Preliminary Courseware Conceptual Model for Dyslexic Children

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Abstract

The main objective of this paper is to discuss the preliminary conceptual courseware model to support dyslexic children in reading. The construction of the model has incorporated suitable teaching and learning methods for dyslexic children. To study the effect of the model, a prototype courseware was developed and tested by dyslexic children. The model is called "E-Z-dyslexia".

1.0 Introduction

Dyslexia is associated with difficulty dealings with words specifically in reading, spelling and expressing thoughts on paper (Greene, 2006).

To date, the actual number of students with dyslexia in Malaysia is not obtainable (Peters, 2010). However, it is estimated that about 9% of children with learning difficulties is reported in Malaysia in 200 (National Education Blueprint 2006-2010, 2006). Lyon (1995) advances that 80% of children with learning difficulties have primary difficulties in learning to read. The same scenario is also reported in Malaysia by Lee (2008) where 9.4% of children in standard one schools in Penang having learning difficulties and 92.3% of them were found to have severe reading problem. When this problem is not treated at the early stage, it may cause adult literacy problems.

In addition to the number of students with learning disabilities stated above, Table 1.1 shows the latest data on literacy rate in Malaysia.

Table 1.1: Literacy Rate in Malaysia for Year 2009 - 2011 (Ministry of Education Malaysia,2012)

Age Group	Year		
	2009	2010	2011
Literacy Rate Age 10 and above (%)	94.2	94.5	94.2
Literacy Rate Age 15 and above (%)	93.4	93.8	93.6

Dyslexia is identified as one of the contributing factors that resulted into the literacy problems among school going children where it is part of the statistics above (Lim Abdullah et.al, 2009).

Reading problem needs to be addressed as early as possible since literacy is a vital skill to prepare students for the next level of education (Cullingford, 2001; Awang Bolhasan, 2009). It is very essential not only for the advancement in education but also in daily life.

The main focus of this research is to improve the reading skills among dyslexic children. One of the possible solutions to this issue is by adapting a computer assisted learning tool to facilitate children in learning. To our knowledge, Malaysia is still lacks of computer based materials especially in teaching Bahasa Melayu, the national language in Malaysia (Gomez, 2004; Devaraj and Roslan, 2006; Devaraju et al., 2006; Lee, 2008).

Motivated with the situation stated above, the researcher has conducted a study to identify the important elements that should be considered when developing a computer assisted learning material for dyslexic children.

2.0 Dyslexia and CAL

With the problems faced by dyslexic children, it is clear that dyslexic children need extra work compared to other students (Shaywitz, 2005). In addition to the traditional super visionary learning environment, dyslexic children should be given the opportunity to explore reading on their own, as it is indeed a good way to improve their reading skills (Devaraju et al., 2006; Shiela and Andrew, 2002). Adopting a computer aided learning environment would be an alternative as it could give flexibility to the dyslexic children in terms of what to study and when to study (Athanasaki et al., 2008).

Multimedia as mentioned by Singleton (2006) is one of the tools to promote a CAL environment since it has the potential to reduce or even remove most of the problems faced by dyslexic people. For example, Beacham (2007) in his article has mentioned that learning materials containing text can be supplemented with graphical and auditory forms as dyslexic children are able to comprehend meaning better in that format.
Using multimedia, instructions can be represented in a

graphical or auditory form since providing instruction in multisensory way allows dyslexic children to develop links between what a word looks like, sounds and meaning. Multimedia has the potential to improve reading ability as it provides large amounts of practice that promotes the drill and practice concepts (Lundberg, 1992.). This is supported by Karsh (1992) in his report where substantial gains were made by dyslexic children in word reading fluency using 'Construct a Word' program. This program provided drill and practice in forming real words by matching consonants with word endings.
In order in ensure that the multimedia application can addressed the problems faced by dyslexic children, the researcher has conducted a research to develop the multimedia conceptual model for dyslexic children. The following section will explain in details the construction of the model.

3. 0 Construction of the preliminary model

This section will discuss the preliminary conceptual courseware model constructed by the researcher. The construction of the model was based on the study conducted in the related fields (dyslexia and computer assisted learning). The model is aimed to serve as a guideline in designing multimedia courseware for dyslexic children. The model is illustrated in Figure 1.1.

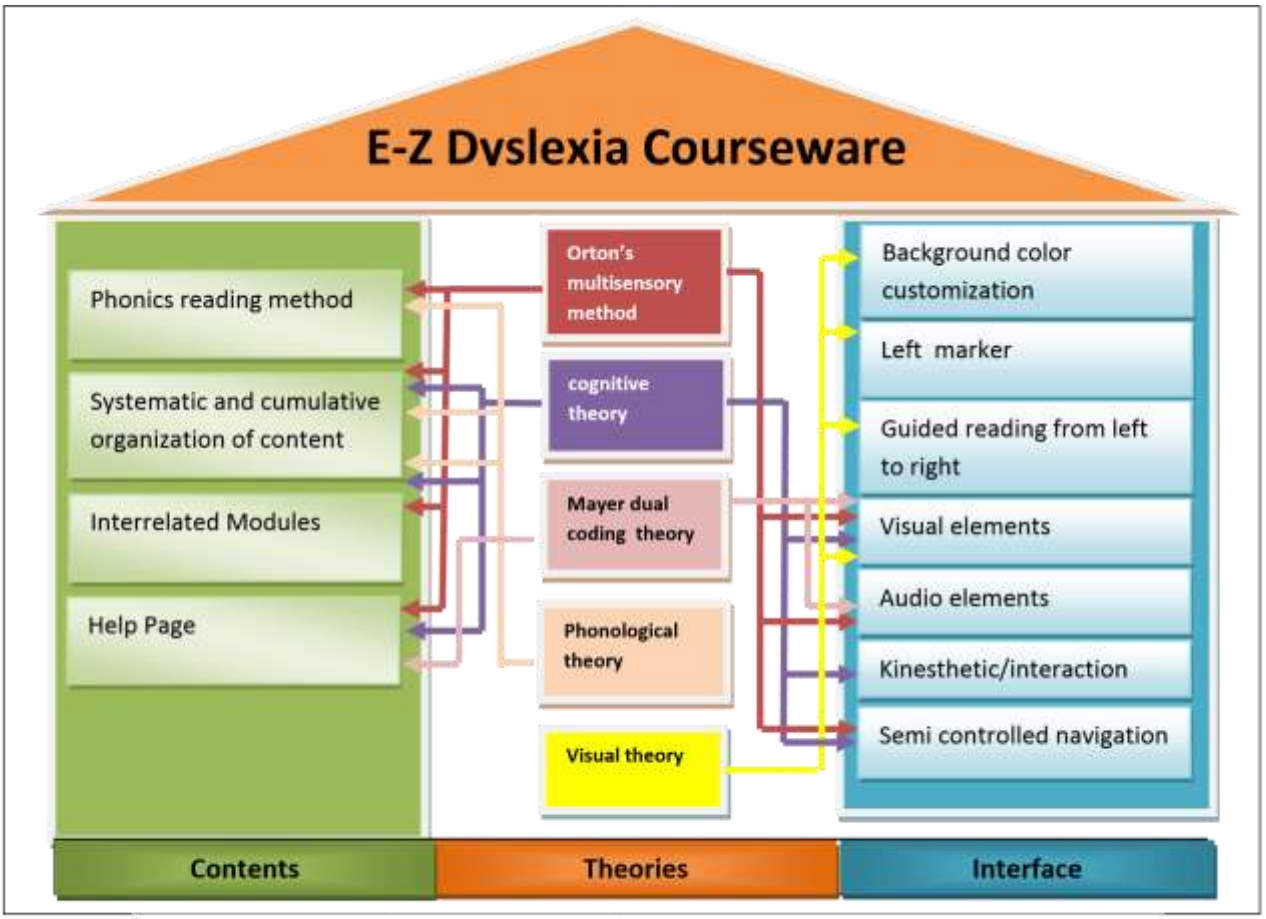

Figure 1.1: Preliminary Courseware Conceptual Model

With reference to Figure 4.3, there are three components that represent the overall courseware model. Those components are the courseware content, the interface and related theories.

2001; Snowling 1995). Common difficulties

a. Related theories

Four important theories were used as the basis in designing the courseware. Those theories are the multisensory theory, cognitive learning theory, Mayer's Multimedia theory, Phonological theory and visual deficit theory.

- Phonological theory of dyslexic children explains that dyslexic children main difficulties lie in phonological problem. It is referred to as impairment in the representation, storage and retrieval of speech sounds.
- Visual deficit theory

Basically, the proponents of this theory concur that the cause of difficulties faced by dyslexic children is partly due to the vision problems (Stein et al., associated with this theory are the scotopic sensitivity (Irlen, 1991) and mirror opposite problem (Heymans, 2008).

- Multisensory method

Multisensory teaching method involves a simultaneous links between visual, auditory and kinesthetic-tactile pathways to enhance learning and memory (Marcia, 1998; Logsdon, 2008). This method is proven to be

effective to teach dyslexic children because it can accommodate different learning styles (Logsdon, 2008). This method is discussed in Section 2.8.

- Cognitive learning theory

This research has taken into consideration several cognitive areas that is very much related to the dyslexic children learning as proposed in multisensory method based on significant findings from Ho Yu et al., 2007). Selected cognitive areas for this research (Alessi & Trollip, 2001;) includes:

- Perception and attention.
- Encoding – Mayer dual coding theory
- Memory
- Active learning
- Motivation
- Locus of control

The following parts are aimed at explaining the link between those theories with the content structure design proceeded with the explanation on its relationship with the interface design.

b. Content structure design

The content structure design of this courseware is divided into three parts. Each of the parts is explained below:

 Content

Variety of activities should be presented in the multimedia application for dyslexic children to gauge their attention.

"The courseware should be designed with anticipation and accommodation of different learning styles by systematically varying teaching and assessment methods to reach every student" (Ross-Gordon 1998).

Activities that are designed for the courseware should be presented in visual and auditory elements and also supported kinesthetic elements which involved interaction between user and the courseware.

Likewise, the information gathered from interview with teachers also suggests the importance of incorporating hands on activities into learning materials in order to sustain dyslexic children's attention.

With regards to the cognitive theory, this feature supports the principles of attention and perception, active learning, motivation as well as locus of control.

- Interrelated modules

Contents of the courseware should be divided into modules. Besides that, the modules were arranged in the sequential order with the easiest module first followed by more difficult modules. To ensure that the dyslexic user still remember and use what has been taught in the first module, a part of the first module is also included in the following modules. This feature is also related to the phonological theory of dyslexia that suggested the use of phonics reading structure to help dyslexic children.

Besides that, this feature is also supported by the cognitive theory specifically the memory as well as the motivation area. One of the principles in memory is repetition. The repetition principle states that the more information is practiced and used the better and longer it is remembered. In addition, the perception and attention area in cognitive theory encourages the repetition of information to maintain user's perception and attention.

- Organization of content that is systematic and cumulative

Organization of material is designed to follow the logical order where it begins with most basic elements and progress methodically to more difficult material. (Fawcett et al,1994). This concept is aligned with Phonological theory of dyslexia also suggested a systematic structure of learning content to enhance dyslexic children learning outcome (Oakland et al, 1998). In addition multisensory method explained in section 2.8 and also with the principle of attention and perception in cognitive learning theory (refers to Section 2.6).

- Help page

"Instruction is most efficient when students engage in activities within a supportive learning environment and when they receive appropriate guidance that is mediated by tools" (Vygotsky 1978, as cited in Gillani & Relan 1997).

The statement above explains the importance of including Help page in designing courseware. c. Interface design

Interface design is another important part in the courseware conceptual model. The interface design of this courseware has incorporated these elements: o Background color customization - to reduce the scotopic sensitivity or Meares-Irlen syndrome associated with visual deficit theory of dyslexia

- o Left marker – to indicate left side of the course (to read from left to right)
- o Guided reading from left to right - the appearance of the text or syllables one by one from left to right.
- o Visual elements - include the texts that are supported with graphics, animation and video. Those contents help the dyslexic children to understand the lesson better.
- o Auditory elements –
- o Kinesthetic elements - two way interaction between the user and the courseware
- o Semi controlled navigation – This feature will indirectly ensure that the user finished all the modules and not getting lost within modules.
- o Text to audio conversion

The preliminary model discussed above will be tested and evaluated before it could be officially accepted and used. In order to evaluate the model, a prototype courseware was developed based the proposed model.

4.0 Conclusion

The researcher believes that the conceptual model constructed in this research will be beneficial for dyslexic children. However few modification and enhancement need to be done to ensure its effectiveness.

For future work we will carry out analysis of the data gathered and further improve the conceptual model.

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