

MULTIMEDIA DESIGN PRINCIPLES IN DEVELOPING VIRTUAL REALITY LEARNING APPLICATION TO INCREASE STUDENTS' KNOWLEDGE IN ISLAMIC FUNERAL RITES

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Abstract

This paper focuses on multimedia design principles which explain the design strategies when developing a virtual reality learning application. This study aims to increase students' knowledge in Islamic funeral rites. Past studies have shown that students, young people and communities are less mastered in this practice and this was due to less effective methods in teaching. Hence, this calls for an alternative approach to assist students in learning and mastering the Islamic Funeral Rites. Having known the advantages multimedia and technology can offer, learning can be supported by effective multimedia application, especially by using virtual reality. Accordingly, a virtual reality learning application which follows the instructional design model by Alessi and Trollip has been developed. Alpha and Beta testing was conducted with the help of a content expert. Results showed that the virtual reality technology can facilitate students in better understanding the knowledge of Islamic funeral rites.

Keywords: Virtual Reality; Islamic Funeral Rites; multimedia design principle

I. INTRODUCTION

In various educational applications, multimedia has been utilized successfully in many learning environments and has shown many advantages, especially in making students' learning process smoother. Multimedia application could present the learners with real world experiences and allows them to apply the contents in different contexts (Shank, 2005). In addition, current technologies have also been playing important roles in education. Technologies enable teachers to explore different teaching methods in accelerating students' learning process. The use of computer-based applications can also enhance the explanation of complicated concept through multimedia presentations.

Virtual reality is one of the technology that has been used in education to improve students' understanding since the 80s (Wang & Li, 2004; Smith & Ericson, 2009). It can be a tool that use as a training tool in dangerous and expensive situations because it can provide a realistic simulation environment without any risk (Ruggeroni, 2001). Students can interact with computer with virtual reality learning environment. Other than that, learning will be done by interaction within students' prior knowledge and new knowledge in virtual reality learning as in constructivist learning environment (Youngblut, 1998). Constructivist learning focuses on meeting the learners' needs and helping them to construct and build their own knowledge based on their prior knowledge (Roblyer, 2003). There are many research about virtual reality in education, such as research by Wang & Li (2004), Chen, Shen & Jeng (2007), Adamo-Villani, Wilbur & Wasburn (2008), Smith & Ericson (2009), Kovárová & Sokolský (2011), Elin, Duenser, Billinghurst, Herritsch, Unsworth, Mckinnon, & Gostomski (2012) and Huang & Khan (2012).

The Islamic funeral rites, is one of the subtopics contained in the syllabus of Islamic education for form three students in Malaysian Secondary School (KPM, 2012). This topic covers the practice of early death, bathing the dead, wrapping the body with a shroud, praying for the dead and burying the body. Islamic funeral rites, is a very important thing for all Muslims because every individual is sure of the fact that we will all die one

day. Allah S.W.T says in the Quran what can be translated as: “Every soul shall have a taste of death.” (Surat Ali Imran, verse: 185).

Islamic funeral rites is “*fard Kifayah*” duty for Muslims, meaning that if some Muslims carrying out this duty properly, then other Muslims will be exempted from the responsibility. Customary in Malaysia remains managed by the family of the deceased. This case coincides with the statement that was written by the Islamic Center of Universiti Sains Malaysia (2007), that the most worthy and nice to deal with funerals are those of family members and beneficiaries remains the closest and most brilliant deeds of worship (Pusat Islam Universiti Sains Malaysia, 2007). However, past studies showed young people have not mastered this practice due to a less effective method of teaching (Ahmad Shukri, 2003; Rezany, 2002). Based on a review by researchers, it was found that students' understanding of this topic is at an intermediate level, the same was found with the different human societies. Understanding the rites within the society does not exceed the intermediate level as well. In addition, when viewing the practical syllabus, not all aspects of Islamic funeral rites are contained in this syllabus, funeral prayer is the only aspect that was being covered (KPM). In other words, the teaching time and teaching resources were insufficient if this topic were being taught and learned at school. This topic is rather different from other topics in the ritual field; as it emphasize on the overall implementation of practical measures, such as *wuduk*, *solat* and et. For those reasons, teachers were only teaching the ritual theories by referring on the textbook.

With that in mind, a virtual reality learning application has been developed. The learning of Islamic funeral rites knowledge was designed based on the constructivist learning environment (CLEs) and the Cognitive-Affective Learning Theory with Media (CATLM). The survey conducted has also found, that there is no virtual reality learning application related to funeral rites was found in the market neither resources provided by the Ministry of Education. This learning application therefore can helps students to understand and master the topic because it is more interactive and closer to the real world. Students can also use it repeatedly either in the classroom or at home, as theirs' virtual training which can enhance the understanding and skills of Islamic funeral rites without being bound by the school learning times. This learning application is for practical use because by using it students can do Islamic funeral rites virtually.

II. LITERATURE REVIEW

Literature analysis focuses on specific aspects which are important to address the research at hand: past studies about Islamic funeral rites, the use of Constructivist Learning Environment (CLEs) in education, Cognitive-Affective Theory of Learning with Media (CATLM) and signaling principles (Mayer, 2009).

Islamic Funeral Rites

There are few studies on Islamic funeral rites by using multimedia in education in Malaysia. Zuraini (1997), ran a case study about learning computer aided funeral rites. This coursework in her study includes sound, text, pictures and animation. The findings of this study showed this learning package has benefited the users because it can be done at any time with a personal computer and it can provide a continuous learning process. Fatim (2008) studied the development of courseware on the topic of funeral rites. He used pictures, videos and animation in his courseware. Roslan (2008) did a study on the development of websites for this topic. He used videos and texts in his website. They hope that both of their teaching materials can increase students' understanding of this topic. Both studies just focus on the development of the website. These teaching materials are not tested for its effectiveness and its motivation. So, this virtual reality learning application in a constructivist learning environment on Islamic funeral will be tested for its effectiveness in aspects of recognition, recall and transfer learning. In addition, the activities in the learning application are already proven to be more practical.

Constructivist Learning Environment (CLEs) in Education.

Constructivist Learning Environments (CLEs) Jonassen (1999), focused on problem solving for students to learn through trial to resolve the problems. Problems for constructivist learning environment need to include three integrated components: the problem context, the problem representation, and the problem manipulation space. The representation of the problem must be interesting, appealing, engaging, and making students interested. The problems must represent a meaningful challenge for students. The problem manipulation spaces should be controllable, sensitive, realistic, and informative. Virtual reality was recommended to represent the problem. Students have to solve the problem by exploring all the components of knowledge available CLEs in such related cases, information resources, cognitive tools, conversation and collaboration tools and social contextual support. The information was provided as notes, visual simulation,

graphic, friends and teachers, as well as links, which can help students to solve the problems. Figure 1 represents the components in Constructivist Learning Environments (CLEs) adapted from Jonassen (1999).

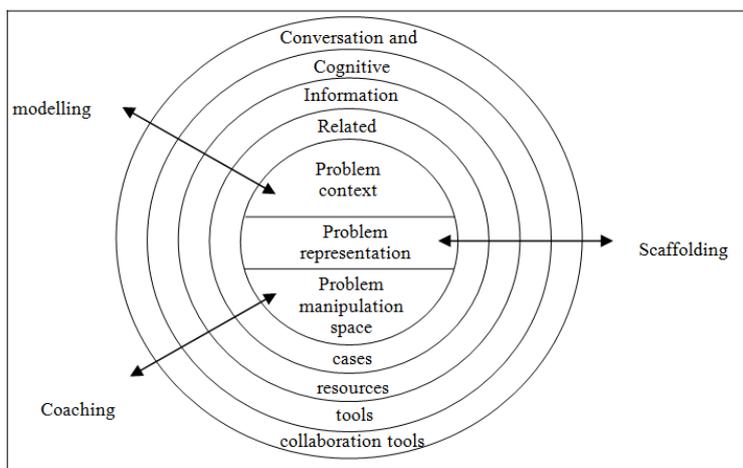


Figure 1: Components in Constructivist Learning Environments (CLEs) adapted from Jonassen (1999)

Constructivist Learning Environment (CLEs) was introduced by Jonassen (1999). According to him, knowledge is constructed based on interpretations of experiences in the world, and not transferred from teachers. The fundamental difference between constructivist learning environments and objectivist learning environments is that learners learn domain content to solve the problem, rather than solving the problem to apply the learning. Recently, there has been an increase in the number of studies that examined the impact on students' achievement that are using the courseware with the constructivist learning environment (CLEs) with courseware objective environment. Farzana (2009) has done a study on the effects of a multimedia constructivist environment on students' achievement in the learning of coordination between the nervous system and the endocrine system amongst four students. Vickneasvari (2007) has conducted a study on the effects of a multimedia constructivist learning environment on students' achievement and motivation in the learning of chemical formulae and equations. Both of the study's findings showed significant differences regarding the achievement and motivation of students who used learning courseware (CLEs) compared to students who used objective learning courseware.

Cognitive-Affective Theory of Learning with Media (CATLM)

Moreno and Mayer (2007) have proposed a theory of Cognitive-Affective Learning Theory with Media (CATLM) suitable for interactive learning environments such as virtual reality and case based on learning. There are five principles of multimedia learning proposed in this theory: guided activities, reflection, feedback, pacing and pre-training. Based on these features, students can learn interactively. Interactivity involves a process of manipulating the dialogue, controlling, searching and navigating. A theory is an outgrowth of Cognitive Theory of Multimedia Learning (Mayer, 2001, 2005) to be integrated relationship with cognitive, metacognitive, motivation and affect.

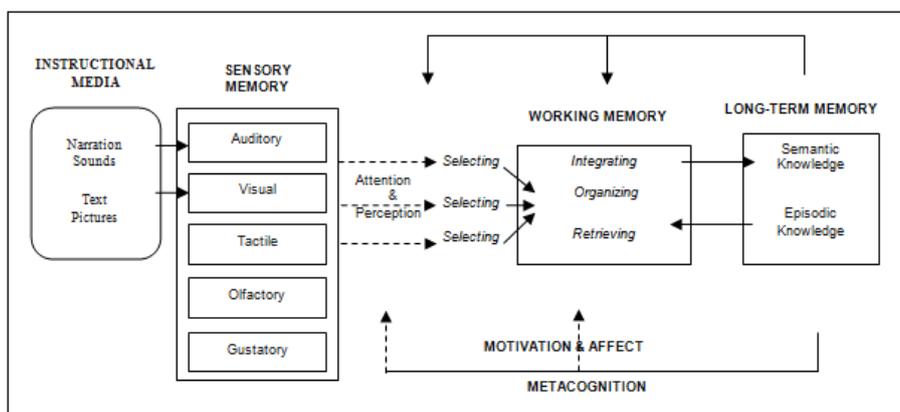


Figure 2. Shows the Cognitive-Affective Model of Learning with Media (adapted from Moreno & Mayer, 2007)

CATLM is an interactive multimodal learning environment. Based on this model, instructional media can consist of verbal explanations presented in narration or text, combined with non-verbal knowledge presented as pictures and sound. Information can be received through the five senses: auditory, visual, tactile, olfactory and gustatory. For creating meaningful learning, students first need to choose the verbal and non-verbal information relevant to be processing in the working memory. Then students need to organize the information into a mental model. Then, the information that has been organized will be integrated with the long-term memory. Lastly, the process of receiving information will occur. In the interactive learning process, this model is innovative from Mayer multimedia learning, cognitive theory (2001) in terms of the division of cognitive process into two parts, guided and feedback. Guided partitioning of prior knowledge activated by the learner (see figure, the arrows starting from the long-term memory to attention and working memory subsequent perception). While feedback is contained in a learning environment (see figure, students can also use meta-cognitive skills to regulate motivation and cognitive processes during the learning sessions). The influence of meta-cognitive, motivational, and effects of learning are shown by the arrow from long-term memory into working memory.

CATLM is an innovation from Mayer multimedia learning, cognitive theory (2001) (Mayer, 2001). Innovation process that arise includes a receivable knowledge through the five senses: auditory, visual, tactile, olfactory and gustatory. This process involves the following five principles: guided activities, reflection, feedback, pacing and pre-training (Moreno & Mayer, 2007). There are many studies that used guided activity, suggesting that the empowered group scored higher on tests of knowledge transfer (transfer test) than the group that was not given guidance. Among them are the results of three experiments carried out by Moreno, Mayer, Sires & Lester (2001). Findings from Moreno & Mayer (2005); Moreno (2004); Moreno & Mayer (1999), showed that those students can learn better when given feedback information. This feedback can also increase students' motivation and help them to select and organize new information. This is how important feedback is for stimulating a deeper understanding (Moreno et al., 2001).

Signaling Principles (Mayer, 2009)

Mayer defined signaling principle as an approach of people learns better when cues that highlight the organization of the essential material are added (Mayer, 2009). Signaling principle can help learner to pay attention and organize the knowledge on learning process. Besides that, signaling may help to reduce extraneous processing by attracting students' attention and help students building of connection between the main elements during the lesson. The principle has been used in the development of this courseware as a presentation element. It also has been used as the main independent variable in this research to increase students' achievement on Islamic funeral rites.

Signalling principle is a Mayer's principles in multimedia learning. The principle can reduce the cognitive load of students and reduce the difficulty of students to master the information presented in the learning process (Mohamed, Antonenko, Greenwood, & Wheeler, 2012). The signaling principle can help students to reduce the cognitive load and help students to organize related information by giving signal to them. In addition, Chen (2005), found in his study that students who were exposed to virtual reality mode signaling principle are significantly outperformed than students who were exposed to virtual reality mode without signaling principle.

III. THE VIRTUAL REALITY LEARNING APPLICATION

Virtual reality courseware in a constructivist learning environment for the topic of Islamic funeral rites has been built with the intention to increase students' achievement on Islamic funeral rites. The methodology used for designing and developing the application was adapted from Alessi and Trollip (2001). There are three main stages in this model; planning, designing and developing, in which Fig. 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 suggests ways to be creative and introduce techniques for designing, developing and integrating the various components of multimedia application (Alessi and Trollip, 2001). Figure 3 shows the Model of Instructional Design.

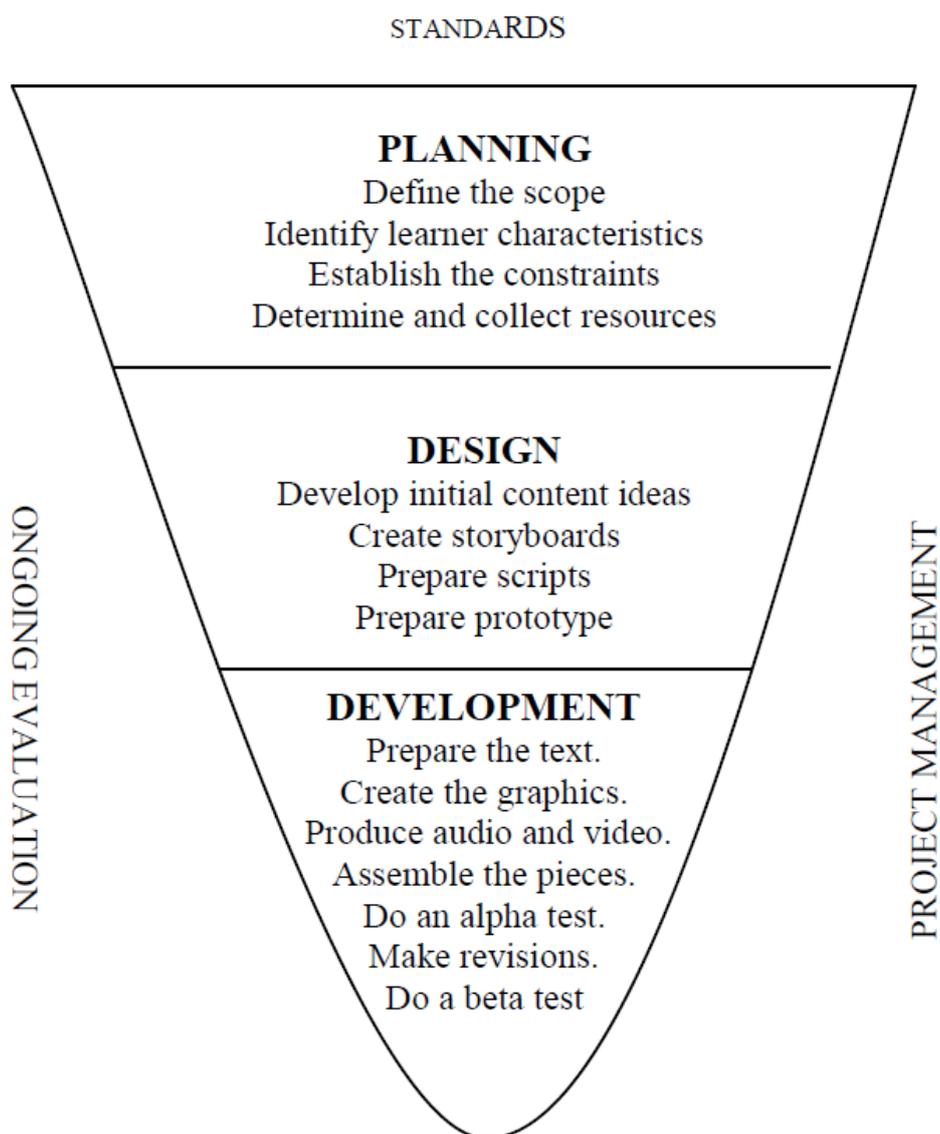


Figure 3: Model of Instructional Design (adapted from Alessi & Trollip, 2001)

A. Planning

The planning phase is to ensure a comprehensive understanding of the project and to assess possible constraints (Alessi and Trollip, 2001). It begins with determining the scope of the content that the instruction expected to cover. Then, it allowed 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 Islamic funeral rites in Malaysia. In order to define the scope of the study, current Islamic education syllabus for Islamic funeral rites was referred. In addition, Form 2 students were chosen as samples for this research after identifying learner characteristics were done. After that, the developer was established the constraints, determined and collected resources for developing the virtual reality learning application.

B. Designing

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 reality. During the design phase of the virtual reality learning application, 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 Constructivist Learning Environment (CLEs), Cognitive-Affective Learning Theory with Media (CATLM) and by adopting multimedia design principles Mayer (2009) specifically signaling principle. There are four steps identified in this phase; (i) developing the content ideas, (ii) preparing storyboards, (iii) preparing scripts, and (iv) preparing a prototype.

C. Developing

The development phase involves programming task that integrates the whole application function. The courseware was developed using Adobe Flash CS6 as the main platform. Virtual reality and 3D graphic were drawn and render using 3DsMax. Sony Sound Forge 9.0 was used for audio editing.

Two virtual reality learning application has been developed, The first one is VRTI using presentation mode 1 (PM1) which utilize the learning application without signaling principle and the second one is VRDI using presentation mode 2 (PM2) which utilize the learning application with signaling principle.

The signaling principle appears through the verbal signaling by using texts. A sentence about visual will appear simultaneously with the visual that included the action of the Islamic funeral rites process. This can be seen in Fig. 4



Figure 4: Screenshot Which Apply Signaling Principle.

IV. 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. Two groups of experts were involved in evaluating the application, who are (i) content expert, and (ii) instructional design experts. Particularly, the content expert's responsibility is to review the accuracy, significance and comprehensiveness of the content. Since the content is about the knowledge needed to make students' understand about Islamic funeral rites, two Islamic education teacher that have 10 years experience in teaching was chosen as a content expert. The evaluation about content based on a questionnaire from Che Soh (2012). Meanwhile, two lecturers from Universiti Utara Malaysia evaluated the instructional design. The instructional design expert evaluated the materials on the criteria of good instructional design and examined the interface of the application. They judged based on a questionnaire of usability for instructional design experts from Che Soh (2012). The evaluation goal was to identify any usability issues that can be addressed as part of an on-going evaluation design process. 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 (Alessi & Trollip, 2001). It is a formal process with clear procedures about what to do and what to observe. In the beta test session, a group of 38 students of form 2 was randomly selected to participate. The students were randomly divided into two groups which consist of 18 students each. The first group explored VRTI using presentation mode 1 (PM1) which utilize the virtual reality learning application without signaling principle and the second group explored VRDI using presentation mode 2 (PM2) which utilize the virtual reality learning application with signaling principle. After that, they were required to answer the questionnaire of usability for users. It was adopted from Che Soh (2012). The item scales ranging from 1 (strongly disagree) through 5 (strongly agree). Students also had to sit for pretest, posttest and transfer learning test in the Beta testing.

V. RESULT AND DISCUSSION

From the Alpha test, usability results show that the virtual reality learning application has the potential to be an educational tool, particularly to be used in educating and increasing students' achievement on Islamic funeral rites. Specifically, from the user interface part, most of the experts agree that this application gives appropriate reaction to the software, screen are organized and designed clearly and easily for the learner interaction. At the same time, the terminology and system information are consistent and related to the task you are doing. In terms of learning, most 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 students' achievement.

From the Beta testing, based on the questionnaire's feedback, usability results showed both of virtual reality learning application are very useful, screen are organized and designed clearly and easily for the learners to understand the content of learning application. There are good of quality presentation of audios, visuals and virtual realities. Besides that, Table I, II and III illustrates the descriptive statistics of VRTI and VRDI. It is reported that students who explored virtual reality learning application with signaling principle (VRDI) showed slightly higher in recognition, recall and transfer learning scores (students' achievement) compared to the students who explored virtual reality learning application without signaling principle (VRTI).

Table I. Descriptive Statistics for Recognition Scores by Presentation Mode

	VRTI		VRDI		Total	
	Pre	Post	Pre	Post	Pre	Post
n	18	18	18	18	36	36
M	31.67	72.22	50.56	90.0	41.12	81.11
SD	16.54	19.19	20.79	10.43	18.67	14.81

Table II. Descriptive Statistics for Recall Scores by Presentation Mode

	VRTI		VRDI		Total	
	Pre	Post	Pre	Post	Pre	Post
n	18	18	18	18	36	36
M	12.22	44.17	5.56	49.44	8.89	46.81
SD	10.18	22.9	6.62	18.78	8.4	20.84

Table III. Descriptive Statistics for Transfer Learning Scores by Presentation Mode

	VRTI	VRDI	Total
n	18	18	36
M	76.67	78.5	77.59
SD	3.92	3.4	3.66

VI. CONCLUSION

Virtual reality and signaling principle are important impact of increasing students' achievement on Islamic funeral rites, this paper discussed the impact of applied multimedia design principle as a strategy to design and develop virtual reality learning application. The findings test of this study show that the advantages of signaling principle can facilitate to increase students' achievement on Islamic funeral rites. While results from

beta test prove the utilize VRDI has more desirability compared to VRTI in test for recognition, recall and transfer learning.

VII. ACKNOWLEDGEMENT

Awaatif Ahmad is a PhD candidate student at University Sains Malaysia in Instruction Design and Technology course. She has masters from University Sains Malaysia in Educational Technology field and degree in Islamic Education and Arabic Language from Universiti Malaya. This research was financially supported by the USM's PRGS grant.

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