

***Designing Children's Multimedia Learning Application in  
Developing Children's Knowledge on Child Sexual Abuse***

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**Abstract**

Various educational applications have been successfully utilized multimedia in learning environment. Many researchers agree that multimedia can facilitate learning through its advantages. However, there are differences in developing multimedia application for young children and for adults. Children are different than adults in the way they think and learn, and this difference evolves over time. Particularly, the challenges faced by designers of applications for children include determining strategies to design applications that meet children's capabilities, needs and expectations. Accordingly, this paper discusses the process of designing and discussing an application specifically for building-up children's knowledge about Child Sexual Abuse (CSA). This paper also measures children's knowledge before and after the demonstration of the application. During the design stage, guideline for Educational Websites for Children was referred to. The guidelines contain 10 elements of design guidelines for children and the elements are grouped into three categories which are navigation, appearance, and content. A group of 222 primary school children between 7 and 9 years old were involved. They were divided into gender groups. Knowledge and Awareness Survey (KAS) instrument have been used to evaluate the children's knowledge of child sexual abuse before and after they used the application. The results reveal that children's knowledge (in both groups) has increased after they used the application. Additionally, it was found that girls are more interested to the application compared to boys.

Keywords: knowledge, multimedia learning, children design guideline, child sexual abuse

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## **Introduction**

Nowadays, computer technology plays an important role in education system. Consequently, instructional materials are developed based on the advancement of recent technologies. This enables teachers to utilize different teaching apparatus and modes to accelerate student learning in their teaching practices.

At the same time, multimedia has also been successfully utilized in learning environment for various educational applications and it has brought various advantages especially in improving children's learning process because it extend the amount and types of information to learners (Shank, 2005) and it is very effective at maintaining user interest and reducing cost (Najjar, 1992). In addition, the use of elements in multimedia such as animation and video can help a lot in describing complicated concepts. Besides, learning with multimedia save time, is more pleasant and improve learning process (Hick, 1997).

Studies have revealed that developing multimedia applications for young children is different than those for adults. Shneiderman (1998) argued that any design should be based on perceptive of its intended users and he includes age and gender as among the important of user characteristics that should be considered. In addition, children have a different way of thinking and learning than adults, and this difference evolves over time until adulthood. It is noted that maturation educates about learning, but it does not mean that children are bound in what they can do in learning. As a result, Large and Beheshti (2005) found that particular interface design guidelines are required for young users and do not only relying on general design guidelines. On the other hand, Demner (2001) found that 66% of children agree that the Internet technology assists their learning process, and 34% would like to use it for lessons if they are home sick.

As a consequence of the great capabilities of multimedia in learning, this study attempts to design and develop a multimedia learning application with intention to deliver basic knowledge about CSA to children aged 7 to 9 years old. CSA is serious social problem that exists in almost all countries. In fact, child abuse could happen at every socio-economic level, across ethnic and cultural lines, within all religions and at all levels of education (Renk, 2002). Studies found that CSA victims are more traumatized in their life compared to other type of abuse (Bornstein, Kaplan, & Perry, 2007). Regarding that, UNICEF Malaysia (2009) reported that a child does not know that an adult cannot abuse their body. It is because children are not aware of danger and self-protection (Hitrec, 2011). Hence, it is important to provide information about CSA to the public especially to children so that they would understand better and they are also aware of the phenomenon.

In accordance, this paper describes and discusses the development of a multimedia learning application for children that incorporates design guidelines. It provides basic knowledge about sexual abuse to children. In detail, three categories namely navigation, appearance, and content are covered in the guidelines. The rest of the paper is organized as follow: the general view of multimedia learning is addressed first. Then, the children knowledge on sexual abuse follows. Next, a detailed description on the design guideline for children is outlined. In the last section, the paper discusses on how the application design may support children capabilities, needs and expectations.

## **Multimedia Learning**

According to Mayer (2009), multimedia learning refers to learning through words and pictures. Mayer claims that multimedia learning can occur when people could construct mental model from words (such as spoken text and printed text) and pictures (such as illustrations, photos, animation, or video). Further, Wisegeek (2010) defines multimedia learning as the process of learning using multimedia presentation and teaching methods. Learning process usually happens in classroom or a simulated environment and can normally be applied to any subject. Generally, any sort of learning process can either be achieved or enhanced through a proper practice of multimedia applications. In fact, well-designed multimedia applications are able to improve student's understanding and to offer meaningful experience during the cognitive process that eventually reduces cognitive load (Wisegeek, 2010). Multimedia learning process can be viewed as response strengthening, information acquisition or as knowledge construction (Mayer, 2009).

## **Children Knowledge on Child Sexual Abuse**

Knowledge refers to an appropriate collection of information and it is a deterministic process. When someone had memorized information, then they have amassed knowledge. This knowledge has useful meaning to them and could be integrated for further knowledge. Basically, knowledge can be divided into two type; tacit knowledge and explicit knowledge. Tacit knowledge is hard to expressed and formalize. It is highly personal, difficult to communicate to others, and may also impossible to capture. In contrast, explicit knowledge is formal and systematic. It can be easily communicated and shared. Typically, it has been documented. In this study, explicit knowledge has been adopted in designing and developing learning application since the structure and learning content could easily presented into digital interface.

Regarding the knowledge about CSA, UNICEF Malaysia (2009) has found that children are normally not aware of their rights, that it is wrong for an adult to abuse their body. This fact also supported by Hitrec (2011) who found that children have too little knowledge on danger and self-protection. In addition, there are only very few studies and prevention programs focusing on educating children about CSA in Malaysia (Cheah, & Choo, 2011). In regards to this, this study believes that awareness programs on prevention should be organized constantly and more research works are required in conveying information in helping children facing dangerous situations. It has to be addressed using appropriate learning material and methods. Therefore, it is important to provide knowledge to the children about CSA using appropriate learning programs so that children will understand the danger of CSA and be more aware of this phenomenon.

## **Design Guideline for Children**

Meloncon et al (2010) present several guidelines as a starting point that ensure educational websites meet children learning goals by considering children developmental abilities and web preferences. These guidelines were formed based on a evaluation of the existing literatures related to Web site design for children and their own usability tests of one educational Web site geared toward children. Table 1

presents the 10 elements in the guideline, which are categorized into three main groups which are navigation, appearance and content.

The ways children interact with technologies are different depending on their gender and age level which reflects their changing interests, characters, humors, and contexts. Most theories of child development start with Jean Piaget (1970). Based on Piaget's theory, concept of children physical and mental development are categorized in four stages which are sensory motor, pre-operational, concrete operational, and formal operational. The age of children for this study falls into concrete operational stage. Based on Butterworth and Harris (1994) as cited by Meloncon et al (2010) when considered to interacting with a computer application, children are able to use and control a mouse, and they can read more complete and complex texts. At this age children start to work together with peers based on a strong group identity and think logically (even though they still depend on concrete references). In addition, they start to develop the ability to categorize objects and start to relate and convey their existing knowledge and experience to a particular situation. However, the children still have limited sense of relationships in space and time.

Table 1: Design Guideline for Children.  
(source: Meloncon, Haynes, Varelmann & Groh, 2010)

Element	Consideration for Children	Recommendations
<b>Navigation</b>		
Hierarchical Navigation	Children do not have a fully developed sense of space or temporal recall, and can easily become lost in complex navigation.	<ul style="list-style-type: none"> <li>• Limit navigational topics.</li> <li>• Use literal icons and directional image to point the way through the navigation.</li> <li>• Do not include search options, in text links, or pop-ups- all add an unnecessary layer of complexity.</li> </ul>
Image Map	7 to 9 years old children find it easier to navigate visually. They also interpret icons literally.	<ul style="list-style-type: none"> <li>• Provide clickable hotspots obvious through rollover effects (e.g., blinking, changing color).</li> <li>• Use representational images that children can recognize from their everyday lives.</li> </ul>
Multiple Cues	Children need specific prompts to stimulate their understanding of navigation.	<ul style="list-style-type: none"> <li>• Provide various options for navigation (e.g., breadcrumbs, prominently-displayed "back" button).</li> </ul>
<b>Appearance</b>		
Graphics	Children appreciate simple, playful graphics. They interpret icon literally.	<ul style="list-style-type: none"> <li>• Use images from children's everyday lives.</li> <li>• Age-appropriate mascots can be helpful, but they should play a role in the interface.</li> <li>• Avoid graphics for visual interest</li> </ul>

		alone.
Color	Children hate white backgrounds or empty space. They enjoy the variety of color combinations.	<ul style="list-style-type: none"> <li>• Use vivid colors.</li> <li>• Avoid excessive use of white.</li> </ul>
Games	Children enjoy games even it is simple.	<ul style="list-style-type: none"> <li>• Incorporate games that play a role in the site's learning objective.</li> </ul>
Accessibility	Complex content could make children feel confuse.	<ul style="list-style-type: none"> <li>• Surpass minimum WCAG 2.0 guidelines so that all children can participate.</li> <li>• Keep sites simple or provide alternative to complex content.</li> </ul>
<b>Content</b>		
Age-Appropriate	Children can improve their reading ability.	<ul style="list-style-type: none"> <li>• Use content appropriate for the target users.</li> </ul>
Readability	Children's recall is less than that of adults. Organizational cues (subheadings, etc.) do not help them. They are willing to read instruction.	<ul style="list-style-type: none"> <li>• Use concrete words, active verbs, and concise sentence structure.</li> <li>• Organize content efficiently and effectively.</li> <li>• Provide clear directions and goals.</li> </ul>
Page Length	Children are willing to scroll down the page.	<ul style="list-style-type: none"> <li>• Limit the length of sentences and paragraphs to increase readability.</li> <li>• Segment page length based on concepts.</li> </ul>

### **How the Design Guidelines Support Multimedia Learning Application**

Since the multimedia learning application in this study is design for children in order to increase their knowledge of child sexual abuse, a set of design guideline specific for children must be considered. In accordance, a set of guidelines for educational websites for children by Meloncon et al (2010) was adopted as the strategies to develop a prototype. These guidelines are classified into navigation, appearance and content. These guidelines were adopted in this study as the strategies to develop a prototype.

#### *Navigation*

This multimedia learning application limits the navigation to important topics since children have limited in developing their full sense of space or temporal recall, and complex navigation can make children easy to get lost. To support their recognition, icons (as seen in Figure 1) are used as part of navigation tools. The icons are simple and easy to click to make them attractive to children. Suitable metaphor is used to represent the function of each icon, which are located at the same place in each page (consistent) so that it could make users feel easy to recognize and avoid them lost in navigation.



Figure 1: Screenshot shows navigation through icon.

### *Appearance*

In terms of appearance, the multimedia learning application makes use of daily apparatus in a house, in a classroom, and in a playground as the background elements. It maps children's everyday life. All graphics and colors are also simple and playful. In addition, a character of a teacher appears in the application as an agent that communicates with the children. A teacher is considered appropriate for the users in this study because the children at this age are very familiar with situations at school. Also, the application incorporates simple educational games that play a role in the application's objective.

### *Content*

For specific target group, the contents are organized with clear hierarchical subtopics (as seen in Figure 2) and are delivered with simple, concise, and clear oral conversation.



Figure 2: Sub Topics in the Application.

## Research Design and Methodology

The purposes of this study are to design and develop application of multimedia learning application with the aim to increase children's knowledge on child sexual abuse. Therefore, this section discuss on the research design, sample, method of data collection and data analysis.

Quasi-experiment approach using pre-test and post-test has carried out to assess the children's knowledge before and after they used the developed multimedia learning application. A group of 222 school children of Years 1, Year 2, and Year 3 from randomly selected schools were involved in the evaluation. In the test, Knowledge and Awareness Survey (KAS) was used as the instrument that measures children's knowledge level on CSA before (pre-test) and after (post-test) the treatment. Each pre-test and post-test consist of 14 questions with True/False options.

In the test, the pre-test started first, in which the children answered the 14 questions. Then, they were given at least two sessions to explore the multimedia learning application. After exploring the application, the children then answered the similar 14 questions. To ensure that the children were free from bias (memorizing the sequence of questions may affect the result) the 14 questions were randomly rearranged so that the sequence of questions changes. The collected data were analyzed using descriptive statistics.

## Results and Discussion

The purpose of this analysis is to measure children's knowledge of CSA before and after they used multimedia learning application. In addition, this study also aims to assess children's knowledge between boy and girl by comparing the mean value of post-test result with pre-test result for both genders.

Table 2 exhibits the score for pre-test and post-test. It can be seen that mean for pre-test and post-test are 9.42 and 10.68 respectively. This means that children's knowledge slightly increases with a mean difference of 1.26 after they have explored the multimedia learning application. Minimum score also increase from 3 to 7. Based on the results, it could be deduced that the developed multimedia learning application has the potential to be an educational tool, particularly to be used in providing knowledge of CSA.

The finding of this study is parallel with studies reviewed by Daro (1992), which the programs assessed, produced a small but statistically significant gain in knowledge.

**Table 2:** Scores for Pre-test and Post-test.

	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	222	3	14	9.42	2.190
Post-test	222	7	14	10.68	1.773
Valid N (listwise)	222				

Further, Table 3 summarizes the children's knowledge before and after they have explored the developed multimedia learning application by gender (illustrated in graph in Figure 3). It can be seen that girl's score is higher than the boy's in both tests. It was found that girls tended to find the developed multimedia application more attracted compared to boys. However, both genders show an improvement after the explored the application.

This finding is similar to Finkelhor and Leatherman (1992), which their research found that girls are more interested, and think that the programs more helpful, and providing with new information. This finding also consistent with study by Shaffer, Garland, Vieland, Underwood, and Busner, (1991) regarding of teen suicide prevention programs.

Table 3 Children's knowledge score by gender.

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Pre-test	Boy	107	9.05	2.103	.203
	Girl	115	9.77	2.222	.207
Post-test	Boy	107	10.39	1.742	.168
	Girl	115	10.94	1.769	.165

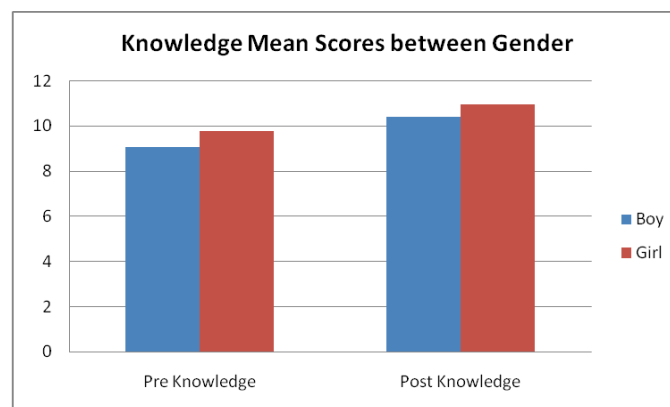


Figure 3: Children's knowledge score by gender

## Conclusion

Realizing the capability of multimedia technology in facilitating learning and the importance of referring to appropriate design guidelines for children, this paper discusses the effects of applying multimedia and design guideline for children in designing and developing a multimedia learning application. The findings from quasi-experiment reveal that the multimedia learning application can facilitate children in understanding the learning content. The results also indicate that the multimedia learning application have a potential to attract children to use the application. Further, this study hopes that the multimedia learning application will meet the capabilities, needs, and expectations of the children in using multimedia application.



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