

Virtual Reality Courseware Towards Achievement of Transfer Learning Among Students with Different Spatial Ability

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Abstract—This paper aims to examine the effectiveness of the signaling principle in virtual reality courseware pertaining to the topic of Islamic Funeral Management in the Islamic Education subject to ensure the accomplishment of transfer learning among students with different spatial abilities. The study comprises of two phases namely the courseware development phase and treatment phase. The courseware development employs the Instructional Design Model by Alessi and Trollip. Besides that, the courseware is integrated with components of CLE, principles in Theory of CATLM and signaling principle in multimedia learning. The sample consisted of 130 Form Two students who were selected randomly from four Malaysian secondary schools. They were divided into two experimental groups with 63 students in Group 1 and 67 students in Group 2. The experimental Group 1 used VR courseware without the signaling principle (VRTI) while experimental Group 2 used the VR courseware with the signaling principle (VRDI). The experiment lasted for three weeks. ANOVA was utilised to analyze the data from this research. The findings showed significant differences between students who used VRDI in the transfer of learning compared to students who used VRTI.

Index Terms—Virtual Reality; Islamic Funeral Management; Multimedia Design Principle; Signaling Principle.

I. INTRODUCTION

Virtual reality is one of the technologies that has been used in education to improve students' understanding since the 80s [20][24]. It can be a tool that uses as a training tool in dangerous and expensive situations because it can provide a realistic simulation environment without any risk [18]. Students can interact with the 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 [25]. Constructivist learning focuses on meeting the learners' needs and helping them to construct and build their knowledge based on their prior knowledge [17]. Signaling principle is 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 [13]. Also, Chen [4] found in his study that students who were using the virtual reality with signaling principle are significantly outperformed than students who used to virtual reality without signaling principle.

Islamic Education as a subject is a critical component of the national education system. All Muslims students of primary and secondary schools in Malaysia must learn the

subject [8]. The Islamic funeral management is one of the subtopics contained in the syllabus of Islamic education for Form Three students in national secondary school. This topic covers the immediate rituals following death, the cleansing of the deceased, shrouding the deceased, conducting prayers for the deceased and the burial of the deceased. The Islamic funeral rites are very significant for all Muslims because every individual is well aware of the fact that they too will die one day. Allah (S.W.T) commands in the Quran what can be translated as: "*Every soul shall have a taste of death.*" [2].

This paper aims to examine the effectiveness of the signaling principle in virtual reality courseware for the topic of Islamic Funeral Management in Islamic Education subject towards achievements transfer of learning among students with different spatial ability.

II. BACKGROUND OF STUDY

Islamic funeral management is "*fard Kifayah*" duty for all Muslims, meaning that if only a few Muslims properly carry out this duty, then other Muslims are exempted from the responsibility. It is customary in Malaysia that the deceased is managed by his/her family. This coincides with the statement made by the Islamic Center of Universiti Sains Malaysia [15] it is most proper and blessed for family members and beneficiaries to conduct funeral rites for they shall be the closest and they shall have the most brilliant deeds of worship [15]. However, past studies showed that young people had not mastered this practice due to a less effective method of teaching [7][16]. Based on a review by researchers, it found that students' understanding of this topic is at an intermediate level, the similar found with the different human societies. Understanding those rites on the within the society did not exceed the intermediate level as well. Also, when viewing the practical syllabus, not all aspects of Islamic funeral rites are contained in this syllabus, funeral prayer is the only aspect covered [8]. So, there is a lack of time and materials provided to implement of this topic overall, practically at school. It is different from other topics in the ritual field; emphasized in the overall implementation of practical measures as *wuduk*, *solat* and others. So, teachers just teach this topic in theory based on the textbook.

Toh [21] in his study, suggests the use of computer simulation methods in place of practical work in learning. It is because the computer simulations can be used for situations in which practical application is difficult. For

example, dangerous situations or situations that are considered constraint in terms of time and materials. This method can improve the effectiveness of teaching and learning. Aside from the fact that learning can be facilitated in a short period of teaching time and flexible conditions, computerized simulation can also be used to overcome the problems of absent students who miss the actual practice in a lesson. Students can do this simulation at any time and are directly involved in learning activities and not tied to the expensive cost of materials.

III. DEVELOPMENT OF COURSEWARE

The courseware development employs the Instructional Design Model by Alessi and Trollip [1]. Besides that, both coursewares integrated with components of CLE, principles in Theory of CATLM and signaling principle in multimedia learning. This study was using two types of courseware that have the same characteristics, but different from the aspect of the presentation mode. The first mode is Virtual Reality courseware with signaling principle (VRDI) while the second mode is Virtual Reality courseware without signaling principle (VRTI). 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 as shown in Figure 1, while the mode without signaling principle (VRTI) as shown in Figure 2.



Figure 1: Screenshot which applies signaling principle (VRDI)



Figure 2: Screenshot which not applies signaling principle (VRTI)

IV. METHODOLOGY

This study was done using the quasi-experimental design. The sample consists of 130 Form Two students who were selected randomly from four Malaysian secondary schools. The sample is divided into two experimental groups with 63 students in Group 1 and 67 students in Group 2. Experimental Group 1 used the VR courseware without the signaling principle (VRTI) while experimental Group 2 used the VR courseware with the signaling principle (VRDI). The experiment lasted for three weeks. The data from this research are analyzed by ANOVA.

Two types of tests are conducted for the purpose of data collection. First is the Spatial Ability Test from Bennet [3] before using the courseware and the second is the Practical Test (AMALI) using the courseware. The value of the reliability tests of spatial ability is 0.91, while the practical test reliability, obtained through interrater reliability, was 0.82 or 82% similarity. This value indicates that the level of reliability of the scoring for the practical test is high because, according to Landis and Koch [9], 0.80 to 1.00, or 80% or 100% agreement between the two examiners calculated the level of agreement is perfect. Spatial Ability Test conducted by using a questionnaire to test the level of spatial ability. There are two levels of spatial ability; low ability (KRR) and high ability (KRT). The Practical Test was conducted by using a checklist to test level transfer of learning among students. The methodology of the study is shown in Table 1.

Table 1
Methodology of Study

Group 1	U ₁	X ₁	O ₁
Group 2	U ₂	X ₂	O ₂
Duration	15 minutes	15 minutes	15 minutes

Group 1	Experiment group 1
Group 2	Experiment group 2
U ₁ U ₂	Spatial Ability Test
O ₁ O ₂	Practical Test
X ₁	Learning by using VRTI
X ₂	Learning by using VRDI

V. FINDINGS

Data are analyzed by using Statistical Packages for Social Sciences (SPSS). Findings from the Analysis of Variance (ANOVA) showed significant differences of students who were using VRDI in the transfer of learning compared to students that were using VRTI, as shown in Table 2.

Table 2
Mean, Standard Deviation (SD), the Mean and Standard Error (SE) for the Practical Test

Dependent Variable	Mode of Presentation	
	VRTI	VRDI
Transfer of Learning (Practical Test)	n=63	n=67
	Min	104.71
	SD	12.08
		113.31
		12.18

Table 2 shows the students' transfer of learning by using courseware VRDI ($\bar{X} = 113.31$) improved significantly compared with the percentage of students who were learning by courseware VRTI ($\bar{X} = 104.71$). The mean difference was 8.6 between the two groups. Therefore, there is a significant difference ($p = .000$) between the transfer of learning of

students who were learning by courseware VRDI compared the students who were learning by courseware VRTI. Finding also showed there was a significant difference in the transfer of learning score ($F = 11.94, p = .000$) between four groups that have different spatial abilities as shown in Table 3.

Table 3
ANOVA Results of Practical Test with Different Spatial Abilities

Mode of Presentation	Spatial ability level	N	Min	F	p	Findings
VRTI	KRR	30	102.17	8.59	.000	Sig.
	KRT	33	107.03			
VRDI	KRR	37	110.14			
	KRT	30	117.23			

Table 3 shows that there are significant differences in overall mean between the four groups. KRT (height spatial ability) Group of students learning by using courseware VRDI obtain the highest mean $\bar{X} = 117.23$, followed by a group of students KRR (low spatial ability) that were learning by courseware VRDI obtained mean $\bar{X} = 110.14$. Followed by a group of students KRT that were learning by using courseware VRTI obtain mean $\bar{X} = 107.03$. The group obtained the lowest mean is a group of students KRR that were learning by using courseware VRTI $\bar{X} = 102.17$.

VI. CONCLUSION

Results from ANOVA showed a group of students that were using courseware VRDI obtain better results for the transfer of learning scores than students who were using courseware VRTI. It shows that the use of courseware VRDI affects the transfer of learning student achievement positively in Practical Test compared to the use of courseware VRTI. Moreover, this situation may occur due to the application of the principle of signals that guide students to perform funeral management in cyberspace properly and thus can increase the achievement level of students' transfer of learning. These factors may give an advantage to the group of students who were using the courseware VRDI for results achievement scores better transfer of learning as compared to a group of students who use the courseware VRTI.

This finding is consistent with research findings on the level transfer of learning that uses the principle of the signaling. Among the studies [11, 12, 14] which shows that the group of students who exposed to learning the principles of signal gain achievement, transfer of learning improved significantly compared with the group of students without applying signaling principles. It is because the use of the signal can help students to understand the contents of multimedia materials better and attract students to the important elements [12]. Also, such information can also be selected to enable it to process in working memory without burdening the students cognitive [22].

Moreover, the finding from this research is consistent with the findings from past researchers [5, 10, 18, 19, 23] that revealed the use of virtual reality in learning can improve the transfer of learning. The results of this study suggest that learning that used the courseware VRDI is effective and suitable for teaching and learning funeral management title

on the subject of Islamic Education Level 3 to increase the level of student transfer of learning as in this study. Repetition and hands-on also need to be done to strengthen the memory of the students so that students can attained a level of mastery of the psychomotor [6].

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