Empirical Evaluation on Preliminary Courseware Conceptual Model for Dyslexic Children

Eze Manzura Mohd Mahidin

Universiti Tenaga Nasional
ezemanzura@uniten.edu.my

The main objective of this paper is to discuss the outcome of testing conducted on the preliminary conceptual courseware model to support dyslexic children in reading. The construction of the model has taken into consideration the suitable teaching and learning methods for dyslexic children. A prototype courseware has been develop based on the preliminary model to identify its effect on dyslexic children. The empirical experiment were conducted which involved 30 dyslexic children and three teachers from two schools (Sekolah Kebangsaan Taman Tun Dr. Ismail (2) and Sekolah Kebangsaan Taman Maluri). In summary, the results from data analysis showed that generally, the dyslexic pupils who participated in the study had positive attitude towards the use of courseware in learning to read.

1.0 Introduction

Dyslexia is associated with difficulty dealings with words specifically in reading, spelling and expressing thoughts on paper (Greene, 2006). Dyslexia is identified as one of the contributing factors that resulted into the literacy problems among school going children (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 multimedia learning material for

dyslexic children. In order to ensure that the multimedia application can addressed the problems faced by dyslexic children, the researcher has constructed the multimedia conceptual model for dyslexic and further to that a prototype courseware has been developed. The following section will explain about the model.

2. 0 Construction of the preliminary model

This section will discuss the preliminary conceptual courseware model constructed by the researcher. The model is aimed to serve as a guideline in designing multimedia courseware for dyslexic children. The model is illustrated in Figure 1.1

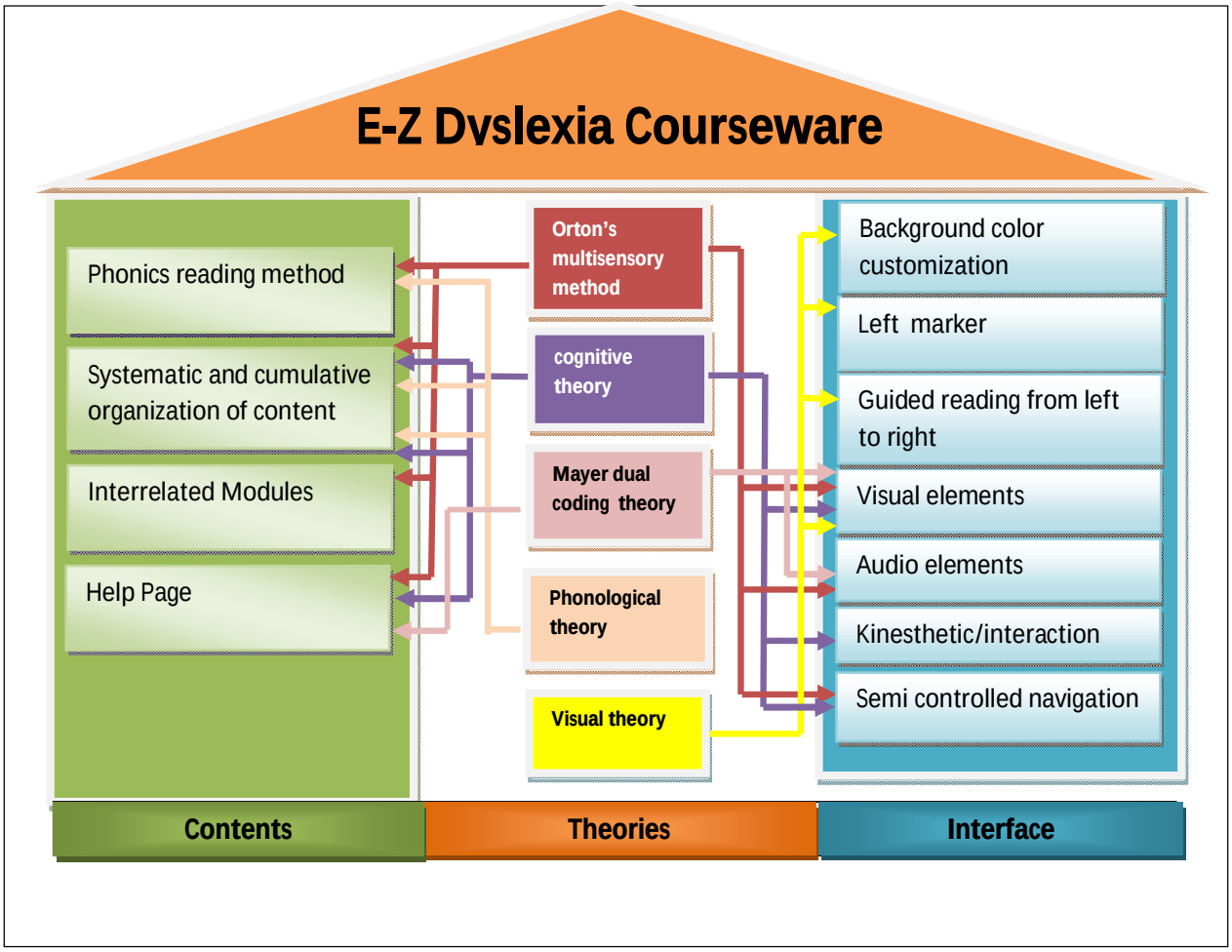

Figure 1.1: Preliminary Courseware Conceptual Model

With reference to Figure 1.1, there are three components that represent the overall courseware model. Those components are the courseware content, the interface and related theories. All of the components are interrelated. Breif explanation of the components is presented below:

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.

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. 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.

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.

- 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).

- Help page

c. Interface design

Interface design is another important part in the courseware conceptual model. The interface design of this courseware has incorporated these elements:

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

In order to verify the conceptual model constructed above, a prototype courseware has been developed and its relation to the model is presented in Table 1.1 below.

Table 1.1: The Relationship between the Conceptual Model and the Prototype Courseware

Preliminary Courseware Conceptual Model	**Prototype Courseware**
Left marker	The marker is represented with a picture of a hand on the left side of the screen.
Color palette for background	User has the ability to customize the background color that suited their vision. The color palette is provided on the top of the screen.
Interrelated modules	The modules in the courseware is arranged in a logical order with the content of the earlier module is included in the new module.
Visual elements	The courseware is equipped with the text (syllable content), picture of things associated with syllable, icon for navigation button and animation on how to write the letters.
Audio elements	The courseware is equipped with the narration on the syllables and also narration on instruction.
Tactile	The tactile elements in the courseware buttons interaction and exercise on how to write the letters.
Controlled user interaction	The courseware offered semi flexibility for user in exploring the courseware content. User could not move to other page unless he/she had finished the current page.

The next step was to evaluate the prototype courseware in order to verify the effectiveness of the courseware conceptual model in assisting dyslexic children's learning process. The following section aimed to discuss the result from the evaluation.

3.0 Evaluation

The summative evaluation involved the real respondents amongst dyslexic children and also teachers. For the purpose of this evaluation, the researcher with the help from teachers had selected 30 students from both schools (*Sekolah Kebangsaan Taman Tun Dr. Ismail (2) and also Sekolah Kebangsaan Taman Maluri*) where 16 of them were dyslexic and another 14 with obvious dyslexia symptoms. The age of respondents ranged from 7 years old till 11 years old. The evaluation consisted of several methods such as interview, questionnaire and observation. The flown of evaluation is shown in Figure 1.2.

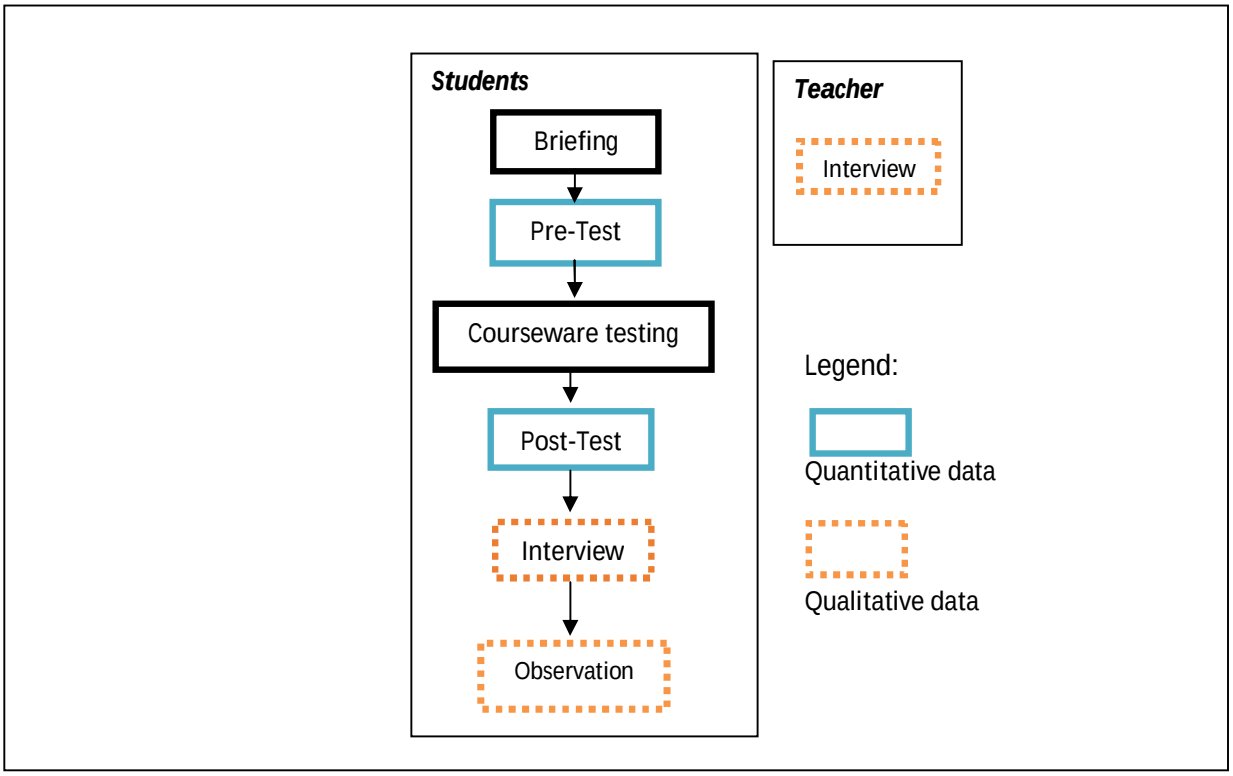

Figure 1.2 : Summative Evaluation

The result from the testing is summarized in Table 1.2 .

Table 1.2: Summary of Findings from Evaluation

Type of Testing or Evaluation	Findings
Dyslexic Students' Learning Style	
a. Interview session was conducted to get feedbacks on dyslexic children's learning style	• It can be concluded that the students' learning styles are the combination of the three learning preferences namely Visual, Auditory and Kinesthetic. • Kinesthetic was has the highest score, followed by the auditory and visual learning style.
Pre-test	
a. The pre-test questions were given to the students prior to the courseware hands-on experience session.	• The first 10 students achieved a good result thus reflected their ability in reading basic Bahasa Melayu while another 20 students showed average result. This indicated their weakness in reading basic Bahasa Melayu. Another set of pre-test questions were given to the 10 students who achieved good result. The questions cover advanced module.
Post-test	
a. The pos-test questions were given to the students after the courseware hands-on experience session.	• 87% of the students who participated in the experiment showed improvement in their score with 63.3% with increment by 4 points and above in their post-test. Another 6.7% of the students got the same score for both pre-test and post-test while 6.7% of the participants had a slight dropped off in their score.
Interview with students about courseware	
a. The courseware in general	• 90% of the respondents agree that the courseware is interesting.
b. "Ease of Use"	• There are two major improvements to the courseware should be considered based on the "ease of use" category. Those improvements were: - Instructions given should be supplemented with visual or animation. - Help page also should be accessible from any page.
c. Motivation	• The feedback recorded showed that 40% of the students think that the courseware still lacked of fun (activities or games).
d. user interface	• The feedback gathered was more positive as most of the students like the interface design.
Observation	
a. observation was conducted during the courseware hands-on session	Encouraging observations were noted during the experiment as listed below: • Most of the students were eager to explore the courseware. • Students actively giving feedback throughout the session. They asked for guidance whenever needed thus showing their interest towards the courseware and also towards learning. Besides that, some negative responses were also recorded from the observation. Those negative responses are: • Some of the students found it a bit difficult to use the mouse.

	• Most of the students did not even click on the left marker and the help button. This might be because they are not sure of the function thus showing the limitation of the courseware especially in providing instruction. • Most of the students spent more time on writing exercise and they enjoyed it very much. • Students were not familiar with the flow of the courseware as they were new to the courseware. Thus, they needed help from the instructors. • There were some students who looked uninterested with the courseware. They clicked everywhere on the page hoping that something will happen. This scenario signified that they would like to have more interaction with the courseware in order to sustain their attention.
Interview with teacher	
a. Feedbacks and suggestions to the courseware	• The instructions given in the courseware should be more detailed and easy to understand. • The courseware should be integrated with more activities in order to grab students' attention.

4.0 Conclusion

The researcher believes that the conceptual model constructed in this research will be beneficial for dyslexic children. However few modifications and enhancement need to be done to ensure its effectiveness. For future work we will carry out detailed analysis of the data gathered and further improve the conceptual model.

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