DEVELOPMENT OF MULTIMEDIA LEARNING RESOURCES FOR CHILDREN WITH LEARNING DISABILITIES IN AN UNDERGRADUATE SPECIAL EDUCATION TECHNOLOGY COURSE

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Abstrak: Sebuah projek telah dilaksanakan dalam kursus teknologi program pendidikan khas ijazah pertama yang memberi peluang kepada guru pendidikan khas pra perkhidmatan untuk mengalami persekitaran pembelajaran konstruktivis dalam program pendidikan guru. Tujuan projek ini adalah untuk mereka cipta sumber pembelajaran multimedia untuk kanak-kanak pendidikan khas dengan menggunakan *Microsoft PowerPoint*. Prinsip dan model reka bentuk pengajaran melibatkan tiga komponen penting iaitu perancangan, perkembangan dan penilaian, yang telah memberi arah tuju kepada proses reka cipta sumber pembelajaran multimedia untuk kanak-kanak yang mempunyai masalah pembelajaran. Contoh projek guru pra-perkhidmatan yang mempunyai elemen reka cipta yang baik dan yang telah memaksimumkan penggunaan teknologi untuk disesuaikan dengan keperluan kanak-kanak pendidikan khas diketengahkan.

INTRODUCTION

In Malaysia, children with learning disabilities are defined as those with a wide spectrum of different categories of disabilities. These include children with mental retardation, children with specific learning disabilities such as dyslexia and dyscalculia, children with emotional and behavioral disorders which include children with autism and ADHD, children with speech and language problems as well as children with motor difficulties such as dyspraxia. The main defining feature of these children is that their learning difficulties differ from the norm to such an extent that an individualized, adapted and specialized education is required to meet their needs. In order to meet their learning needs, some are placed in regular classes with supplementary instruction and services, but most of these children are placed in special education classes that are attached to normal schools. These special education classes follow a specialized curriculum, and are taught by special education teachers who are trained in special education methods of instruction.

MULTIMEDIA RESOURCES FOR CHILDREN WITH LEARNING DISABILITIES

Special education for children with learning disabilities is individually planned, intensive and specialized instruction that is goal-oriented in order to help these children maximize their potential to achieve self-sufficiency. A competent special education teacher is trained to develop appropriate lessons that incorporate curriculum and instructional strategies with individualized education goals. However, in reality, teachers rarely do have time to personally give individual students all the practice and reinforcement that they need. Instructional support or tools that are available to help special education teachers in their jobs should then be fully utilized. One of the most promising ways in which instruction can be individualized is through the use of multimedia technology (Lee, 2003). Over the past two decades, much research has been conducted on the use of multimedia technology to support learning and instruction for normally developing children as well as children with special needs. For typically developing children, the results have been very promising (Mayer, 2001). For children with special needs, the positive effects of technology have been even clearer and much more positive than for the general school-age population (Belson, 2003). Multimedia software and

multimedia learning environments have been proven to be effective in helping children with disabilities to develop skills in domains as varied as academic domains of literacy and numeracy, life skills and social interaction. Lee and Zabedah (2005) developed multimedia reading lessons based on a phonics method of instruction to teach word recognition skills to children with reading disabilities. They found that their intervention using multimedia-based phonics lessons were effective in helping these children with learning disabilities to master the foundational skills of word recognition. Azmi and Lee (2004) explored the use of available multimedia resources to teach reading to students with learning disabilities in a special education class. They reported that the use of multimedia enhanced the literacy skills of these children.

Multimedia technology can be defined in many ways. Generally, multimedia involves the computer presentation of multiple media formats (e.g. text, pictures, sounds, video etc.) to convey information in a linear or nonlinear format. There is a good match between multimedia technology and the learning needs of children with learning disabilities. Presentation of information in both verbal and pictorial forms allows children with learning disabilities to process information via two channels. With twice as much exposure to the same information, a more meaningful connection can be made between the visual and verbal presentations. As children with learning disabilities are usually limited by print reading, presenting print information through additional formats of oral presentation (enhanced with pictorial prompts) will allow children with learning disabilities to create a deeper understanding of the information presented than from either words or pictures alone.

In addition to the cognitive benefits of multimedia learning for children with learning disabilities, the use of multiple media also helps to increase motivation. More often than not, children with learning disabilities lack intrinsic motivation to finish learning tasks. Multimedia technology has the potential to provide extrinsic motivation for task completion. Generally, children have a longer attention span when interacting with the computer than when interacting with everyday print materials. This is especially so when the information is presented in a games format, whereby children are reinforced periodically over the span of playing.

Apart from the elements of multiple media, there is another part to technology that augurs well for teaching children with learning disabilities. Children with learning disabilities require instruction that is relentless and repetitive which bends towards over learning. It is the nature of multimedia technology to lend itself to repetition through drill and practice without loss of ‘patience’ or depletion of ‘energy’. The multimedia resources can be reused to serve the purpose of mastery.

Even though the elements of multimedia augurs well for learning and research has also shown the effectiveness of multimedia for children with special learning needs, the development of multimedia resources for this special population is still limited as it is considered not commercially viable to develop for this market. Hence, using technology with special needs students can prove challenging as finding age appropriate and ability appropriate resources specifically focused on academics and matched to individual learning needs and educational goals can be difficult (Belson, 2003). The lack of multimedia resources, in part, has hindered the integration of multimedia technology in our Malaysian special education classes. It is not uncommon to find special education teachers using software developed for typically developing children. As such the software is usually too difficult for children with learning disabilities in their classes, often it is the special education teacher that is interacting with the software through demonstrations rather than the students engaging with the multimedia

programs themselves. The lack of appropriate multimedia programs have prevented the children from benefiting from the interactivity of computers which allows students to be engaged, guided and supported in their learning.

As the main medium of instruction in Malaysian schools is Malay, a lot of available multimedia resources in English from the overseas market are not fully accessible to students with learning disabilities. Apart from the lack of resources, most multimedia content available in the market is also not based upon the local context and thus, might not be appropriate to promote the learning objectives of our country. Thirdly, some of the local multimedia resources available in the market have been found lacking in pedagogically sound principles. The lack of or almost non-existence of multimedia resources for children with special needs in Malaysia is one of the reasons which prompted the project below.

DEVELOPMENT OF MULTIMEDIA RESOURCES IN AN UNDERGRADUATE SPECIAL EDUCATION TECHNOLOGY COURSE

As new knowledge on how people learn is centered around the constructivist paradigm and learners are now considered as active agents who engage in their own construction of knowledge through interactions with the environment, it follows that preservice special educators be given the opportunity to experience authentic technology-supported constructivist learning environments in their teacher education programme. A constructivist learning environment in teacher education should involve the process of problem-solving tasks found in authentic settings which are closely related to work in the real world. Technology has been found to be one of the most promising tools to integrate constructivist principles in teacher education (Nanjappa & Grant, 2003). Technology should therefore be integrated into students' coursework in order to provide them with opportunities to explore creative uses of technology.

The goal of training preservice special educators in the use of multimedia technology for children with special needs was incorporated into the Technology in Special Education course curriculum. As mentioned earlier, most software developers are not keen to develop programs for children with special needs due to its limited marketability. Thus at the present moment, the onus of realizing the potential of multimedia learning for children with learning disabilities will have to fall on the shoulders of the special educators themselves. In line with this reality, it was considered essential to equip preservice special education teachers with skills and knowledge in developing basic multimedia instructional content which can be integrated into their future teaching repertoire.

Their task in this course was constructivist-based, which was to design, develop and evaluate multimedia learning resources for a child with learning disabilities. The course requirement was designed to provide them with an authentic task in special education which they have to problem-solve with the creative use of multimedia technology. The processes that the preservice teachers had undertaken to complete their task of developing multimedia learning resources for students with learning disabilities are described below.

NEEDS ANALYSIS

The process of creating the multimedia learning resources in this course was guided by the principles and models of instructional design, which usually involve three major components of planning, development and evaluation (Dick, Carey & Carey, 2001). The first step in the design process was to conduct a needs analysis, which included problem identification, assessment of needs and specification of goals and objectives. In order to provide the preservice special education teachers with a constructivist approach to

learning, they were required to engage in tasks found in authentic contexts. The preservice special education teachers were required to identify a child or a group of children with learning disabilities and conduct a needs assessment in order to identify their strengths and weaknesses. Based on the results of their assessment, they were required to identify the instructional needs of the child. As in real life teaching situations, they were required to refer to the *Sukatan Pelajaran Pendidikan Khas Bermasalah Pembelajaran Sekolah Rendah & Menengah* (Jabatan Pendidikan Khas, 2003) during the needs analysis process. This special education curriculum for students with learning disabilities encompasses four developmental domains which are life skills, functional academic skills, ethical and social skills. Most of the preservice special educators identified functional academic skills as the main problem area.

DESIGN

The next step in their planning process involved task analysis of the problem content area. The purpose of conducting a task analysis was to break down complex skills into component skills in order to determine an effective teaching sequence. Based on the results of the task analysis and analysis of the child's characteristics, goals and performance objectives of their multimedia learning resource were specified. The next step in the planning process after task analysis was flow charting. Flow charting is an important step in planning multimedia learning resources as multimedia resources should be interactive and these interactions are best depicted as visual representations. Even though the preservice special education teachers were quite adept at conducting task analysis to determine teaching sequences, they faced problems in designing and visualizing the interactions for their program. Interactivity are usually decisions, events, consequences and feedback. This problem arose most probably because they were more used to a sequential form of learning. They found it much easier to incorporate interactivity into their multimedia software as they were authoring the learning resource during the development phase. Storyboarding, which is a process of drafting textual and pictorial displays was a much easier task for them.

DEVELOPMENT

The next phase in their project was to translate their designs into multimedia resources. They were provided with guidelines on screen design, use of language, amount and complexity of instruction. Navigational issues were also addressed. These guidelines considered the learning characteristics of children with learning disabilities. For example, presentation of textual information should be concise, preferably supported by audio recordings and visual information in order to provide more channels for understanding the textual information. Instructions given to children with learning disabilities should be concise and consistent throughout the multimedia program and navigational icons should be large enough with a consistent design throughout the program.

In order to decrease the learning curve due to time constraints in this course, it was decided that the multimedia learning resources be developed based on a platform which was familiar to teachers and which will also be readily available in actual school settings. The use of Microsoft PowerPoint as an authoring tool for the project seemed to be the most logical choice. The preservice special education teachers were given lessons in Microsoft PowerPoint which included the more advanced features of interactivity. They were also taught basic editing of pictures as well as how to create their own sound files. During the process of development, feedback was provided by the author to improve the multimedia resources being developed. Suggestions were given to improve on screen

layout, navigation, and interactivity of their program. The custom animation feature in Microsoft PowerPoint was maximized. The 'Add Effect' and 'Effect Options' under this feature were fully utilized to enhance interactivity of their multimedia learning resources.

FORMATIVE EVALUATION

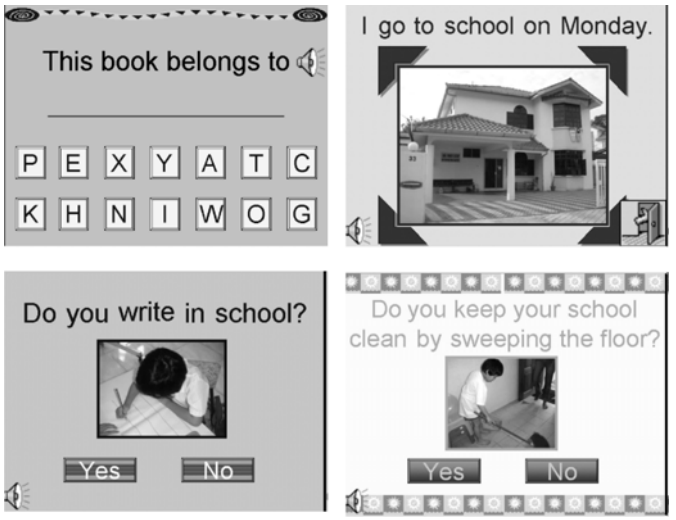
After the completion of their multimedia learning resource, the preservice special education teachers were required to evaluate their product by assessing how well the lesson works on the targeted special child. However, due to unforeseen circumstances, the second batch of preservice special educators was unable to carry out this phase of the project. The feedback reported here is from formative evaluation by the first batch of preservice special educators. Evaluation data were collected mostly through observations and through simple tally recording. The preservice special educators were able to identify the strengths and weaknesses of their own programs to meet the needs of children with learning disabilities. Collectively, the preservice special educators reported that motivation was increased with the use of the multimedia learning resources. They also reported the importance of using varied reinforcements in their programs to maintain interest. The preservice special educators also realized the value of using multimedia. They reported that the use of a combination of audio, visual and textual information to present concepts to children with learning disabilities had motivated and enhanced learning. Most of them also discovered that the effectiveness of their multimedia learning resource was dependent on the level of interactivity. They reported that one of the areas to be improved was interactivity in their multimedia resource. Another result was the use of prompts, which varied across individual children. They found that physical and verbal prompts were initially required to teach the children to interact with the multimedia learning resources. In general, 95% of the preservice special educators reported that their targeted learning objectives were achieved after five presentation sessions.

SAMPLE MULTIMEDIA LEARNING PROJECTS

Below are some examples of the preservice special education teachers' projects. The first two projects were also highlighted previously in an article by Lee (2005) discussing multimedia talking books.

The special feature of the first project was in its lesson objective, which focuses on behavioral change. Most of the other projects focused on functional academics. In this project, a social story was created based on a child's schedule in school. Actual pictures of the child engaging in real life activities were used to enhance the child's participation and to increase motivation. Simple sentences were constructed, supported by oral narration. A set of questions based on the social story was constructed to test the child's understanding. Formative evaluation revealed that the social story was able to help modify the child's behavior in school. Some of the slides from the social story are shown in *Figure 1*.

Figure 1: Sample slides from the Social Story

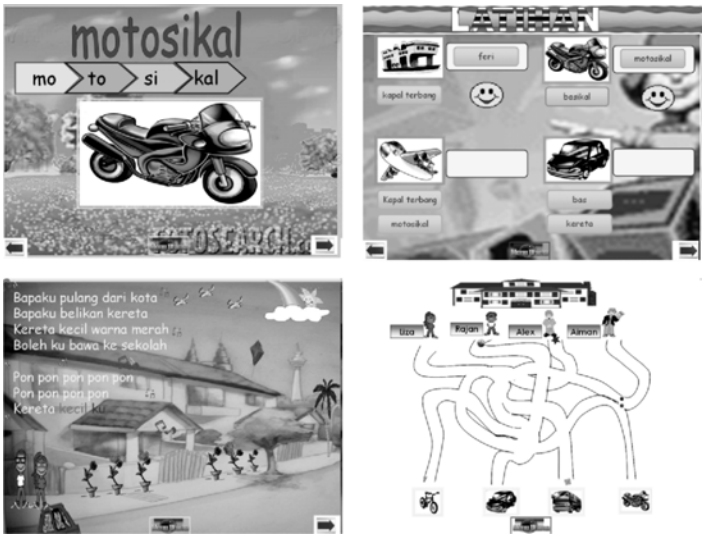


The lesson objective of the second project was to identify and name animals (*Mengenal Binatang*). Multimedia elements such as sound effects, animation and text narration were used to elaborate on the concept taught. A series of questions at the end tested the child's understanding. The preservice teachers found that the child was able to answer all the questions correctly after five learning sessions. Sample slides from this project are shown in *Figure 2*.

***Figure 2*: Sample slides from *Mari Mengenal Binatang*.**

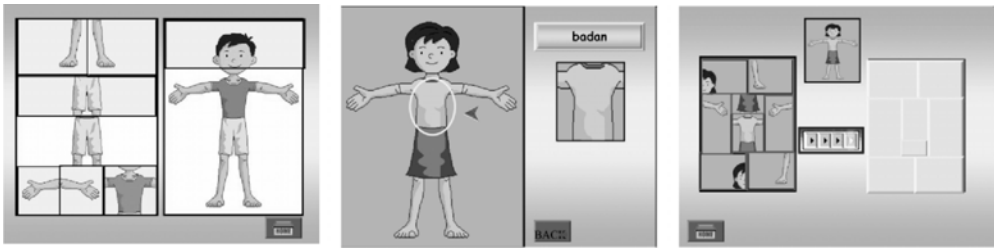
The lesson objective of the project illustrated in *Figure 3* teaches children about transport (*Kenderaan*). Children with learning disabilities were taught word recognition through blending of syllables. Blending is illustrated graphically via movement of syllables across the screen to form a word. In the screen capture below, the word *motosikal* is formed from the blending of four syllables. The children with learning disabilities were also taught vocabulary skills through matching of labels to pictures. In order to increase motivation, a theme song was taught. Another feature which the children positively reacted to was a game-like task at the end which required them to click an icon in order to trace the movement of the icon to reach a destination. This project was one of the most comprehensively developed as it fully utilises the multimedia and interactivity features in Microsoft PowerPoint to illustrate concepts. Verbal or graphic prompts were provided throughout the lesson to guide children in their learning and immediate feedback was built into the learning resource tasks.

Figure 3: Sample slides from Kenderaan.



The final project described in this paper is concerned with teaching recognition of body parts (*Anggota badan*). Children with learning disabilties were given a choice to work with either a picture of a girl or a boy. The pictures below illustrate one of the puzzle exercises found in this program. The user is required to choose a part and match the part to the picture. Feedback is given via the use of sounds or movement. The wrong choice would result in the puzzle piece moving back to its original position. Sample puzzle slides are shown in *Figure 4*.

Figure 4: Sample slides from Anggota Badan



CONCLUSION

In conclusion, the objective of the course was achieved as the preservice teachers had demonstrated knowledge and skills in developing and evaluating multimedia learning resources for children with learning disabilities. In addition to that, the skills were demonstrated in an authentic technology-supported constructivist learning environment in their teacher education programme. The multimedia learning resources developed by the preservice teachers showed promise that those resources can be effective in teaching children with learning disabilities especially in the area of functional academics. The multimedia learning resources were able to allow children to cognitively engage in learning via multiple senses and they were also able to increase motivation for learning. It also showed promise as a reusable tool for individualizing instruction. More research on the effectiveness of using multimedia to teach children with learning disabilities is required. Having gone through the process of developing multimedia learning resources, it is hoped that generalization of learning will occur with the

preservice special educators using multimedia learning resources as part of their future teaching repertoire.

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