

*The Design and Use Of Multimedia Storytelling
Book for Hearing Impaired Students*

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Abstract

Multimedia application of a multimedia storytelling book is useful and has many advantages for hearing impaired students. This paper presents information based on reliable literature reviews about the multimedia storytelling book design framework for hearing impaired students. The purpose of this research is to explore the application of a multimedia storytelling approach in teaching the hearing impaired. In addition, the paper aims to inform educators as to the importance of understanding the three aspects of this study: multimedia design, hearing impaired learning design, and interface design. This current study shows how these three aspects can be combined to furnish a multimedia storytelling book prototype for hearing impaired students. In the next phase the researcher will create the multimedia for hearing impaired students.

Keywords : multimedia storytelling book , multimedia application , hearing impaired student

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Introduction

Providing education to hearing impaired students is important for the development of Thailand. Although, schools must be able to teach children with physical disabilities and focus on this group of children, schools also need to develop appropriate teaching methods, that will enhance the development of hearing impaired students. Thus, the educational system in Thailand should not be confined to the hearing student. It must, also provide opportunities for children who are hearing impaired and who are considered disadvantaged. (Department of Education, 2003) According to a survey of the disabled population, by the National Statistical Office (National Statistical Office, 2012) 1,319,832 people out of the 65.4 million Thai population have disabilities, including 243,044 hearing impaired. This represents 18.41% of the total Thai disabled population. Therefore, to provide education for those hearing impaired students, the traditional public and private schools have established a special education program, which was established with the goal of providing a road to a successful, happy and normal life.

Thai law requires all children study basic education (Prathom 1 to Mattayom 3) to help develop manpower for the future of the country. Mathematics is important both for higher education and for everyday life. Mathematics is as a subject that begins with simple concepts and problems and continuously becomes more challenging. Mathematics involves rational problem solving and systematic thinking from simple concepts to difficult ones (Warinthorn, 2004) (e.g. addition, subtraction, multiplication, division). The importance of mathematics make it one of eight groups of subjects that students must learn. Mathematics is a subject that helped develop the idea that children (Sucha, 1982) can think creatively, rationally, and can analyze problem or the situation carefully, help in forecasting that outcome, solving the problems or situations effectively. Mathematics also helps students, forecast outcomes, solves problems, and apply their skills to daily life situations. Although mathematics is compulsory for students with hearing impairments, the test of the national basic education level (O-NET) Level 2 includes both the hearing and hearing impaired. The National Institute of Educational Testing Service (Ministry of Education, 2001) found that of the eight groups of subjects students study, students averaged a lower scores than normal students in all subjects areas. This was especially true in mathematics where students with hearing impairment scored only 34.5 % on average compared with hearing children. This points out that the division in mathematics courses is the lowest compared to other subjects

This study includes interviews with, mathematic teachers (Angkana, 2012) and (Jarawan, 2012) in Thug Mahamek school for the deaf on 26 July 2012. The study found that mathematic achievements (Angkana, 2012; Jarawan, 2012), mathematic skills (Surin, 2002) and lower achievement (Furth, H. G., 1981) for deaf student was consistent (Meadow & Schlesinger, 1976). In Meadow & Schlesinger's research, they found that hearing impaired students cannot clearly, and accurately receive learning content because they often forgot the lesson content, and as result, the students have to guess about the content of teachers' lectures.

The way to solve problems in mathematics for students with hearing impairment is to help the student acquire a basic knowledge of mathematics such as addition and

subtraction. The research related to students with hearing impaired students including interviewing teachers found that hearing impaired students have the ability remembering images (Piyaporn,2013). The researchers suggest one way to solve the problem is create multimedia-based instruction. This can improve mathematical skills. The present findings posit that multimedia helps students understand content that cannot be described in words. It is widely used to present information so that people of all levels can understand quickly and accurately. The students learn more efficiently, develop creative thinking skills and understand concepts easier. Furthermore findings indicate that media of instruction in mathematics for students with hearing impairment can be successful. As a result, the researcher designed a framework to enhance the mathematics skills of hearing impaired students.

Content of design framework

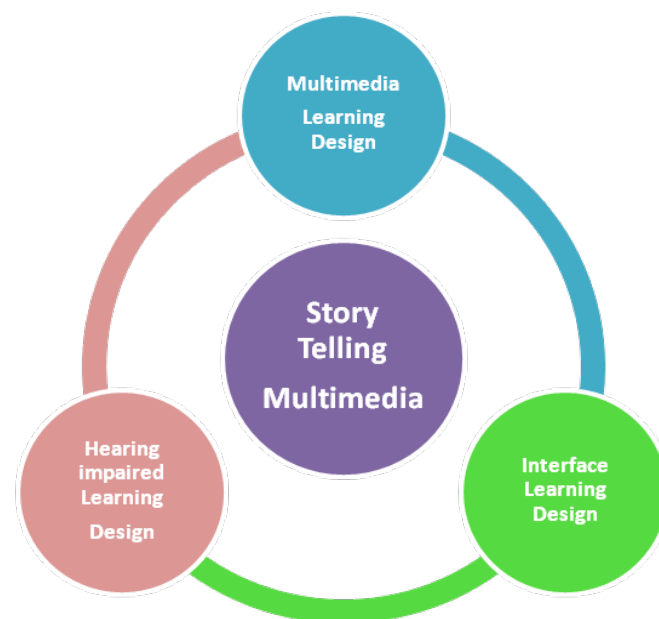


Figure1. The multimedia storytelling book design framework for hearing impaired

This research summarizes the multimedia storytelling book for hearing impaired students in three steps. Three steps follow the e-book design framework (Parton, 2006) : multimedia design , hearing impaired learning design and interface design. In the next phrase I will create the multimedia for hearing impaired students.

- **Multimedia design**
The multimedia design is implemented for the hearing impaired to support literacy, mathematics and communication. Also included are tips for creating multimedia design :
 - Use sign language (Anderson-Inman&Horney, 2007) and (Adamo-Villani, N., J. Doublestein, & Martin, Z.,2005)
 - Use graphic, images and video (National Association of State Directors of Special Education , 2007; Loeterman, Paul ,&Donahue, 2007)
 - Students who have a hearing impairment require visual images to support their learning and to enhance their understanding of content. (Gentry, M. M., Chinn, K. M., & Moulton, R.D.,2005)

- Use of paintings, drawings, photographs or prints can be classified as a media of instruction. (Dowliby and Lang, 1990)
 - Using pictures from the story , the student can learn and understand content. (Parton, B. S. , 2006)
 - The images should be bright colors, not black or brown that give the feeling of depression. Images should be clear and create a smooth picture , and the images should have aesthetic qualities and illicit emotional tenderness. (Roskos K.,2009)
 - The multimedia design should be interactive between students and the media. (Mana Prateppornsak, 2006)
- Hearing impaired learning design
The hearing impaired learning design is the guideline to support the hearing impaired student and learning style :
 - A strong primary relationship between child and parent leads to strong self identity and more appropriate peer interactions.(UNESCO, 1987and Marc Marschark and Peter C. Hauser, 2011)
 - Support from parents on social issues increases the child’s social independence and increases socialization with peers and motivation to socialize. (Padden, Carol A.; Humphries, Tom (Tom L.), 2005)
 - The hearing impaired cannot hear but they can see so they can use the multimedia storytelling book for learning. (Miller, Kevin J. , 1998)
 - Deaf and hearing impaired use sign language for communication. (Marschark, M., Leigh, G., Sapere, P., Burnham, D., Convertino, C., Stinson, M., Knoors, H., Vervloed, M. P. J., and Noble, W. , 2006)
 - Deaf parents identify with their children, provide appropriate modeling in relating with other deaf individuals and encourage autonomy within their children. (Lane, Harlan L.; Richard Pillard and Ulf Hedberg, 2011)
 - Use of visual and spatial images , sense of sight and the visualization of objects and helps create internal mental images/pictures.(Carney,R. and Levin , J. , 2002)
 - Use content and function of sign language, which is important in the early years for the deaf child. (UNESCO,1987)
 - Use imagery instruction to facilitate learning . Students are more successful in recalling and retaining information. The ability to create mental images is a part of cognitive learning . (Kosslyn, 1981) and (Hodes, C. L., 1992)
 - C . Interface design
The interface design is the guideline to support the hearing impaired student when using the multimedia storytelling book :
 - Icons for children should be designed so they represent actions or objects in a recognizable manner and easily distinguishable from each other. (Kim, M.Y., 1995) and (Druin, A. & Solomon, C., 1996)
 - Icons should also be sized so that children can easily click on them. (Shneiderman B. and C. Plaisant, 2004)

- Use of text should be minimized for children. (Theng, Y., Nasir, N., Thimbleby, H., Buchanan, G., Jones, M., Bainbridge, D., & Cassidy, N., 2000) and (Bilal, D., & Bachir, I., 2007).
- Design multimedia and an interface that is familiar to the children in school and daily life. (O’Keefe, E & Solman, R., 1987)
- Design interface in a way that allows the user to focus on what is most content important. The size, color, and placement of each element work together, creating a clear path to understanding to interface. (Borgna, G., Convertino, C., Marschark, M., Morrison, C., & Rizzolo, K., 2011)
- User interface design for children, designers should: Use highly visual menus, icons, animation, and create an environment that has many guidelines to prevent errors. (Grammenos, D., A. Paramythis and C. Stephanidis, 2001)

Application to the prototype

This study follows the multimedia storytelling book design framework for the guideline in developing the prototype. This study examines the effect of multimedia use on hearing impaired children’s ability to learn math using a multimedia storytelling book. During the development of the prototype, each step was tested with hearing impaired students who were the targeted users. The results of the testes were evaluated by teachers in the deaf school. From the evaluations, the strengths and weakness of the prototype were accessed and the comments by the teachers were used to improve quality and flexibility of the users. Formal evaluation for the complete prototype was conducted. Example of the prototype are shown in Fig2 , 3 ,4 ,5 and 6.



Figure 2. Content Screen Title



Figure 3. Content about menu



Figure 4. Content about story



Figure 5. Content about counting sign language



Figure 6. Content about exercises

Conclusion

This paper examines in three steps the usability design of the multimedia storytelling book based on a literature review; multimedia design, hearing impaired learning design, and interface design. This current study also provides guidelines for students' use of the multimedia storytelling book. The book for hearing impaired was designed as an educational tool to support hearing impaired students and teachers in Thailand's school for the deaf. The first step of the framework of the multimedia storytelling book has been designed. The current design covers math numbers from one to twenty. Future studies should increase the math numbers to one to one hundred because the Thai department of Education has set the math standards for grade one students at one to hundred.

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