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A Review on Courseware for Down Syndrome Children

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***Abstract*—** Educational courseware is very popular nowadays as an alternative teaching tool for children's early education. Courseware that integrates with multimedia elements can bring positive effects by reducing the difficulties in the learning process. Down Syndrome children who face difficulty in learning are being encouraged to utilize educational courseware as a learning tool in their education. Multimedia elements can integrate visual and auditory information into one by primarily presents the visual information first. Thus, other than common coursewares, there are coursewares being designed specifically for Down syndrome children according to their learning behaviours and problems. These coursewares implemented different courseware design techniques with different target subject. This article mainly reviewed on the selected coursewares designed for Down Syndrome children. As Down Syndrome has achieved the highest cases among all the learning disability cases in Malaysia in the recent years, it is crucial to conduct a review on the current research and works in field of courseware learning to understand the current trend and state. Besides, review is conducted on the coursewares in terms of the design techniques and content as a comparison. Thus, improvements and suggestions can be made through the comparison of the coursewares.

Keywords – Down Syndrome; Educational Courseware; Courseware Design; Multimedia Courseware

1. INTRODUCTION

Children learning courseware is a common tool for parents and teachers as technologies develop from time to time especially in this technological era. However, it is stated that most of the coursewares in the market are designed for normal children that have the normal learning ability [1]. There are coursewares in the market that created specifically for children with special needs [2]. However, due to their learning behaviour and problems, the courseware might not be suitable for their level of learning and unable to utilize them effectively. It is stated that maintaining a person's attention is one of the important factors that should be taken into consideration when designing educational software [3]. Although the courseware content is suitable and helpful, it is considered less effective if they did not continuously utilize it in their learning process. As mentioned in a study, courseware should be designed in a way that can draw their attention by keeping interaction between software and user, provided that they constantly have activities to carry on during software browsing [3]. Judging from this statement, if the software fails to maintain attention, users will tend to discard the software and probably choose to not utilize it. It is not encouraged to force them to use the common courseware as it might cause the lost of interest in the study for Down Syndrome children.

In the recent studies regarding courseware development for children with Down syndrome, various techniques being applied in the courseware design. This including implementation of Scaffolding method [4], Augmented Reality technique [5] and Dual Coding Theory [6] in the courseware design. Besides, different subjects being targeted at different studies including language learning [4, 5] and mathematics skills [6]. Many different design techniques are proposed and tested. These coursewares implemented different design techniques to target different problems of Down Syndrome children. However, these mentioned coursewares either targeted one problem of Down Syndrome [4] or did not mention what learning problem they target [5, 6]. It is stated that the software should be interpreted in accordance with user's needs and considerations [3]. Thus, problems need to be addressed in details and clearly to understand their level of learning before the courseware being developed. Besides, these studies did not specify the age of the target group for using the courseware. Software should be adaptable to individual user needs [3]. Thus, different age level of children with Down Syndrome should utilize different content of courseware. It is important to address the age of user for the courseware to target correct audiences. In addition, these studies do not apply design technique that can persuade and encourage them to continuously use the courseware as maintaining attention is important for educational software design [3].

The purpose of this paper is to review the existing coursewares designed for Down Syndrome children in terms of their design techniques and content. The review should be conducted to understand the current research directions of the courseware learning field for Down Syndrome children especially in Malaysia. Down Syndrome community needs to be taken care, especially in their early education as it is the most frequent case among all the learning disability cases. The review will analyzed the current existing coursewares. As a result, a comparison can be made among all the discussed courseware.

2. LITERATURE REVIEW

This section reviewed on Down Syndrome in terms of the definition and the learning problems. The learning problems are discussed in detail in this section. Besides, the learning styles are being discussed for Down Sydrome children. Lastly, the.relationship of Down Syndrome and Computer is also being mentioned in this section.

A. Down Syndrome

According to National Down Syndrome Society [7], Down syndrome happens when the individual has a full or partial extra copy of chromosome 21. This additional chromosome affects their development and causes the symptoms among them. Children with Down syndrome are individuals that have same learning strategy with normal children, but have slow development in the learning process [8]. They can be identified through several symptoms and characteristics. The Centers for Disease Control [9] stated that the frequency of Down syndrome is 1 in 691 live births. Down syndrome is one of the types of learning disabilities and affects their lifelong development either physically or mentally. It is important to understand their learning problems and behaviour first in order to identify their learning ability and level.

Down syndrome is categorized as one of the types of learning difficulties in Malaysia's education system. According to a report produced by National Early Childhood Intervention Council [10] that obtained from Malaysia Ministry of Health, Family Health Development Division, the total number of registration children with special needs is 22 089 (from 2004-2012) and the cases of Down Syndrome achieved the highest number. Since Down syndrome is the most common among the special need cases, it is encouraged that more contribution should be done towards the Down syndrome group. The negative effects suffered from them can be improved by giving them better and more effective education especially in their early stage. This has shown that there is a need for research to be conducted on them.

Children with Down Syndrome have their own learning behaviours and problems. Their learning progress is different from normal children. Thus, these problems should be analysed to understand their level of learning and problems they faced during the learning process. They have their own problems in language learning. Most of them are late in saying first words, as well as their late vocabulary growth [11]. They also have difficulty in talking grammatically correct sentences [11]. From the reviews of Down Syndrome language development, the direct and indirect problems identified for children with Down Syndrome regarding language learning are as follows:

i. Poor phonemic awareness

Phoneme is any one of the set of the smallest units of speech in a language that distinguish one word from another. Children with Down syndrome have poor phonemic awareness [12]. They are weak in segment syllables into phonemes, deletion and rhyming. Phonemic tasks involve counting, adding, delete and identify the position of phonemes in words. Without proper phonemic skills, they are unable to differentiate words or read the words correctly. They need proper guideline and assistance to learn that suits their learning ability.

ii. High rate of hearing problems

Children with Down syndrome often possess mild to moderate hearing loss problem [13]. The hearing problem may contribute to problems in language learning [14]. In the normal learning process, listening skills is very important to obtain information. However, Down syndrome children have problems in hearing and affect their language development. This will be a lifelong problem as 60% of them possess with hearing loss and problems in one or both ears [15]. Since language is a basic skill for learning other subjects, this problem might bring negative impact on their learning process.

iii. Weak development of vocabulary

The average time for children to produce their first word is 21 months [13]. However, children with Down syndrome produce their first words much later than normal children. The late development of vocabulary skills will affect their learning progress as they require more time to recognize more words. Vocabulary is crucial in language development to represent objects and to communicate with each other. Without proper vocabulary skills, they will face difficulty in learning other subjects.

iv. Have difficulty in understanding the meaning of an object or an event through concept

It is stated that individual with Down syndrome have difficulty in defining an event or object with meaning [4]. They are weak in combining information from the past and present to be used to describe objects or event. Proper assistance and guideline should be provided to them to enable them to learn information arrangement skills. This can help them to use the information stored in their memory. Thus, the courseware should be designed in a way that does not confuse them with too many instructions or information at once. The information should be presented to them one at a time to enable them have

enough time to arrange it and store in their memory. Usability of educational courseware is determined by the courseware's ease of use without getting lost in the learning activity [16]. Only related information should be provided to them to prevent them from losing track in the learning activity.

v. Poor short term memory

Children with Down syndrome have poor short-term memory according to a study [4]. The weak short-term memory can directly affect their learning progress, especially in reading skill. However, they are still able to learn through strategies same as normal children, but their progress is slower [4]. They require more time and repetition compared to others in order to remember or memorize a thing. The short-term memory weakness can be improved through memory exercises according to a study [17]. This problem can greatly impact their learning ability as they are unable to memorize words for a longer period of time. Thus, they are unable to utilize the words from their memory to produce sentences or words in order to communicate. Auditory exercises can enhance their phonological coding and should be implemented in their education [4].

vi. Weak in distinguishing significant information and redundant information

Normal individual can obtain information by observing objects through touching, hearing and seeing. Then, they can distinguish which are the significant information and redundant information and stored only significant information in their memory. This process can assist us to recall only the information that we needed [4]. However, children with Down syndrome are weak in differentiating the information into significant and insignificant groups. Thus, they are unable to identify or describe an event or object after they learn. This may lead to weak memory skills as less significant information being stored and recall [4]. In this context, the courseware should avoid all redundant instructions or information that is not important for them to remember. This can greatly reduce their memory load on the activity and improve the learning efficiency.

B. Learning Style of Down Syndrome Children

There are different types of learning style that suit each individual in different context. A series of theories of learning styles has been developed and studied including Kolb's Learning Style Inventory (LSI) [18], Honey and Mumford's Learning Styles Questionnaire (LSQ) [19], Riding's Model of Cognitive Style Analysis (CSA) [20], Myers-Briggs Type Indicator (MBTI) [21], Jackson's Learning Styles Profiler (LSP) [22], Hermann 'Whole Brain' Model [23], Allinson and Hayes Cognitive Style Index (CSI) [24], Vermunt's framework [25], and Neil Fleming's Visual, Auditory and Kinesthertic (VARK) Model [26].

VARK Model focuses on visual, auditory and kinesthetic learning. Visual learning is related to seeing things that involve pictures, graphs, charts and methods other than words. Auditory learning focuses on the hearing and listening part through audio. Kinesthetic learning focuses on the learning via experience, including moving, touching and doing [26]. It is stated that multimedia elements in educational software can integrate visual and auditory information into one by primarily presents the visual information first [27]. Besides, it is stated that the movement of fingers across the touch screen mobile devices encourages the kinesthetic elements [2]. Thus, the usage of multimedia mobile courseware can encourage the three elements in VARK model.

A study mentioned that multi-sensory approach that involves visual, auditory and kinesthetic elements is suggested in the courseware design[28]. The study showed positive result with the integration of these three elements. Thus, VARK Model is recommended because it also utilizes the three elements. Besides, a study by [29] stated that in visual learning, especially in writing skills by Down syndrome children, flashcards and pictures cues are recommended. Flashcard is considered useful in Down syndrome children's spelling and writing skills. Teach spellings as visually as possible in the early years through method such as flashcards is recommended [29]. On the other hand, pictures cues can encourage visual learning by enable them to think via pictures. VARK learning style can describe the learning style of Down Syndrome children in a suitable context. Next, the relationship between computer studies and Down Syndrome is discussed.

C. Down Syndrome and Computer

Computer technology and computer-related devices have the potential to help children with Down syndrome in their education and independent living. However, most of the software and applications does not consider their special needs that result in ineffectiveness of software towards the children with Down syndrome [30]. In previous study, many theories and techniques have been applied in the courseware design for children with learning disabilities including Down syndrome children. We can divide the design method into two, which are structure-based and function-based [31]. Structure-based design method is the way to design the courseware layout and entire courseware presentation. For example, multi-sensory is a design approach that encourages the interaction of visual, auditory and kinesthetic. It can be realized with the function-based design method such as Augmented Reality technique that promotes the interaction. We can conclude that from these

studies, most of the design method focuses on visual and auditory approach, which involves pictures and sounds [2, 6, 32]. It is suggested that multimedia elements can increase learning ability of the children.

There are several studies and coursewares being designed and developed for the Down syndrome children [27, 33, 34]. A study introduced a mathematical courseware for Down syndrome children to improve calculation skills [27]. The results showed that the multimedia group achieved better performance than the pencil-paper-based group and suggested a clear relation between teaching method and mathematical learning in Down Syndrome children. Another courseware discussed the vocalization courseware (Sounds Beginning) that improves the speech skills of Down syndrome children [33]. This courseware allowed children to select appropriate sounds, words and phonemes and has importing own picture function. Besides, this study also introduced a reading courseware (See It Say It) that focus on vocabulary development among Down syndrome children. There is a study the effectiveness of computers for training language skills of children with special needs [34]. The result showed that computer-based intervention was as successful as one-to-one language therapy in a study of eight toddlers with Down syndrome. Another study of fifty two children in special education class using interactive computer learning sessions and it showed significant progress in vocabulary level [34].

Since Bahasa Melayu is the national language of Malaysia, we will make priority to review Bahasa Melayu courseware in the language learning domain. In Malaysia, there are several courseware develop for Down syndrome children in different subjects and area. This includes MEL-SindD courseware [4], AR-BACA SinD courseware [5] and SynMax courseware [6]. Different techniques and design are being applied in the mentioned studies. All the studies above targeted Down syndrome children with no age specified [4, 5, 6]. These mentioned coursewares will be discussed in detail.

3. METHODOLOGY

The review is conducted using systematic review methodology. First, a review question is formed. Review question should focus on the purpose and reasons of the review to be conducted. Review question is important to be stated out to indicate the content of the review to be conducted. In this review, our review question focus on how to select the appropriate courseware to be included inside the review. This includes on the criteria and specifications on the courseware selection that defines what should be considered when selecting the courseware. Besides, targeted subjects and age group for the courseware should be considered when being selected for review.

In second step, we need to identify the relevant work for the review. As many prior researches and works are being conducted in the field of courseware learning for Down Syndrome children, we have to identify the work that is relevant to the review topic by categorizing the research work. This includes the regions, subject, target audience, and design techniques. In order to get a bigger picture on the state and trend of courseware learning for Down Syndrome group, we have to identify different research works from different countries or regions. This will provide a clearer picture on the current works that are already being conducted. For example, research works in western countries and asia countries might be different in terms of the design techniques being implemented in the courseware. We summarize the works from other countries as a comparison. Then, we focuses on the works and research being conducted in Malaysia. We select the suitable courseware from Malaysia and discuss it in detail. Then, we have to analyse the subjects of coursework to be considered in the review. As this review focuses mainly on the language problem of the children, language courseware are made to be a priority for the review. However, other subjects are still will be considered in the review with consideration on other criteria such as design techniques. Target audiences of the review are Down Syndrome children in their early education stage. Other learning disabilities such as Dyslexia or Autism are not considered into the review. Lastly, courseware design techniques are analyzed during the selection. The selected courseware should be unique in terms of the design techniques or design framework which means only one will be chosen from all the similar courseware that using same design techniques. This is to ensure a good outcome of the review in order to do a comparison between coursewares.

In third step, we have to assess the quality of the studies. Courseware that is not documented in a proper way will not be selected in the review as the source might be not realiable. Only the reliable source of database are selected in this review. In the detail review section of the Malaysia's courseware, one of the courseware is from Scopus database [4], second review is from IEEExplore Digital Library [5] and the third review is from Web of Science database[6]. All of the coursewares are legit and recognized as a reliable source. Each of the courseware is assess with the proper documentation on the design techniques or design framework and the content of the courseware. If the study did not specify the design techniques or design framework, it will not be considered in the review.

The fourth step required us to summarize the evidence. After selecting the coursework to be reviewed, the details are needed to be summarized. The evidence should be grouped according to the review criteria. The coursewares are analyzed and categorized into subjects, audiences, design techniques and regions. Each of the courseware will be compared to each other according to the criteria. With the summarization of the data from all of the courseware, the similarities and differences can be easily detected. These similarities and differences are important to be analyzed in the later part in the findings.

The last step is to interpret the findings. After summarize the evidences, a discussion can be done to the findings. The selected courseware will be discussed in detail. This review suggests improvements can be done towards the courseware

design for Down Syndrome children after comparison is done. Improvements are suggested through the reviews on the strengths and weaknesses of each courseware. The findings is the main part to be focused in this review.

4. COURSEWARE REVIEW

i. MEL-SindD Courseware

MEL-SindD is a multimedia courseware designed for children with Down syndrome. It focuses on the short-term memory problem among Down syndrome children to give a solution for a better learning experience. Scaffolding model is being proposed here to improve the situation of the children. Scaffolding method is a metaphor to picture a knowledgeable adult to provide guideline or support towards the children's learning process. It is implemented in the courseware to enable the courseware to act like guidance for children to reach expected development. Scaffolding method suggests decent support to the children and aims to build their confidence by implementing strategies such as give clues, explanation, coaching and reflecting. Communicating, coaching and eliciting articulation are types of scaffolding base on multimedia courseware design [4].

Based on the scaffolding concept, MEL-SindD has three scaffolding models in the courseware including scaffolding model to explore the courseware module (MSMkMP), scaffolding model to hear and read stories (MSDBC), and scaffolding model using sub modules to explore the minds (MSsMJM) [4]. This courseware has five modules which are flashcards, hearing story, reading together, explore mind and learning ABC modules. It starts with an introduction screen to input the user name. The subject being taught here is Bahasa Melayu. Figure 1 shows the model of the courseware in Listen and Read Stories module.

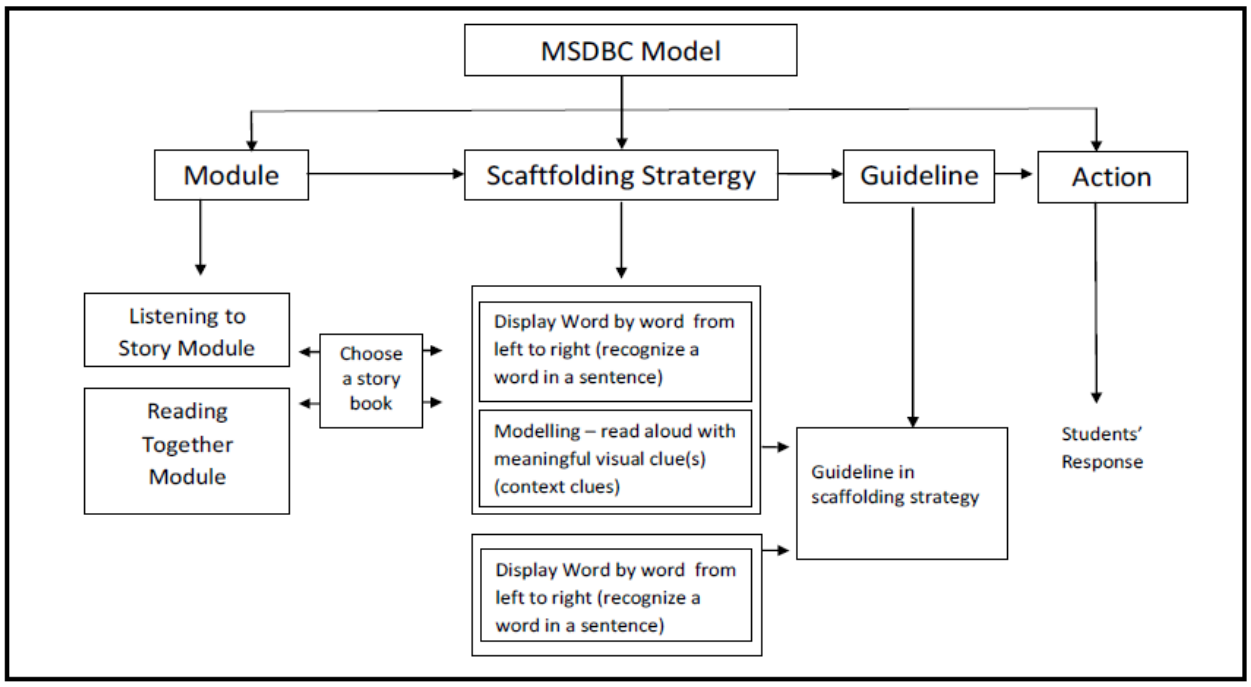

FIGURE 1: Scaffolding Model: Listen and read stories (MSDBC) [4]

The testing result of MEL-SindD has proven that scaffolding method can increase children's confidence level. Children were able to participate actively when using the courseware. This has shown that courseware has promoted the learning process [4]. The strength of this courseware is it increases the memorization skill of the children through scaffolding method. It has also being separated into modules that can be easily understood by the children without confusion. Since Down Syndrome children has difficulty in differentiating significant and insignificant information, module separation can greatly reduce the courseware complexity and simplified the learning module. Besides, it increases the motivation level of children to study which is very crucial to help them in continuing the learning process.

However, this courseware only focuses on the short-term memory problem among the Down syndrome. It does not address other problems or implement specific content design method or screen design method. Besides, this courseware does not specifically design a syllable module for the children. It has alphabets module and reading module. However, without proper syllable module learning, it can be difficult for children to jump to reading module. Syllable learning is crucial before reading words or stories as every word is formed by syllable.

ii. AR-BACA SinD Courseware

AR-BACA SinD is multimedia courseware designed for children with Down syndrome. In this courseware, Augmented Reality (AR) technique is proposed. Augmented Reality is a medium which overlays virtual objects to a person's real environment. It allows user to have seamless interaction with the real and virtual objects. It is a technology that produces three dimensional (3D) objects and people can interact with the virtual objects both in the real and virtual world. It promotes visual and kinesthetic interaction. Previous studies found that AR technology can promote motivation, excitement and high level of engagement in the learning process. AR technology is believed to promote students' learning experience using the courseware [5].

This courseware has five modules which including AR Flashcards, storytelling, read together, mind test and learn ABC modules. Interaction is promoted in this courseware to enhance the learning experience [5]. Figure 2 shows the development model of the courseware and the techniques applied in each phase.

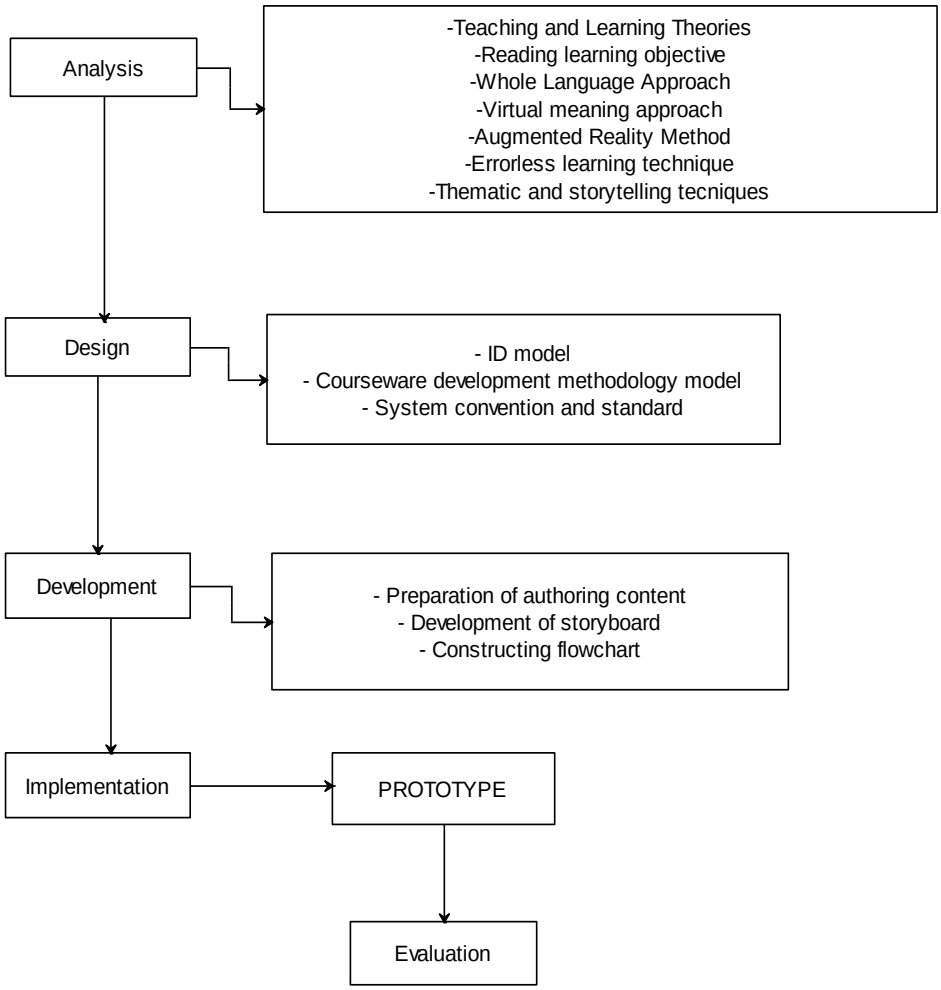

FIGURE 2: Conceptual Framework of AR-BACA SinD [5]

However, this courseware does not mention which problem of Down Syndrome the study target. It does not specify which area this courseware covered to reduce specific problem. There is a preliminary analysis being done before the courseware being developed. Besides, the courseware had only implemented a content-based design technique, which is augmented reality. It does not specify a theory or model to be followed for designing the structure of the courseware. In addition, AR application must be simple enough for the Down Syndrome to follow. A complex AR application might confuse them as they have difficulty in understanding the meaning of an object or an event through concept [4].

iii. SynMax Courseware

SynMax is a multimedia courseware that focuses on numerical skills among Down syndrome children as the subject that provided in both English and Bahasa Melayu language. This courseware implements schema learning theory and dual coding learning theory as the courseware design techniques. Dual coding theory suggests that recall and recognition can be improved through the use of both verbal and visual form. It can be done by providing pictures (visual) and sounds (verbal) together in a single activity. It is stated that when these two forms combined, it produces a mental image that processes by the human brain [2, 6].

There are three modules in the courseware which are learning identifying numbers, matching and counting. The main objective of this courseware is to improve the numeracy skills among Down Syndrome children. This courseware is based on a previous study that stated children with Down syndrome can perform better with multimedia courseware teaching method compared to traditional teaching method [6]. Figure 3 shows the design model of SynMax courseware.

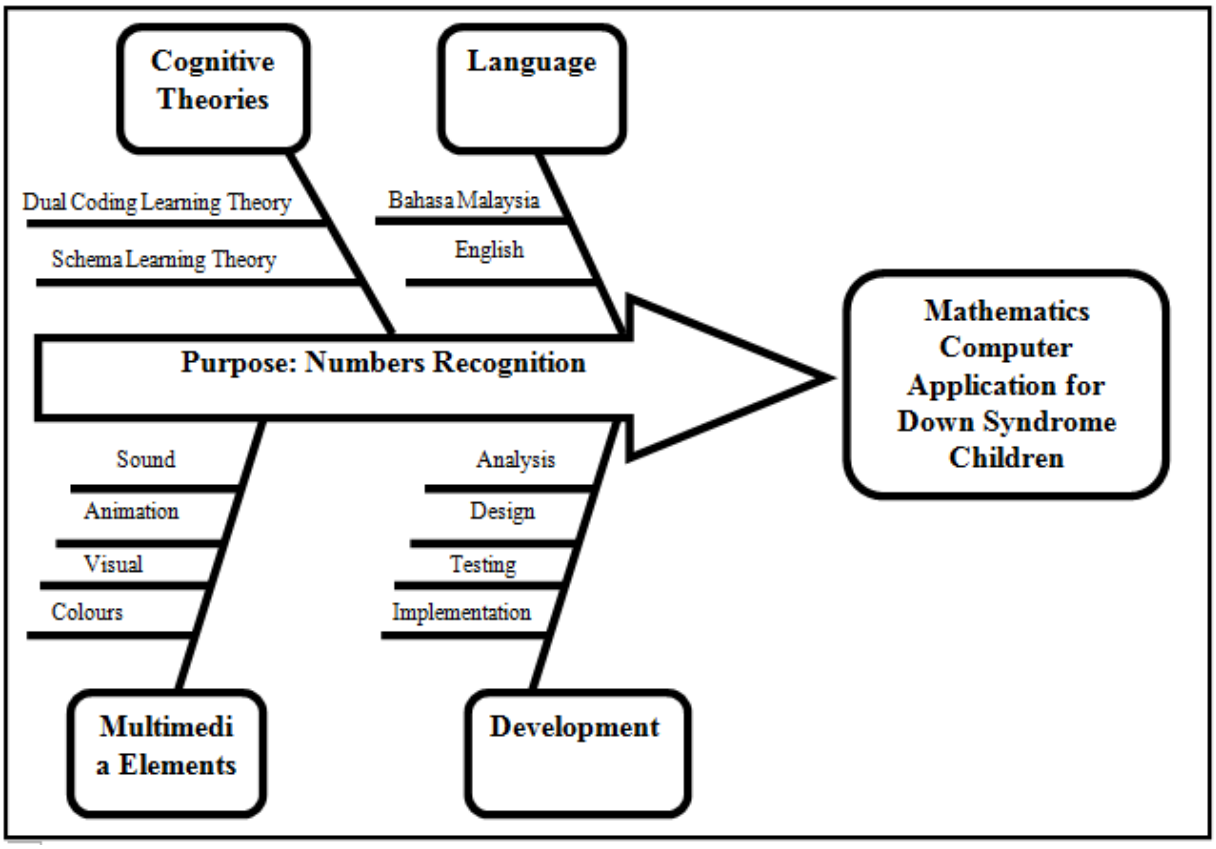

FIGURE 3: Methodology for Development of SynMax [6]

A user acceptance test is conducted for the courseware and it gained positive feedbacks including the good use of colours, suitable content and well arranged structure. A good use of colours can definitely attract the children without giving them vision stress. Too many colours may result in eye soreness and too less colours may result in boreness of courseware. This courseware utilizes a good combination of colours towards Down Syndrome children. Besides, numeracy courseware is not common in the market whereby this courseware provides an initial step for the development of numeracy skills among the children. Besides, it is provided both in English and Bahasa Melayu language, which can benefit more users from different regions.

However, it is also stated that few improvements should be done after the testing being conducted. This includes the selection of music and use of animation [6]. It is stated that Down Syndrome children has a high rate of hearing problem [13]. A good use of audio and sounds is very important in the courseware design for them. A loud and clear voice should be inserted into the courseware for them to listen clearly and follow. Besides, the lacking of animation in the courseware also is one of the weaknesses. Animation can greatly increase their interest of using as they will be attracted to the movement of the pictures. In addition, they can follow the movement if the animation is related to the body movement.

5. DISCUSSION

After reviewing on the existing courseware, we can identify that there are similarities and also differences. As for the similarities part, all of these coursewares targeted Down Syndrome children, but with no age specified [4, 5, 6, 27, 33, 34]. On the other hand, these coursewares focus on two common subjects, which are language subject [4, 5, 33, 34] and mathematical subject [6, 27]. Language learning is the most common subject in the reviewed existing coursewares whereas calculation subject is the next. Besides, all of the reviewed cousewares implemented multimedia elements, including pictures and audio [4, 5, 6, 27, 33, 34]. The usage of colour pictures and audio are implemented to attract the children. However, video element is not included in the courseware design. In addition, these coursewares also separated the learning content into modules to ease the courseware usage by the children with Down Syndrome [4, 5, 6]. Content is divided into module and sub module to enable the children to learn from easy to hard. Other than that, these coursewares are not being applied on mobile platform but being implemented as a desktop application [4, 5, 6, 27, 33, 34]. Only one courseware [6] does mention it will be further developed into a mobile application to keep up with the current mobile technology. Besides, these coursewares do not implement database storage to record the data from the user. Database record can enable user to monitor their performance if there are exercises to be recorded. It benefits parents and teachers as they can check the performance on children and identify where is their weakness and strength based on the marks they achieved.

However, there are differences among the coursewares. First, different design techniques are being implemented including Scaffolding method [4], Augmented Reality [5] and Dual Coding with Schema Learning Theory [6]. All of these design techniques has its functionality and objectives. Other than that, different languages are being implemented including English [27, 33, 34] and Bahasa Melayu [4, 5] as the medium language. One of the courseware [6] did implement both English and Bahasa Melayu language for user to choose. By doing this, more users from different regions can benefit from the courseware with different language provided. Learning problems of Down Syndrome being targeted in these coursewares are either a single problem, short-term memory problem [4] or did not mention specifically in the studies [5,6, 27, 33, 34]. Besides, some of the courseware has been tested [4, 6, 27, 34] and some are not being mentioned [5, 33]. However, courseware [5] does discuss a usability evaluation methodology to evaluate the courseware, but with no results given.

The usage of multimedia courseware is encouraged in education domain as it brings positive effects to the learners [27]. Down syndrome education can also benefit from the usage of multimedia courseware. Refer to the reviews on the courseware of Down Syndrome above, each of the courseware applied different design techniques and content. Each of them has their own strengths and weaknesses. However, improvements can be made in different criteria. The courseware should specifically address the targeted problem. Children with Down Syndrome has different problems in different domain. For example, in language domain, they are weak in phonemes and vocabulary learning. Thus, for language courseware, the developer should design the courseware according to the language problem addressed. The problem is different in other domain, such as mathematical calculation domain. Courseware such as [5, 6] does not specify the targeted problem in their studies. Design according to the addressed problem is important to make sure the courseware suits their special needs in different domain. In addition, it is found that the courseware does not specify the targeted age group in their studies. Different age group required different learning content and methods. Thus, it is important to identify the age group to target correct audiences. With different ability and skills at different range of age, the courseware should be designed according to their level. The content of the courseware should be analyzed with the consultation from the experts as it will be different from normal children. Moreover, the courseware also should be designed in a way to encourage children to continuously use it during their learning process. Thus, they can be attracted to the courseware and take initiative to use it when necessary.

More researches and works are encouraged to be carried out for Down Syndrome community to benefit them especially in their education. Multimedia courseware is one of the recommended teaching and learning tool for them. Parents and teachers may utilize it as an alternative teaching method other than conventional teaching method. It is believed that with the usage of suitable education courseware, the learning progress of children with Down Syndrome can be enhanced and improved.

6. CONCLUSION

Courseware learning definitely helps in the learning process of Down Syndrome children. Since Down Syndrome cases are very significant in Malaysia as it is the highest among all the learning disability cases in recent years, more researches and contribution should be done to Down Syndrome community. The development of educational courseware is one of the contributions that can aid them in their learning process in different subjects. This paper has reviewed selected coursewares in terms of their design techniques and content. The strengths and weaknesses are being discussed according to different courseware design and testing results. With the comparison as a review among the coursewares, improvements and suggestions are being proposed after analyzed the courseware in terms of design techniques and content. Besides, we identified the current trend and area of study of the courseware learning for Down Syndrome children in Malaysia through this review. Thus, more researches and works should be done in the less focused area or subjects. It is encouraged that more researches can be done in this area to benefit Down Syndrome community, not only in the educational domain, but in different other domains.

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