The Design of a Learning Prototype Promoting Reading Skills for Hearing-Impaired Persons Using the Sign Language Picture Story Technique

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Abstract. Hearing-impaired children (H-I children) develop readings skills at a slower pace than those with normal hearing. This is because these children do not hear sounds, which is crucial in human language learning. H-I children have difficulty in reading because they learn from seeing and recall meanings through viewing pictures and in the use of sign language. Reading in glyphs differs from reading using pictures. This makes it difficult for HI-children to recall the meanings of vocabulary items. The goal of our research is fill this gap and explore the design and develop concept frame work for promote reading skill for HI-children (ages 11-13) that for guidelines applicable to HI-children learning to read more naturally and determining how the content of these guidelines could be accurately extrapolated to the situation in which hearing-impaired students are being taught how to read. What has been learned after this fashion can thereupon be applied to HI- children learning how to read stories in an appropriate manner. The researcher selected a sample population from Sot Sueksa School in Bangkok and Metropolitan areas. This project investigation were the role of sign language, glyphs images and reading skill practice, the use of windows to make interactive contact with users and for content responses, concepts applicable to vocabulary memorization, and the understanding of sentence in stories. It was found that H-I children pay attention while reading and they can practice using sign language themselves. This prototype finding can be used in motivating H-I children to be more interested in learning to read and make recommendations for designing children's promote the second language (L2) reading of H-I children.

Keywords: Hearing-Impaired Children, Picture Story Sign Language, Technology and Design

1. Introduction

Hearing-impaired children (H-I children) develop reading skills at a slower pace in comparison to normal children. This is because H-I children lack direct experience in the learning of language requiring the hearing of sounds emitted by their parents and others in their environment from the time of birth [1]. Accordingly, H-I children cannot learn language through the oral-acoustic-auditory nexus as is the case with those who can hear sounds [2]. As such, H-I children use sign language for communication in lieu of oral speech [3]. In Thai, the spoken language differs from the written language [4]. Accordingly, all of these factors lead to H-I children having reading difficulties [5].

The conceptual framework utilized by the researcher in developing a learning model promoting the reading development for H-I children involved three aspects: [1] the concept of L2 development; [2] guidelines for visual communication; and [3] the concept of multimedia interaction as depicted in Figure 1.

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Fig. 1: Concept of L2 Learning and Screen of the prototype to read interface

Utilizing this conceptual framework, the researcher went on to develop a model that could be extrapolated to assisting H-I children to learn to read Thai on their own involving cognitive processes analogous to the acoustic-auditory processes used in natural language learning by normal children. The parallel process for H-I children involves, however, the analogous cognitive processing on learning through visual processes a manually-constructed sign language in which information is conveyed through clear pictures. Thus, the emphasis falls on developing learning skills through visual learning. The researcher's program goes on to show how motivation can be fostered and reinforced in H-I children through the continuous presentation of pictures or images synchronized with multimedia interactive stories [7]. This will assist H-I children to learn vocabulary with a heightened understanding of the meanings of the words being learned [5]. The reading model is designed to instill confidence in these children such that they believe they can indeed learn to read properly. Short moving pictures are part of the program in providing reading guidance with a sign language video explaining meanings in the form of words and sentences. Freedom in reading is enhanced because buttons can be used for purposes of stopping, playing and rewinding. Children can read interactively using glyphs in conjunction with moving images, colors and special techniques. Using these techniques as reinforcement will better ensure the recall of the meanings of vocabulary items [8]. The researcher found that knowledge of vocabulary affects knowledge and understanding in reading for the purpose of locating or identifying main ideas. This is a skill that is crucially implicated in developing more advanced reading skills [9].

The researcher expected to extract guidelines for developing a model of reading for H-I children by fostering the experiential learning of the meanings of vocabulary items. The conceptual framework for the researcher in this connection was derived from the bilingual-bicultural model of literacy education for the deaf [10]. The researcher accordingly learned that the use of materials must be clear and appropriate, as well as specifically designed for the purposes of reading development. Although certain limitations are found, it is necessary to develop and foster reading motivation in H-I children [11].

2. Related work

A review of the related literature and a preliminary survey of the development of H-I children indicated that they lack linguistic skills because they cannot adequately learn how to use language from their parents and others in their environment [3]. More importantly, more than 90 percent of H-I children have parents who have normal hearing abilities and thus do not learn sign language as a manually coded language on a par with the natural language they learned as they matured. This state of affairs also shows that learning language in the family setting and at educational institutions is discontinuous for these H-I children. The study of sign language commences at an early childhood level with practicing sign language vocabulary concurrently with practice using the Thai language. Practiced also are speaking, writing and spelling in a manner duplicating the process of language learning commencing with the early days of life [4]. As we know, development for these H-I children is slow paced and so required are guidelines and tools that can be used to widen the experience of these children in language learning.

The use of technology allowing children to practice or to remedy their deficiencies enhances their linguistic potentialities and thereby encourages learning [13]. Other researchers have contributed to this area by designing program for enhancing the reading skills of H-I children by using the visual resources of sign

language, pictures, and concept mapping. These are used as tools to develop skills and cognitive processes supportive of the understanding used in reading. It was found that the use of pictures in the learning of vocabulary was possible, but it was of the essence to practice skills. The same is true of the use of concept mapping in fostering thinking skills. It is difficult in teaching such children if they have not previously learned the technique of concept mapping [12]. Systematized sign language translation is helpful in children learning meanings. This approach can be used to enhance the learning of Thai grammar and sign language. In this model, however, are many glyphs which may not be suitable for children [10]. Technology has been developed that allows integrating reading aloud by those with normal hearing with reading using sign language. This technological advance permits the parents of H-I children to instruct their own children through the reading of stories using both the natural language of Thai and Thai sign language, thereby simultaneously practicing both types of linguistic skills [13,14]. 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.

3. H-I children learning to read

Guidelines for developing a model for the enhancement of reading skills for H-I children involve the use of sign language, pictures, and stories. The researcher conducted preliminary experimentation on a memory test [9], especially testing the understanding of the meaning of vocabulary items shorn of grammatical context [5]. Initially, the researcher employed this prototype experiment as depicted in Figure 1. The structure of this prototype experiment was as follows: beginning to learn (from the guide); the presentation of stories (sequence of stories, click selection of vocabulary from glyphs and movement techniques); the interpretation of meaning (still and moving pictures explaining the meaning of the stories). Windows are used to make contact with users. Applications are divided into three systems: the presentation of the sign language video in conjunction with 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 make comparisons through showing how sentences differ. This system will allow children to experience language through presenting vocabulary in video form and in illustrations, as well as through using buttons allowing the viewing of vocabulary explanations using pictures.

4. Evaluation Testing

4.1. Participants

On the basis of preliminary testing, the researcher developed a model allowing for conducting preliminary experimentation. In the first period of inquiry and research, the researcher reviewed related literature, interviewed teachers and observed children's reading behaviors in three schools for H-I students in Bangkok Metropolis. These students were at educational levels between Prathom Sueksa Six and Matthayom Sueksa One. In the next step, data were recorded and used in drafting the test. In the second period, the prototype experiment was conducted using a sample population taken from H-I students enrolled at Sot Sueksa School at the Matthayom Sueksa One level. 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 eleven to thirteen. 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.

4.2. Survey Techniques

The researcher conducted participatory observation in classes at Sot Sueksa School and found that the teaching of vocabulary from stories requires teachers who have command of sign language and the Thai language at a very good 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 more adept at reading. Materials for reading must be prepared beforehand.

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 or glyphs 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." 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, etc.

4.3. Evaluation Setup

For the preliminary evaluation process, the researcher used a computer laboratory at Sot Sueksa School in Nonthaburi. The instruments of research were two fifteen-inch laptop computers and four sets of books. Two teachers assisted in the evaluation as interpreters for the students of the researcher's explanation of the process of testing and evaluation.

4.4. Procedure

Before starting the evaluation process, the testing procedure was explained to participants. A vocabulary test was given before the subjects turned to using the books and the computers. The students were divided into two groups of four students each with one group using the computer reading program and the other group reading ordinary books. 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 reading 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 during 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.

4.5. Observation

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 [12]. The concept guiding the researcher was how best to allow the children to access the computer program easily while being entertained [8]. 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 [13]. These techniques can also be applied in teaching sign language to normal children as well.

5. System Overview

An introduction gives information, texts in different sizes, color movements, changes in forms, special techniques, icons, and the conveyance of meaning showing clearly differences in the selection of buttons such as the picture button and the video button. Still and moving pictures help to explain vocabulary such that situations can be clearly seen on the basis of an abstract form. Sounds or actions accompanying

vocabulary are used. Sign language is used in conjunction with reading words in the explanation of vocabulary. Sign language is used to explain meanings in each sentence. Video windows are clear and the viewer can see details in the use of gestures accompanying vocabulary in a complete and accurate manner. The size of screen and windows are appropriate for user viewing and congruent with the program. Play back or response techniques stimulate students to control and use the program [12],[3].

6. Conclusion

On the basis of guidelines for fostering designing prototype promoting reading skill for H-I children, the researcher applied relevant concepts and found that the model should consist of these major elements: 1) the standardized communication; pictures, sign language video and content; 2) compatibility of theory with practice; and a learner-centered orientation information is linked in the form of multimedia interaction with stories appropriate to the level of knowledge characteristic of children at different learning stages [8],[13]. 3) visual forms of identities representations; the overall conceptual framework is learning from viewing pictures. The conveyance of meaning of words is clear with the video use of sign language to explain the meaning of vocabulary items. This fosters motivation to memorizing vocabulary in responding through selecting the proper content. The design of user interfaces is included as part of the model and explanations can be seen, thereby stimulating interest and reading motivation [9].

7. Acknowledgement

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