allow memory (Epstien & Wolfson, 2005). The multimedia learning tool of this current study contributes significantly to the process of learning to read. The "Click to choose words" technique enables the reader to engage or interact with the text. However, the choice is not able to make a successful reader if the reader is not familiar with the text because there will be a lack of perceived meaning. Most research believes that cognitive learning needs motivation in order to use material to assist in the reading of the deaf individuals who have difficulties learning and have a lack language experience. There have been more problems with learning materials themselves (Mayer, 2009) and research reports indicate that if learning content is composed only of visual materials (captioned sign language), the cognitive load increases (Yoon & Kim, 2011).

This multimedia environment wants to help deaf children learn a second language (Thai written language) and to continue simultaneously to learn a first language (sign language-Thai sign). And then Children acquire meaning in a second language (Thai language) with a first language (sign language-Thai sign language) for a second time. Deaf Children need to do some reading on their own, because they have less skill and lack opportunities to practice reading independently. The researchers are interested in modeling the interaction of the multimedia tool with parents and children. The multimedia programs for deaf children have been shown to be successful when deaf children and parents read a story and share together. The authors believe the multimedia environment for deaf children required participation in research through accessible designs.

However, this study reveals how this multimedia environment can be an advantage for deaf students with various learning needs. The development of the model for multimedia learning environment to support reading skill for deaf individual needs to provide multiple, flexible methods of meta linguistic (Meyer & Rose, 2002). This current study attempts to create a structured model which provides multiple and flexible methods for presenting the content as scaffold learning, that engages children using multimedia learning environments. This model incorporates opportunities for

deaf children and their hearing parents to learn to read and to gain knowledge, skills, and enthusiasm for learning together

The learning of sign language using videos makes the inner meaning cognitive in their first language as well as picture intermediate sign language and Thai language. This experiment of language used native language with stories as deaf children and their hearing parent learned to read together. This study created an important environment that allows interaction between deaf children and their hearing parents, learning sign language as a second language. The authors used two languages, Thai sign language and written Thai languages together. Windows are used to make contact with users. Applications are divided into three systems: the presentation of the sign language video in conjunction with written vocabulary; the presentation of pictures reflective of vocabulary and stories; and assistance in explaining meaning using sign language. Explanations are brief using simple vocabulary and making comparisons by showing how sentences differ. This system will allow children to experience language by presenting vocabulary in video form and in illustrations, as well as through using buttons allowing the viewing of vocabulary explanations using pictures.

The experiments and discoveries focus on the training of deaf children and their parents based on a perspective of understanding in language learning in which children learn Thai as a second language and parents learn Thai sign language as a second language in the same environment or classroom.

### **Period of the prototype experiment**

In the second period, the prototype experiment was conducted using a sample population taken from H-I students enrolled at deaf schools at the sixth grade. The students under study were expected to have some command of vocabulary and sign language. They were completely unable to hear, but had no other deficiencies. The total sample population was comprised of eight students, six males and two females who were between the ages of thirteen and fifteen. The students were divided into two groups: one group read using a computer and the other group read using ordinary books. Teachers participated in the process of observation.

Guidelines in evaluating the use of this prototype are as follows: knowing only sign language may not be sufficient for students achieving full understanding of vocabulary. H-I children learn from seeing and memorizing the pictures seen. Therefore, the explanation of the meaning of vocabulary must fall under the categories of simultaneously occurring or related incidents. An example is provided by the word “museum” in this paper used to “พิพิธภัณฑ์”. The vocabulary item is simultaneously presented with a picture of a museum. The sign language used in the explanation is in the form of incidents or representing in abbreviated meanings defining the word through such techniques as showing that this is a place where valuable and ancient things are collected and exhibited.

A survey of the classes at deaf school found that this model of storytelling in practicing reading can help students to develop a more complex vocabulary. Furthermore, the presentation as unfolding in various steps includes the presentation of pictures according to their temporal sequence of occurrence, learning from storytelling using sign language, or selecting situations in order to practice in real

circumstances. Students were trained to ask and answer questions and to construct short sentences, etc. Then, finally, they were guided in the actual process of reading.

The researcher conducted participatory observation in classes and found that the teaching of vocabulary from stories requires teachers who have command of sign language and the Thai language at a high level because they have to be able to explain vocabulary items for each section in an understandable manner.

The process of practicing reading on a single topic is time consuming and requires at least twelve hours solely for the memorization of vocabulary items. The children's understanding of what they read is limited. Therefore, tests and reviews were regularly conducted step by step. If constant testing and reviewing are practiced, reading outcomes will be improved and the readers will become more adept at reading. Materials for reading must be prepared beforehand.

In view of the aforementioned problems, the researcher concluded that a learning model promoting reading with a pictorial and sign language structure can be used for practice purposes through application of the appropriate technology on the foundation of a theoretical conceptual framework integrating inputs from learners, the environment, and technology. The researcher video-recorded the discussion which took place during the reading observation session and explained the basic use of the program. In the next step, each student was tested over a period of ten minutes. After testing was completed, the students were asked to complete an evaluation form and to discuss the reading model used for both groups.

In the survey investigation of the two techniques, the researcher found that the reading model using ordinary books showed that most students looked at the pictures and flipped through pages very quickly. If interested, they would look at glyphs. In regard to explanation of stories in this group, it was found that storytelling was based on illustrations using the technique of pointing at pictures. For those using the computer program, sign language, pictures, and stories, it was observed that students easily selected which stories to read, although there were difficulties at first. After explanations were made, they could continue.

The students were asked what their opinions were of the experiment after its conclusion and it was found that they were satisfied with reading using sign language and moving pictures. Finally, it was observed that while the clicking on glyphs during reading, some students paused and simultaneously practiced sign language. For those students with limited knowledge of sign language, this method can be used as a review so that this will benefit them in regard to reinforcing their knowledge of sign language as well.

Findings on the basis of the model used in this preliminary evaluation indicated that H-I students differ in their capacities to learn on their own, in paying attention to the reading task at hand, and yet remaining satisfied with reading activities. This model was applied as a pre-assessment guide. As an example on the first page, the researcher provided guidance before the subject was requested to read on his or her own. This guidance allowed the participant to observe reading behaviors, the applications, the selection of glyphs, and the understanding of meaning from sign language and pictures as shown in the sample pictures.

The concept guiding the researcher was how best to allow the children to access the computer program easily while being entertained. The meaning can be understood accurately by using clear pictures and sign language. The colors used must be easy to discern. Buttons to select for responding to content must be clear with easy-to-understand symbols that encourage joint learning between parents and H-I children. These techniques can also be applied in teaching sign language to normal children as well.

## **Discussion**

Analysis of these based on three aspects of the basic method of this research used participant observation in a classroom with an instructor teaching Thai vocabulary and sentence structure to deaf students. This study found that Deaf children have different perceptions, experiences and knowledge in reading Thai language. These are the three groups this study observed; Children who can understand examples immediately, Children who can understand with further explanation. And finally children who find it difficult to understand because they don't know sign language and the teacher must use more sign language examples in order to get the children to understand.

The research questions for this study are intended to serve as a guide for further development in improving the child's ability to learn to read on their own. This current study found that children might lack the background knowledge in Thai sign language. The study provides a guide to build a sign language background using pictures and stories so that children see images and text that are used by teachers to enhance their learning. Most of time children can learn Thai language and sign language simultaneously. Vocabulary by sight was designed to support deaf children's reading skills by construction of the visual experience. Stories were used to provide information and to help children remember and recognize vocabulary. Teachers used a method of introducing 6 to 8 word for children to learn and practice (McAnally, Rose, & Quigley, 1987). Guided reading by teachers was combined with the multimedia environment tool because deaf children need practical skills in order to build background knowledge working independently from a teacher or parent. Furthermore, in order to create an environment that encourages reading children need to be fully guided to access the information.

This study is a prototype concept to build language experience for deaf children. The research will develop an assessment tool to determine the level of the ability and skills in reading in part 2 of the study. The child's development will be based on the idea that children can practice and learn on their own. Moreover, this environmental learning tool will be used to support learning Thai sign language by hearing parents as part of the process of children's learning a second language.

## **Conclusion**

The author believes that the bilingual book for deaf children can be used to increase the children's motivation to read whole stories. Deaf children who have a basic literacy in their first language (sign language) are different individuals. A learning system to read in a second language can be implemented to review children's knowledge of language learning in order to understand the efficiency and the effectiveness when learning to read Thai written language. The multimedia book

appears to make it easier to learn to read. In order for deaf children who have less skill and for whom it is more difficult to learn to read, guidance is best for teaching them.

Multimedia interactive environments can be used to promote children to reading skills because deaf children need motivation (Yoon & Kim, 2011). Whole stories show the concept and form of material and allow deaf children to identify the content clearly (Nikolarazi & Vekiri, 2011). Deaf Children are different from hearing individuals (Hermans, Ormel, Knoors, & Verhoeven, 2008). Reading that illustrated the sequence of events are needed to provide a clear overview of the content and to show how many sign language picture stories are needed for children to learn to read (Marshall, M., & D., 2004/2005). The story book used in this study is a simulated learning experience for explaining the meaning of vocabulary with a teacher in the classroom (Mueller & Hurtig, 2009).

Moreover, deaf children need additional practice time in the classroom. This paper also represents the need for better communication between deaf children and their parents. Deaf children's social interaction is enhanced when they read with their parents. Deaf children need to have early visual experiences (signing) that form the basics of later language acquisition through reading. However, children are individuals and, a bilingual multimedia interactive environment can make the simultaneous acquisition of two languages possible. Educators need also to train parents to know and use sign language in the home in order for deaf children to succeed in regular school classrooms.

Deaf children will be better learners if the teacher is a role model. These children often have a dependent learning style and the teacher needs to show clear context in the classroom. Children have different skills in both Thai language and Thai sign language, so teachers must make sure that children understand the vocabulary and learn both Thai sign language and Thai language together. Although this is difficult, it is essential and teaching both sign and written language is what the multimedia interactive environmental tool accomplishes.

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