A Review of Learning Courseware for Children with Learning Disabilities in Malaysia

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Abstract Children with Learning Disabilities (LD) are different from normal kids. They need special approach in conducting learning sessions. On the other hand, learning courseware is deemed as best way to encourage children with LD to learn. However, there are limited studies reported on the existence of learning coursewares for children with LD in Malaysia. Therefore, this paper aims to identify the presence of LD coursewares in Malaysia and to propose the most effective courseware design for LD children. By using the four-stage method from Bandara’s Systematic Literature Review (SLR), it is found that multimedia application should be considered as the most effective component for developers while designing the learning coursewares for LD. These coursewares provide an interactive education experience for children with LD.

Keywords: Learning Disabilities, ICT in Education, Learning Courseware, Systematic Literature Review.

1. INTRODUCTION

One of the main factor in learning disabilities is that each disability has its characteristics and thus requires special learning needs (Khan & Bayoumi, 2015). According to Chauhan (2011), based on educator’s experience, children need special help in education due to inability to cope in fundamentals subjects. Those children require extra attention to enhance their education to be aligned with other normal children (Chauhan, 2011). Children with learning disabilities often face difficulties in understanding and comprehending instructions, and they are unable to follow the learning process. These children require a special needs and special teaching method (Landoni, 2008). Therefore, different approach of learning should be used for children with LD such as utilizing learning courseware. Nowadays, technology has conquered many domain including education (Morris, 2009). According to Hassan et al. (2014), tablet technology or well-known as Android technology that uses the multi-touch screen provides motivation to learn and allows the children to engage with the courseware application for a longer duration.

Furthermore, there are many existing studies on designed learning courseware for basic subjects such as Mathematic and the Malay Language (Abdullah, Hisham, & Parumo, 2009; S. Z. Ahmad, Jinon, & Rosmani, 2013; Sahrir, Yahaya, & Nasir, 2013; Yussof & Paris, 2012; Zaini & Ahmad, 2011a). However, there is scarce of literature specifically for LD courseware especially in Malaysia. Besides, little studies were found on designing a courseware that caters for children with learning disabilities (Azizzceanna Hassan, Mahmud, & Tap, 2014).

Hence, this paper presents an investigation of the literature concerning learning courseware for children with LD. It attempts to identify the existence of LD children courseware, specifically in Malaysia. This study also investigates the most effective courseware design for LD children. This paper is organized as follows. The following section, Section 2, presents the literature review on the topic of discussion. Section 3 discusses on the methodology used in the study. Then, the results and discussion from the literature review analysis are explained in Section 4. Finally, Section 5 concludes the paper with potential exploration motivation for learning courseware for children with learning disabilities.
2. LITERATURE REVIEW

This section discusses related literature review.

2.1 Learning Disabilities Categories

Learning disabilities (LD) is defined as a permanent, objective cognitive-neurological disorder that significantly influences an individual’s learning ability (Mafra, 2015). Hassan et al. (2014) categorized the hierarchy of disabilities in Malaysia, as shown in Figure 1. All categories of these disabilities have similar characteristics, i.e. learning problems and poor performance in school.

![Figure 1: Hierarchy of disabilities in Malaysia (2009) adapted from (Asif Hassan, Mahmud, Tap, & Osman, 2014)](image)

At the top of the hierarchy labeled as special needs students that are categorized into three main part; hearing impaired, visual impaired, and learning disabilities (LD). Another six subcategories fall under learning disabilities. There are specific learning disabilities (SLD), autism, down syndrome, attention deficit hyperactivity disorder (ADHD), minimal retardation, and slow learner. This study focuses on learning disabilities.

The first subcategory, specific learning disabilities (SLD), focuses on children with one or multiple difficulty in learning from the context of speaking, reading and writing. The children may show the aforementioned disabilities in the learning process (Grant & Grant, 2010; Pesova, Sivevska, & Runceva, 2014). This type of children are categorized as children in the need of special education (Kavale, 2005). Many researchers have agreed to divide SLD children into three categories; dyslexia (reading problem), dysgraphia (writing disorder) and dyscalculia (calculating problem) (ElSayed, 2012; Asif Hassan et al., 2014; Khan & Bayoumi, 2015; Kulkarni, Kalantre, Upadhye, Karande, & Ahuja, 2001; Pirani & Sasikumar, 2012).

The second subcategory, autism, is a neurodevelopmental disorder portrayed by constraints capacity to cooperate and speak with others (Genuis, 2009), a disorder that influences the social functioning and communication of the child. Autism comprises of “tried” impairments including imagination, problems in socialization, and communication (Gillott, Furniss, & Walter, 2001). Those with the above problems often face difficulties in socialization and intercommunication.

Next, the third subcategory is Down syndrome (DS). According to Sherman et al. (2007), DS is well known as a genetic form of mental retardation that may lead to medical conditions and particular birth defects (Sherman, Allen, Bean, & Freeman, 2007). This syndrome is caused by a chromosomal abnormality that compromised the intellectual level of a person (McCarthy, Dr John Devapriam, Walton, & Kerr, 2015; Van Riper, 2007).

The fourth subcategory is attention deficit hyperactivity disorder (ADHD). This type of disability is among the most frequently diagnosed childhood psychological disorder usually characterized by symptoms like hyperactivity, impulsivity, and inattention (Hervey, Epstein, & Curry, 2004). ADHD is also claimed as a psychological or behavioral development disorder, where all clinical criteria involve behavior. Among the main clinical symptoms are overactivity, impulsiveness, and inattentiveness (Sagvolden, Johansen, Aase, & Russell, 2005).

The fifth subcategory is minimal retardation. Minimal retardation is related to mental retardation that refers to substantial limitations in intellectual functioning. Those diagnosed with mental retardation are characterized by significantly sub average intellectual functioning, existing concurrently with related limitations in two or more of applicable skills areas; self-care, home living, communication, social skills and others. They can be detected as mental retardation before the age of 18 (Chelly, Khelfaoui, Francis, Chérif, & Bienvenu, 2006; Edward A. Polloway, 1997).

The last (sixth) subcategory is slow learner. According to Malik (2009), children who are not performing academically in school can be categorized as slow learners, yet they are not eligible for special education. Their intelligence scores are likely too high to be considered as a child with mental retardation. Usually, slow learners require some level of additional support to be successful in education.

2.2 Early Childhood Education

The main human organ is the brain. As the brain is not fully grown at birth, a child’s memory and attention continues to develop during their early childhood (Gorey, 2001). A study by Thomson and Nelson’s (2001) posits that the phases of human brain development start with sensory pathways during the first few months after birth. After that, a language pathway is highly developed during the third trimester of the first year. Later, the development continues until it reaches higher cognitive function parallel to their increasing age.
According to Rankothge et al. (2012), there are four interrelated children developmental domains: reading, writing, listening, and speaking. These are regarded as linguistic aspects in early childhood development (Rankothge et al., 2012). Nowadays, technology-driven programs are helping educators to teach students. Supporting learning courseware developed also comprises of those linguistic aspects (Melliou, Moutafidou, & Brattitis, 2014; Tootell, Plumb, Hadfield, & Dawson, 2013).

2.3 Importance of Early Childhood Education

Early brain growth is important for children to avoid the risk of brain diseases or mental disorders (Prastawa, Sadeghi, Gilmore, Lin, & Geng, 2010). Early childhood education is necessary and vital in developing their brain. Providing good education at the early stage should not be neglected and overlooked because it will also provide the child with a bright future (Sabariah, Efendi, & Rinandhi, 2015). Education in early childhood is important in our society because it helps parents in deciding for a good school for the children (X. Wang, You, Wen, & Wen, 2012). Therefore, early childhood education is very important to detect children with learning disabilities at an earlier stage.

2.4 ICT in Education

ICT in education provides efficiency in education and the upbringing is reflected in the level of realization of its goal, particularly in primary schools (Lamza-Maronic, Glavaš, & Vukasinnovic, 2010). It can improve the education system, especially in educating slow learners. In addition, the use of ICT in education is to allow knowledge, information, and education to be easily accessible, as well as to provide life-long learning process. Besides that, Wang and Zhou (2013) elucidate that ICT is supported by the education system around the world. Nowadays, it seems that there are no educational institutions that do not use technology and take it as the best method or teaching medium in the learning process (F. Wang & Zhou, 2013).

However, the significance of ICT should not be over-emphasized in the education field. According to Morris (2009), an essential part of ICT in education today is to associate individuals with assets. The number of connecting strategies utilized as part of the training process has been growing fast. It is because ICT is rapidly growing particularly in the telecommunication area (Morris, 2009). Hence, everyone should have the basic knowledge of ICT, thus making class sessions more productive. Teaching to be equipped essentially in the ICT technologies is an imperative role of ICT education. This will lead to being successful in academic, enabling to efficiently take an interest in the modern technical society.

2.5 Learning Courseware

The purpose of developing courseware is to provide educational assistance for children, in which it incorporates attraction approach and interesting learning process (Muda, 2006). Slow learners are appropriate candidates to use courseware to help them in their education (Abdullah et al., 2009). Isa et al. (2010) reported that courseware is likewise called instructional or educational application that is widely accessible at primary schools and can be utilized as a vital part of the conveyance for their courses. Courseware is being used in the learning and teaching method as an approach to improve the learning process in an effective and interesting way (Isa et al., 2010). This approach is learner-centered that encourages self-managed learning (Isa et al., 2010).

3. RESEARCH METHODOLOGY

The methodology used for this study is the Systematic Literature Review (SLR) adopted from Bandara et al. (2011). The use of this method is to address the existing courseware for children with LD, and to find the most effective component for designing it. Later, the collected results were summarized and reported. The subjects were provided with four phases of SLR method (Bandara, Miskon, & Fiel, 2011) as shown in Figure 2. The next section will discuss the analysis of each phase.

Figure 2: SLR Phases adopted from (Bandara et al., 2011)

3.1 Phase 1: Justify and Download Papers

In this phase, reliable papers were selected. The selection of papers was done based on the inclusion and exclusion criteria. Inclusion criteria were carried out using keyword search (courseware and learning disabilities), papers published between 2009 and 2015, and papers written in English. Meanwhile, the exclusion criteria covers rejected redundant papers, and those papers not written in English. After both inclusion and exclusion criteria have been taken into consideration, the papers were downloaded from databases such as Springer, IEEE, and Google Scholar in the form of PDF files. EndNote program was utilized to manage the references. A total of 22 papers related to the studies were downloaded.
3.2 Phase 2: Prepare for Analysis

For preparing the analysis, 22 relevant papers were imported into NVivo 10 tool to be analyzed. Then, the first level coding node named ‘LD courseware’ was set. Once the first node setting was done, all papers were read and relevant points were coded accordingly.

3.3 Phase 3: Creation of Coding and Analysis

The next step involved the setting of the second level coding. A child node code was created from the first coded text. The node was named ‘design component’. All design elements will be analyzed from existing learning courseware for learning disabilities children form this code onwards.

3.4 Phase 4: Report the Results

Based on the analysis of each phases, the result shows that the goal of this paper had been achieved. The following section will discuss further about the findings.

4. RESULTS AND DISCUSSION

It was found that 10 studies had developed learning courseware for children with various categories of learning disabilities in Malaysia. Table 1 shows the summary of the existing learning courseware for children with learning disabilities.

Table 1: Existing Learning Courseware for Children with Learning Disabilities in Malaysia

<table>
<thead>
<tr>
<th>Courseware Name</th>
<th>Explanation</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Komputer Saya’</td>
<td>Developed by Abdullah, Ahmad, &amp; Akhir (2010) for slow learners to learn computer fundamentals. The courseware design involved multimedia elements.</td>
<td>(Abdullah, Ahmad, &amp; Akhir, 2010)</td>
</tr>
<tr>
<td>MyLexics</td>
<td>Abdullah et al. (2009) introduced this learning courseware for Dyslexic children to learn Malay language. Components applied are dual coding theory, structured multisensory phonic teaching and Scaffolding instructional technique.</td>
<td>(Abdullah et al., 2009)</td>
</tr>
<tr>
<td>MyLINUS</td>
<td>W. F. W. Ahmad et al. (2013) developed this courseware for slow learner children to overcome their reading difficulties. The courseware designs were multimedia based and implement ADDIE model.</td>
<td>(W. F. W. Ahmad, Noordin, &amp; Sharihuddin, 2013)</td>
</tr>
<tr>
<td>Mathlexic</td>
<td>Introduced by S. Z. Ahmad et al. (2013) for Dyslexic children to learn Mathematics. The components being used is multimedia element.</td>
<td>(S. Z. Ahmad et al., 2013)</td>
</tr>
<tr>
<td>MEL-SindD</td>
<td>Yussof &amp; Paris (2012) developed this courseware for Down Syndrome children to learn the Malay language. Scaffolding model and multimedia were applied for the courseware development.</td>
<td>(Yussof &amp; Paris, 2012)</td>
</tr>
<tr>
<td>FaceSnap</td>
<td>Chen et al., (2011) introduced learning social behavior and facial expression for children with Asperger’s Syndrome (related to Autism) aged between 7 to 11 years old. The courseware design involved game based method with fun and excitement ways.</td>
<td>(Chen, Ahmad, &amp; Zulkarnain, 2011)</td>
</tr>
<tr>
<td>HANDS Project</td>
<td>Developed by Mintz &amp; Aagaard (2010) for helping Autism children aged between 11 to 16 years old to diagnose young people to navigate and develop socially. Elements used in this project are persuasive technology approach, Behaviorism, cognitive and humanistic psychology, and socio-cultural theory.</td>
<td>(Mintz &amp; Aagaard, 2010)</td>
</tr>
<tr>
<td>Learning Course for Malay Language</td>
<td>Introduced by Ng et al., (2015) for children with learning difficulties to learn the Malay language. Persuasive system design and multimedia elements were incorporated in the courseware development.</td>
<td>(Ng, Bakri, &amp; Rahman, 2015)</td>
</tr>
<tr>
<td>“Aplikasi Kanak-Kanak Autisme: Mari Mengenal Warna”</td>
<td>Fasihah &amp; Mokhtar (2011) developed this courseware for Autistic children aging from 6 to 8 years old to learn to recognize colors. The development of this courseware are utilizes 2D animation and Adobe Flash CS4.</td>
<td>(Fasihah &amp; Mokhtar, 2011)</td>
</tr>
</tbody>
</table>

It can be concluded that learning courseware for LD children existed in Malaysia. It shows a positive result and there were studies concerning about children with LD to receive good education. In addition, it was found that multimedia applications were the most effective courseware design as shown in Figure 3. Thus, 50
percent of the findings as shown in the Table 1 employed multimedia application. It demonstrates that five out of ten studies implemented multimedia component for designing courseware. They were ‘Komputer Saya’, MyLINUS, Mathlexic, MEL-SindD, and Learning Courseware for Malay Language. Multimedia is described as any combination of text, audio, video, graphic and animation elements in digital environment. Therefore, this application enables interactive learning environment to persuade and encourage the children with LD to learn. It can be used to train, assist and even enable the learning process to be simpler (Skiada, Soroniati, Gardeli, & Zisis, 2014; Yusoff et al., 2011).

Besides that, Figure 4 shows the findings of the number of courseware had been developed from 2009 to 2015 with the total number of 10-courseware. The highest number of developed courseware was in 2011 with three coursewares. Followed by the year of 2010 and 2013 with two coursewares. For the year 2009, 2012, and 2015 only one courseware was developed. Unfortunately, there no learning courseware for children with LD was developed in 2014.

While Figure 5 shows the number of coursewares developed for children with LD with the total number of 10 LD children. Based on the graph, it shows that the highest number of coursewares was developed for Autistic and Dyslexic children with three coursewares each. One courseware each was developed for children with learning difficulties and Down syndrome. Meanwhile two coursewares were developed for slow learners. Overall, it seems more studies need to be done to increase the number of coursewares developed year by year and develop coursewares for other LD children too such as ADHD and minimal retardation.

On the other hand, another 12 studies were identified as learning coursewares that was not developed for learning disabilities children. Those coursewares were Al-Furqan (Bakri, Zakaria, Zainulldin, Nazirah, & AbuSafia, 2014a), IQRA (Rosmani, Wahab, & Ibrahim, 2012), i-IRQA (Rosmani & Wahab, 2011), V-Hajj (Yusoff et al., 2011), KAFA (Isha et al., 2010), BAiK (Faryadi, 2012a, 2012b), Li2D (Zaini & Ahmad, 2011b), E-Z. Arabic (Sahrir et al., 2013), HMIEG (Zin & Yue, 2009), i-COM (Bahrudin et al., 2011), PMICMO (Aziz, Rasli, & Ramli, 2010), and ALL (Salim, 2009). These coursewares were identified beneficial for learning process, by which the learning process is done in an exciting and interactive way. However it was developed for normal children or normal people to learn the particular subject.

5. CONCLUSION AND FUTURE WORKS

As a conclusion, this study has successfully investigated existing learning coursewares for children with LD in Malaysia and the most effective approach for designing the courseware. SLR method used assisted this study in identifying the findings. From the findings, the learning coursewares were found to be able to help the LD children to learn as excellent as other normal child in education. It also shows that the LD children have an easier learning process in utilizing the coursewares compared to traditional teaching method by using a textbook. This provides a creative and innovative way to teach children with special needs.

However, current existing learning coursewares for children with LD are insufficient because special children need more supporting tools and technology that could encourage them for better education. Therefore, for future works, this reviewed study can be used as a reference or a future direction in designing courseware which is more useful for special children.
guidance by other researchers in conducting similar studies especially in developing learning coursewares for children with LD. This study can be improvised by adding more new learning coursewares related to children with LD in the future.

6. REFERENCES


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