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MULTIMEIDA DESIGN PRINCIPLES IN DEVELOPING MULTIMEDIA LEARNING APPLICATION (MMLA) TO INCREASE CHILDREN AWARENESS OF CHILD SEXUAL ABUSE

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Graphical abstract



Abstract

This paper is focusing on multimedia design principles as a design strategy in designing and developing a multimedia learning application with purpose to increase children's awareness of potential sexual abuse situations. Currently, children's knowledge and awareness about danger and self-protection is still lacking and they are not totally aware of prohibited adult's touches over their body. In such situation, they need to be educated and made aware of. In such situation, with the advantages of current multimedia technologies, learning can be supported by effective multimedia application. Accordingly, this study develops a learning application by adapting an instructional design model for design and development by Alessi and Trollip. Then, alpha and beta testing has been conducted with the help of an expert. It was found that the advantages of multimedia technology can facilitate children in better understanding of child sexual abuse and improve their awareness of the issues.

Keywords: Component, multimedia learning, multimedia design principle, awareness, child sexual abuse

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1.0 INTRODUCTION

Multimedia has been successful utilize in learning environment for various educational applications and has brought various advantages especially in making children's learning process smoother. Multimedia application could present the learners with real world experiences and allows them to apply the contents in different contexts [1]. In addition, currently technologies have also been playing important roles in education. This enables teachers to utilize different teaching methods and modes to accelerate student learning in their teaching practices. The use of computer-based applications can also enhance explanation of complicated concept through multimedia. According to McCracken & Wolfe [2], multimedia can engage the human sense to inform, persuade, and entertain users. Shank [1] also adds that multimedia certainly

has the potential to extend the amount and types of information available to learners. On top of that, Najjar [3] claims that multimedia gains popularity because they are very effective at keeping the interest of their users, improve the amount of information users remember, and can be cost effective.

With reference to the advantages of multimedia applications as discussed in the previous paragraph, this study aims at designing and developing a multimedia learning application to provide knowledge and increase children's awareness of child sexual abuse. It demonstrates a potential deployment of Cognitive Theory of Multimedia Learning (CTML) [4] and multimedia design principle [5].

This paper first outlines the background information of multimedia design principle, multimedia learning and children awareness of child sexual abuse. The

system design and development which is based on Alessi and Trollip Instructional Design Model [6] is described next, followed by the research design and evaluation of the application. Then, result and discussion are addressed before the concluding remark.

2.0 LITERATURE REVIEW

2.1 Multimedia Learning

Many researchers agree that multimedia has many advantages in facilitating learning. It was found that interactive multimedia learning takes less time, is more enjoyable and increases learning [7]. Mayer & Moreno [8] claimed that multimedia learning is a learning process from texts and images, through the use of multimedia presentation, in which teaching methods usually occur in structured environment. Mayer [5] also insisted that multimedia learning can occur when people build mental model from words (such as spoken text and printed text) and pictures (such as illustrations, photos, animation, or video). This can typically be applied to any subject and generally any sort of learning process can either be achieved or enhanced through a proper application of multimedia materials [9]. The process of multimedia learning can be viewed as response strengthening, information acquisition or as knowledge construction [5]. According to Mayer & Moreno [8] the purpose of multimedia instruction is to aid improving the quality of learning.

Mayer [4] provides description on how people learn from words and pictures and how the information is process through two basic channels, i.e. verbal and visual through Cognitive Theory of Multimedia Learning (CTML) (Figure 1). Particularly, Mayer produced CTML to represent the human information processing system. It encompasses three fundamental assumptions for multimedia design: (i) humans possess separate channels for processing visual and audio information, (ii) humans are limited in the amount of information that they can process in each channel at one time and (iii) humans engage in active learning by attending to relevant incoming information, organizing selected information into coherent mental representations, and integrating mental representation other knowledge.

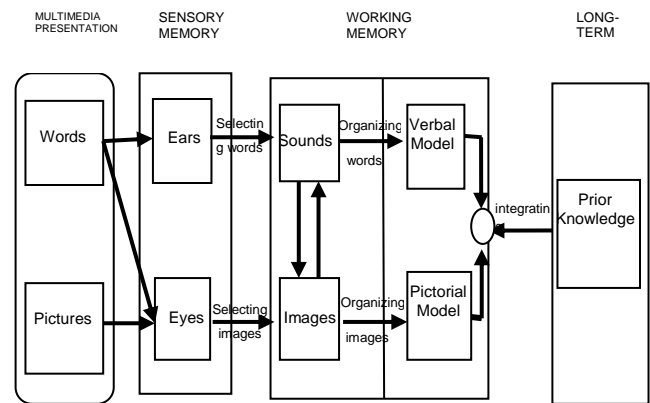


Figure 1 Cognitive theory of multimedia learning (Source: Mayer, 2003)

2.2 Multimedia Design Principle

Mayer [5] has carried out various experimental studies and deferred twelve major principles which are redundancy, spatial contiguity, temporal contiguity, segmenting, pre-training, modality, multimedia, personalization, voice, and image principles. These principles serve as a guideline for developers to design a multimedia system, capable of reducing the extraneous processing, managing essential processing and fostering generative processing. These principles are in line with Mayer's CTML.

The principles explain how students learn better when multimedia message are designed in ways that are consistent with how the human mind works. Further, the principles provide guidance in making use of any combination of words and pictures rather than using only text in the design. When the designers decide to use animation and narration, they must be used together and avoid mixing it with on-screen text. In multimedia lesson, the uses of words need to be written in conversational style rather than in formal style and the narration need to be spoken in a friendly human voice rather than machine voice. Besides, learning process could be easier if the lessons are presented in user-paced segments as compared to a continuous unit and learners already know the names and characteristics of the main concepts. Lastly, if the speaker's image is added to the screen, it does not necessarily mean better for learning. However, the designers need to remember that multimedia effects work really well for both low-knowledge and high-spatial learners.

In the context of this study, only personalization principle and voice principle considered practical to apply in designing multimedia learning application. This is because the content involves instructions and guidance to the children on how to avoid dangerous situation. As an example, guided experiences that are provided to the children are design in the form of conversation between teacher and students, which could help the children to better, understand the

concepts of learning. This further guides them in making decisions in their real life.

2.2.1 Personalization Principle

Normally, learning instruction and information are designed in a formal way to the learners. In contrast, with regard to the personalization principle, users learn better through multimedia lessons when words are in conversational style rather than formal style [5]. The theoretical rationale for this principle is that learners will put deep attention to make sense of what the author is saying when they feel that the author is talking to them. They are more likely to see the author as a conversational partner. However, this principle may be most effective when it is not overdone and when the learners are beginners.

2.2.2 Voice Principle

Voice principle is also considered as another precise principle in designing instruction to the children in this study. The voice principle clarifies that learners learn better when the narrations in multimedia lesson are done by a friendly human voice rather than by a machine voice [5]. The goal of adapting this principle is to establish the instructor's voice to foster a sense of social partnership in human computer interaction.

2.3 Child Sexual Abuse

Children are precious of the country. They should be developed to the optimum level by providing them with safe and conducive environment. Therefore, protecting children from sexual abuse is an important aspect and should be highly prioritized. They need guidance and support from their parents and the society to become wise adolescents. Unfortunately, the number of child abuse cases keeps increasing every year all over the world.

Based on National Child Abuse Statistic [10], at least 80% of the perpetrators of child sexual abuse are familiar with children. Countless work has been attempted in creating public awareness through forum, campaigns and training to prevent child sexual abuse. In the USA, awareness of CSA problem began since late 1970s [11]. On the other hand, in Malaysia, child abuse has been accepted as a social problem since 1990, after the death of a physically and sexually abused child. This tragic incident has led to an emergent to the formulation of the Child Protection Act 1991.

Generally, child sexual abuse could happen to any children. In such situation, having an appropriate knowledge and skill is seen as necessary in helping children to avoid sexual abuse situation. In the USA, schools and other community-based organizations have begun to develop and implement programs aimed in helping children to avoid and report sexual abuse cases many years ago [12]. The prevention efforts have focused primarily on educating children about sexual abuse [13].

In regard to that, Bolen [11] found that the most successful initiative of child abuse prevention programs are by teaching children the concepts about sexual abuse and promote them with self protection skills. This explains that children should be exposed to appropriate educational programs, so that they are aware of any situations that might negatively affect their personal safety and know appropriate actions when these situations arise. In Malaysia, topics on personal safety focusing on the concept of sexual abuse and skills to avoid potential sexual abuse situation has been thought in primary schools through physical and health education subject. However, the content delivered to children are limited and based on textbook [14]. Meanwhile, the discussion and elaboration to make children understand the concepts of child sexual abuse concepts are mostly up to the teacher's efforts and creativities.

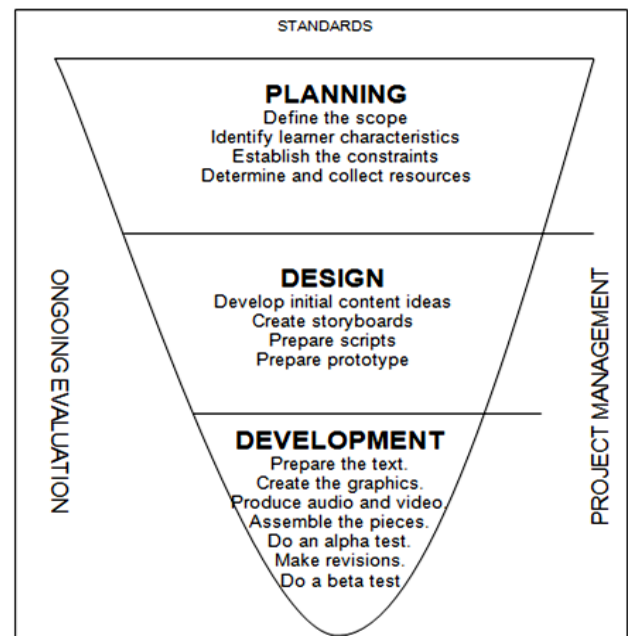


Figure 2 Model of instructional design. Source: Alessi & Trollip (2001)

3.0 THE MULTIMEDIA LEARNING APPLICATION (MMLA)

Multimedia Learning Application (MMLA) has been built with the intention to create children's awareness of child sexual abuse and to avoid from any potential sexual abuse situations. The methodology used for designing and developing the application was adapted from Alessi and Trollip (2001) [6]. There are three main stages in this model; planning, designing and developing, in which Figure 2 illustrates how each component is linked to another. This model was chosen as the methodology in this study because it proposes a set of standards that should guide the design and development tasks. It also

suggest ways to be creative and introduce techniques for designing, developing and integrating the various components of multimedia application [6].

3.1 Planning

The planning phase is to ensure a comprehensive understanding of the project and to assess possible constraints [6]. It begins with determination the scope of the content that the instruction expected to cover. Then, it followed with identifying the characteristics of the learner, establishing the constraints and lastly determining and collecting the resources.

The first activity in this phase is to understand the problem domain, context and situation of child sexual abuse in Malaysia. In order to define the scope of the study, current successful content from various preventive strategies and efforts from Malaysia and others country were adapted and modified to applicability based on Malaysian context and culture. Most content of the programs covered:

- the distinction between good and bad touching,
- children's right to control who touches their bodies and where they are touched,
- the importance of reporting to adults if someone inappropriately touches them,
- assertiveness skills
- the existence of support systems to help the child who has experienced any form of abuse.

In addition, unstructured interviews have been conducted with four representative, from the Department of Social Welfare; a government agency that involves in making Child Protection Policy; a representative of Penang Women's Centre for Change (WCC), an NGO involved in preventive programs, a representative of Family Law Division, Department of Islamic Affairs, State of Kedah (JAIK) and a primary school teacher [14]. The interviews were conducted to gather information on current children's awareness of sexual abuse and current child sexual abuse prevention programs implement in Malaysia. The findings from this study confirm that there is still a lacking in educational materials in term of utilizing multimedia and computer technology in providing knowledge about child sexual abuse. Findings also show that the level of awareness especially among young children about child sexual abuse is still low and they need appropriate educational programs.

3.2 Design of MMLA

The design phase deals with the activities of assembling the contents and deciding on how it is to be treated from both an instructional and interactive perspective. This phase will enable the proposed

instructional product into a reality. During the design phase of MMLA, the ideas were turned into a first draft of the application and finally the design document is created. Also, a conceptual model including theories, principles, and guidelines were used to engage people in such a way that learning takes place in an effective and efficient manner. To ensure the study is systematically conducted, the application was designed based on Cognitive Theory of Multimedia Learning (CTML) [4] and by adopting multimedia design principles [5] specifically personalization and voice principles. There are four steps identified in this phase; (i) developing the content ideas, (ii) preparing storyboards, (iii) preparing scripts, and (iv) preparing a prototype.

3.3 Development of MMLA

The development phase involves programming task that integrate the whole application function. MMLA was developed using Adobe Flash CS6, with Action Script 3 as the main platform. 3D graphic were drawn and render using 3DsMax.

The personalization and voice principle appear through the characters. There are a mother and a teacher interacting with children, explaining and suggesting on what children should do when facing dangerous situation. When children are engaged with the teacher in the application, who talks to them, they perceive the teacher as a conversational partner and therefore they will try to understand and make sense of what the teacher say. This can be seen in Figure 3



Figure 3 Screenshot which apply personalization principle



Figure 4 Screenshot shows in the conversation between mother and daughter that apply voice principle

With the aim of realizing the principle of voice, the voice of mother, teacher and children were recorded using normal human voice. Figure 4 depicts a mother talking with her daughter that applies the voice principle. The voice of mother and daughter were recorded using normal human voice. This helps children to feel comfortable and will learn better when the narrations are spoken by a friendly human voice rather than by a machine voice.

Additionally, Figure 5 applies both principles. It shows a situation where children scream "Jangan sentuh saya" when someone touches their private parts. This study fully understands that even though this issue does not involve the reality of children life, this principle is able to create a sense of awareness among children of the dangerous situations that they should avoid.



Figure 5 A screenshot of which children rehearse scream "Jangan sentuh saya" while other people touch on their private part

4.0 METHODS AND EVALUATION

In the evaluation phase, alpha test and beta test were carried out on the effectiveness of the multimedia learning application. In the alpha testing, experts were requested to go through the application to evaluate the content, the flow of the material, the user interface and the usability of the application. Three groups of experts were involved in evaluating the application, who are (i) a subject matter expert, (ii) instructional design experts, and (iii) user interface experts.

Particularly, the subject matter expert's responsibility is to review the accuracy, significance and comprehensiveness of the content. Since the content is about the knowledge needed to make children understand about child sexual abuse, an expert from criminology department, Universiti Sains Malaysia was chosen. Meanwhile, two lecturers from Universiti Sains Malaysia evaluated the instructional design. The user interface part was evaluated by three lecturers of Universiti Utara Malaysia. In detail, the instructional design expert evaluated the materials on the criteria of good instructional design while the user interface expert examined the interface of the application.

The interface will be judged based on its fulfillment with recognized usability principles (the heuristics). This study adopted the questionnaire from Questionnaire for User Interaction Satisfaction (QUIS) [15]. The items in QUIS are organized into six subscales: overall reaction to the software, screen, terminology and system information, learning, system capability and usability and user interface. The evaluation goal was to identify any usability issues that can be addressed as part of an on-going evaluation design process. After the experts have experienced the MMLA, their perception of the application was recorded and analyzed. The prototype was then revised based on recommendations by the experts.

After all revisions, the beta testing was conducted. It was the full test of the final product by the target user [16]. It is a formal process with clear procedures about what to do and what to observe. In the beta test session, a group of 28 students of Years 1, 2 and 3 was randomly selected to participate. The students were randomly divided into two groups which consist of 14 students each. The first group explored MML using presentation mode 1 (PM1) which utilize the narration in formal style using machine voice and the second group explored MML using presentation mode 2 (PM2) which utilize the narration in conversational style spoken in a friendly human voice.

After that, they were required to answer the questionnaire. The questionnaire was adopted from Persuasive Materials Motivation Survey (PMMS) [16]. PMMS has been adapted from Instructional Materials Motivation Scale (IMMS) by Toh (1988), in which the Cronbach's alpha for reliability coefficient is 0.81. It was then used to determine the level of children's perceived motivation of the subjects in persuasive multimedia learning environment. The items in PMMS were modified to fulfill for children level. It consists of ten items with scales ranging from 1 (strongly disagree) through 5 (strongly agree).

5.0 RESULT AND DISCUSSION

From the alpha test, usability results show that the multimedia learning application has the potential to be an educational tool, particularly to be used in educating and increasing children's awareness of child sexual abuse especially in identifying potential dangerous situation and promoting self protection. Specifically from the user interface part, most of the experts agree that this application give appropriate reaction to the software, screen are organized and designed clearly and easily for the learners interaction. At the same time, the terminology and system information are consistent and related to the task you are doing. In term of learning, most of experts agree that the application is helpful and easy to learn. Besides it has good usability values and user interface is friendly. In overall, they also stated that the application could be successful in increasing

children's awareness and gives better understanding in differentiating between safe touch and bad touch.

Table 1 Descriptive statistics for PMMS scores by presentation mode

Presentation Mode		PMMS Scores	
PM1	n	14	
	M	4.76	
	SD	0.32	
PM2	n	14	
	M	4.8	
	SD	0.21	
Total	n	28	
	M	4.78	
	SD	0.26	

(n=sample, M=Mean, SD=standard deviation)

Table 2 Descriptive statistics for PMMS scores by gender

Treatment Mode		PMMS Scores	
Boy	n	15	
	M	4.71	
	SD	0.30	
Girl	n	13	
	M	4.86	
	SD	0.20	
Total	n	28	
	M	4.78	
	SD	0.26	

(n=sample, M=Mean, SD=standard deviation)

From the beta testing, Table 1 illustrates the descriptive statistics of PMMS scores by presentation modes. It is reported that students who explored multimedia learning application using presentation modes 2 (PM2) showed slightly higher in PMMS scores with a mean difference of 0.16 compared to the students who explored multimedia learning application using presentation mode 1 (PM1) with mean differences of 0. This shows that presentation mode 2 has higher impact on students' perceived motivation.

Table 2 demonstrates the descriptive statistics for the result of PMMS scores by gender. MML application has different effects on difference gender. It was found that girls are more attracted to the application.

6.0 CONCLUSION

Realizing the important impact in increasing children awareness about child sexual abuse, this paper discussed the impact of applied multimedia design principle as a strategy to design and development multimedia learning application. The findings from alpha test of this study show that the advantages of personalization and voice principle can facilitate

children in understanding and increase their awareness of child sexual abuse in general as well as help them to be aware and know appropriate action if such dangerous situation occur. While results from beta test prove the CTML that MML application which utilize presentation mode 2 has more desirability compared to MML application that utilize presentation mode 1. It also found that the application is more attracted to girls. Hopefully multimedia learning application will serve as an alternative approach to motivated children to get information about child sexual abuse and prepare them to be aware and ready if any dangerous situation occurs.

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