



## **The Effectiveness of Web-Based Multimedia Applications Simulation in Teaching and Learning**

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This study focuses on the effectiveness of using multimedia virtual simulation in Islamic Studies in Malaysia. Virtual simulation methods embedded in Microsoft PowerPoint was used in this study to determine the effectiveness of these modes to motivate students on the topic of pilgrimage in the Islamic Studies subject. Pilgrimage topic has been chosen because pilgrimage of hajj is a difficult topic to be learnt as it is not same as performing everyday prayers or fasting during in Ramadhan for Muslims. Virtual simulation allow students to interact with a virtual environment that almost similar to the real environment in Mecca. A study was conducted using a 2x2 factorial experimental and quasi t-test was used as a method of analyzing the data. The finding of this study shows that the use of virtual simulation help students to increase their achievement in a topic of pilgrimage

Key Words: Virtual Simulation, Web-Based Application, Multimedia, Teaching, Learning

### **INTRODUCTION**

The development of multimedia technology has changed the way people learn, obtain various information as well as in interpreting information. By using the Internet, people in Malaysia have access to information from various resources quickly and easily. The use of information technology has also influenced the educational system in Malaysia. Students in Malaysia are also exposed to the emergence of Web 2.0 with social networking sites such as Facebook, Twitter, Google+, mobile devices such as mobile phones, tablets and others. The exposure to the Internet has also brought significant challenges to the Islamic Education subject.

Islamic education subject is a core subject and it is compulsory for every Muslim students at primary or secondary school to learn the subject. According to the Ministry of Education Malaysia, Islamic Education subject must be taught in schools even if the numbers of Muslim students in a school are only five students (Education Act, 1996). The content of Islamic education subject consists of five elements which is reciting the

Quran, faith, worship, Islamic history, Islamic civilization and Islamic manners. The goal of Islamic education is to equip each student with the knowledge of Islam in order to live as a man of faith, noble character, knowledgeable, and do good deed as well as to enlighten people about the main duties of the Caliph of Allah and a status as a servant of Allah on this earth (Azhar Mohammad, 2007).

In Islamic Education subject, students are not supposed to learn the subject only to score in examination but they also need to practice what they learn in Islamic studies in their daily life. A study by Nik Rosila Yaacob (2007) found that students are becoming less interested in the Islamic Education subject. There are 40 to 48 percent of students who did not have any interest in the Islamic Education subject or less interested in the subject. 39 percent of the participants prefer the duration of time for Islamic Education subject to be shorten. The situation occurs probably because of lack of effective teaching methods of the subject in schools. As such, this study suggest that an innovation in teaching and learning Islamic Education subject is applied to Malaysian classroom in order to promote students' interest in the subject. Islamic Education's teachers are encouraged to follow current trends, prepare themselves with ICT skills and change their pedagogy of teaching Islamic studies so it will be accepted and able to catch students' interest. For example, teachers of Islamic Education, can take students to visit Arab countries, to venture into the world to see certain areas of the 'live' using Google software like Google Earth or Google Maps via the Internet. Students can be in the selected location without actually being at there. Therefore, the teaching of Islamic Education with this new method appear interesting, not boring and would motivate students to understand the topics. Hajj as one of the main topic in Islamic Education syllabus for form four students is seen as a tough physical worship practices to be understood by students.. This is because the hajj requires physical ability and only people who have enough money are able to go to Mecca in Saudi Arabia to do the Hajj.

#### **ROLE OF MULTIMEDIA IN TEACHING AND LEARNING**

Heinich (1996) suggested that computers can enrich teaching techniques and provide the capability to control and manage a lot of teaching materials. The ability to use computers to interact with students allows teachers to apply it in teaching and learning process to enable easier and attractive classroom teaching. It is depend on educator to use computer in learning process especially teachers of Islamic Education (Zaharah Hussin, 2005). Therefore, teachers should have the technology knowledge in order to be able to use it in classroom as well the need to be aware of the recent developments in technology skills so that they are not behind technology (Mahzan Arshad, 2005). Technology helps to stimulate students senses, especially the visual sense in which the effect is higher in the senses of learning compare to others (Heinich, 1998).

#### **Multimedia and Virtual Simulation in Education**

Multimedia is a combination of two or more elements which include text, graphics, audio, video or animation. With a combination of these elements in a lesson, teachers can create a learning environment that is full of audio-visual presentation which is not only attract students and stimulate students senses in the learning but also to treat a

variety of learning styles of students (Giam Kah How, 2000).. The use of audio and visual that will help students learn more effectively because of the efforts to build a mental image can be helped by the images displayed on a computer screen when students follow a learning software (Jonassen & Hannum, 1987).

Computer simulations and virtual reality offer students the unique opportunity of experiencing and exploring a broad range of environments, objects, and phenomena within the walls of the classroom (Strangman & Hall, 2003). This study suggested that virtual simulation could be an effective way to help students understand how to perform hajj. Fazidin Mohd Jabar et. al (2007) suggested that method in virtual reality or Game Theory refers to the kind of experience and the response expected from the user. They further described that the method is also called 'experiential design method' which has 4 major areas which are 'Focus',

'Emotion', 'Space/Form' and 'Orientation'. 'Focus' is about experiencing the sense of place, skill or role play. In Virtual Haj, 'Focus' makes users feel as if they are in Mecca doing the Haj pilgrimage. 'Emotion' concentrates on our inner feeling such as sad, angry, happy etc. For Virtual Haj, 'emotion' 'can elevate one's faith and devotion to the religion (Fazidin Mohd Jabar et. Al, 2007).

The teaching and learning method of Pilgrimage topic for Islamic Education is suggested to be revised by this study. Information Communication Technology (ICT) in has been suggested as motivates students' learning and have positive impacts students achievements in general Islamic Education topics (Abulatifeh, 2011, Maimun et. al., 2010 and Wan & Kamaruzzaman, 2009). In Islamic Education, the use of these technologies are accepted and sometimes, used by Islamic educators (Tamuri et. al.,2010). However, there were less study found specifically on the use of virtual simulation in teaching and learning Islamic Education especially in Malaysia.

Currently teaching and learning Islamic Education in Malaysia mostly use traditional methods of teaching or simple ICT integration such as using MSpowerpoint. In this study, the use of multimedia and virtual simulation activities of the pilgrimage has been used which consists of similar to the actual practices as in Mecca. The multimedia and virtual simulation shows three-dimensional environment display which is not static. The mouse and computer keyboard can be used to move around the virtual simulation area. The virtual simulation also include the combinations of color, texture, graphics, voice, text and various other multimedia elements that would be able to support and attract students' learning. It is suggests by this study that by using multimedia and virtual simulation in teaching and learning, students will be able to learn and practice on the pilgrimage topic more effectively. This will be an opportunity for students to be able to experience quite a similar situation as the real pilgrimage activities. As suggested by Alessi and Trolip (2001), virtual simulation can provide better learning experiences to students on how a theory or concept is applied in real situation. As such, he purpose of this study was to evaluate on the impact of using multimedia and virtual simulation on students' achievement in the pilgrimage topics for Form Four in Malaysian Secondary School.

Images or photos that are available in text books are similar to the image in the teaching mode when using PowerPoint. It is displayed in the form of an abstract two-dimensional and to imagine the real situation of an object is not easy. Two dimensional objects also do not show the effects of simulation and animation. Thus, the simulation approach is believed to be capable in helping students to recognize the appearance of the Kaabah, Jamrah, the position of Safa, Marwah and other images which are related to the pilgrimage topic. Aris et. al (2000) proposed that no matter how many thousands or millions of colors used in the textbook or reference books, the advantages offered by a multimedia system could not be beat out. However, in the case of Malaysia, there are less multimedia resources provided for the use of Islamic Education subject compare to multimedia resources for Science, Mathematics and Malay Language subjects (Salmiah, 2008).

The adoption of web-based multimedia technology in teaching and learning process has also been identified as one of the main element in teaching and learning process (Jamalludin and Zaidatun, 2003). Computers can be seen as playing an important role in visioning the simulation and animation of a real thing, object or activities. According to Gredler (2001), the use of games and simulations in learning can be referred as a full training experience. It creates opportunities for students to construct their own knowledge.

#### *Research Aim*

The purpose of the study was to evaluate the use of web-based virtual simulation in teaching and learning activities in the subject Islamic Education which focused on Pilgrimage topic. Specifically, this study has the following objectives:

- i. To identify whether there are significant differences between the achievement of students taught using multimedia PowerPoint teaching mode with web-based virtual simulation embedded within the presentation with students who were taught using multimedia PowerPoint without the web-based virtual simulation applications embedded within the PowerPoint presentation.
- ii. To identify whether there are significant differences in the achievement of the high achievement students that are taught using multimedia PowerPoint teaching mode with web-based virtual simulation application mode of teaching compare to high level achievement students in using multimedia PowerPoint without web-based virtual simulation application mode of teaching.
- iii. To identify whether there are significant differences in the achievement of the moderate achievement students that are taught using multimedia PowerPoint teaching mode with web-based virtual simulation application mode of teaching compare to high level achievement students in using multimedia PowerPoint without web-based virtual simulation application mode of teaching.

## METHOD

The study was carried out using quasi-experimental research with 2 x 2 factorial designs. This type of study is commonly used to evaluate the effectiveness of a project when respondents could not be distributed randomly. Quasi-experimental is used to replace the design of real experiments when a random distribution for the respondents' selection process cannot be done by the researchers (Chua, 2006).

The design of this study involved two groups of respondents consist of an experimental and a control group. Both groups have quite similar characteristics. T-test analysis was used to determine the difference between the respondents of the two groups.

Table 2: Research design 2 X 2 Quasi Experimental

Presentation mode x student achievement		
<i>Student achievement</i>	<i>Teaching strategy</i>	
	Multimedia with virtual simulation	Multimedia without virtual simulation
High level	20	20
Moderate level	20	20
Total	40	40

The data for the experimental group and treatment group were also analysed using descriptive statistics. Independent variables for this study is the teaching mode using multimedia PowerPoint with a web-based virtual simulation mode and multimedia PowerPoint teaching without a web-based virtual simulations.

### Study Samples

Purposive sampling used in this method, in which the two selected secondary schools in the district of Kuala Muda Yan, Kedah. The first school had a total of 20 higher levels of achievement students and 20 students from moderate levels of achievement for experimental group. The second school consists of 20 students with high achievement level and 20 moderate achievement level students as the control group. The students were divided in the high achievement and moderate achievements levels based on the students' Lower Secondary Assessments examination results at the end of the form three year. Students from the first school was taught using multimedia PowerPoint with web-based virtual simulation, while the second school was taught using direct instruction multimedia PowerPoint without the web-based virtual simulation mode. Students were selected according to the classes available in the selected schools. Both schools were selected, as the schools are equipped with good computer facilities with at least 20 computers working properly. In addition, the Internet facilities in both schools are good as their Internet accessibility are reliable to ensure that there were no interruptions during the teaching and learning process for the study.

In this study, researchers used web-based multimedia virtual simulation mode, which is supported by direct instruction using Microsoft PowerPoint as a mode of teaching and learning. For the web-based multimedia virtual simulation mode, web-based teaching model in the form of a simulation using a computer on the internet on-line through [www.islamonline.net](http://www.islamonline.net) was used. Students are able to experience such training in the state of the actual pilgrimage to Mecca. Objects and graphics are displayed as the Kaabah and its surroundings, Hijr Ismail, Jamarat, Hill Safa and Marwah and others look like is really there. Every rule and obligatory hajj be simulated through the instructions and directions provided. The following are the examples of virtual simulation Hajj screenshots:



Two students just arrive in Mecca, still not in ihram.



Aerial view of Masjidil Haram.



Student wearing ihram in the virtual simulation.



Student is walking through a three Jamrah.



A student is ready to do a tawaf.

Figure 1: The picture shows how the virtual simulation carried out by students.

During the teaching and learning process for this study, each student will perform the simulated pilgrimage by following the arrows in the web-based virtual simulation. They need to move their mouse to go to any place within the virtual simulation. Students are able to chat with their friends or teachers while using the web-based simulation of the pilgrimage by using voice or normal chat.

For direct teaching mode (direct instruction) using Microsoft PowerPoint, teachers will provide knowledge and information to students through a PowerPoint slide show arranged step by step. The teachers' task is to help students to develop procedural and declarative knowledge to promote students' understanding the topic of pilgrimage. The development of the PowerPoint-based teaching materials also had also taken into consideration of the multimedia elements required in the teaching and learning. During the direct teaching mode using PowerPoint, teachers had also demonstrated and showed to the students some graphics display, pictures of Mecca in two dimensional form which is Talbiah. Videos showing how the pilgrims are performed such as Tawaf, Sa'i and Wukuf were also displayed to students.

Two teachers in two schools in Islamic education classes had conducted the study. The teachers are Islamic education teachers with moderate skills in using the computer technology. The researchers acted as coordinators and monitor in the study throughout the teaching and learning process. The aim is to avoid experimental bias during the run of the study. The teachers had also been trained prior to the start of the study on the use of the web-based virtual simulation multimedia PowerPoint teaching.

## FINDINGS AND DISCUSSION

The data obtained are analysed using the Statistical Package for the Social Sciences (SPSS version 16). The mean value was used to see an increment in student achievement in learning before and after the quasi experiment. T-test statistical analysis was used to see the differences between the two groups of students in the control and treatment group. The t-test analysis for the effects of web-based multimedia simulation application showed improvements on the overall students' performances in the pilgrimage topics tests as shown in Table 2.

Table 2: Test analysis is at the highest level of significance  $p \leq 0:05$ 

<i>Group</i>	<i>N</i>	<i>Min</i>	<i>SD</i>	<i>t-Value</i>	<i>Significant, P</i>
Experiment	40	49.50	9.20	14.01	.000
Control	40	26.05	9.38		

The t-test results in Table 2 shows a significant difference ( $p \leq 0.05$ ) in mean scores between the experimental group and control group for their achievements in the pilgrimage topic where  $t = 14.01$ ,  $df = 39$ ,  $p = 0.000$ . Therefore, the result shows that there is a significant difference on the achievement of students who were taught using PowerPoint with the web-based multimedia simulation application than students who were taught using PowerPoint without the web-based multimedia simulation application.

The t-test analysis for the effect of multimedia applications with web-based virtual simulation on high level and moderate level students' achievement for the pilgrimage topic is shown in Table 3 and Table 4 below:

Table 3: The level of significance was at  $p \leq 0:05$  for student with high level of achievement

<i>Group</i>	<i>N</i>	<i>Min</i>	<i>SD</i>	<i>T-value</i>	<i>Significant, P</i>
Experiment	40	51.45	9.72	-8.979	.000
Control	40	26.65	11.51		

Table 4: The level of significance was at  $p \leq 0:05$  for student with moderate level of achievement

<i>Group</i>	<i>N</i>	<i>Min</i>	<i>SD</i>	<i>T-value</i>	<i>Significant, P</i>
Experiment	40	47.55	8.45	11.51	.000
Control	40	25.45	6.88		

The t-test results in Table 3 shows a significant difference between mean scores of experimental group with the control group. Results showed that  $t = -8.979$ ,  $df = 19$ ,  $p = .000$  level, which is less than the significance level of  $p \leq 0.05$ . Accordingly, the analysis showed a significant difference in the increase in mean score between high-level students who were taught the experimental group with improvement strategies based multimedia web-based virtual simulation compared with the control group was taught without a virtual simulation strategy.

The t-test results in Table 4 also shows a significant difference ( $p \leq 0.05$ ) in mean scores between the experimental group and the control group for moderate achievements students in their tests for pilgrimage topic, where  $t = 11.51$ ,  $df = 19$ ,  $p = 0.000$ . Therefore, based on the results of this study, it can be stated that there are significant differences on the achievement of students taught using PowerPoint-based multimedia teaching mode with improved web-based virtual simulation strategy than direct teaching mode without PowerPoint multimedia-based virtual simulation applications.

## DISCUSSION

This study aims to find out the level of students achievement when using multimedia PowerPoint teaching mode with web-based virtual simulation for the topic of

pilgrimage. An improved teaching method of web-based virtual simulation had been used in this study in order to help students to increase their understanding of the topic. The findings of this study found that the used of web-based simulation helped students to developed their understanding in the pilgrimage topic in Islamic Studies. This method can be considered as an effective method as it is almost similar to performing the real pilgrimage, which involves cognitive, affective and psycho-motor domains. Students are able to learn effectively through personal involvement and experience, the "hands-on" opportunities for selfdiscovery (Curriculum Development Centre, 2001). By using the web-based virtual simulation, the teaching and learning process is no longer teacher centered but is a student-centered. In this simulation process they are required to think, analyze situations and think critically on how to resolve the problem. In addition students can master skills such as question and answer, the acquisition and use of resource base learning (Suhaimi, 2007).

In transferring of skills and knowledge in the educational environment, various methods of teaching and learning could be easily adapted. However the effectiveness of the adapted methods would ensure a lifelong learning for students.

The findings show that there are significant differences in an achievement between students taught using multimedia PowerPoint teaching mode with web-based virtual simulation and the mode of teaching continues to use PowerPoint without a virtual simulation. The experimental group showed better performances than the control group. T-test was conducted at the significant level of 95% and showed a significant difference with  $p = 0.000$ . The findings are consistent with research done by Shaharuddin, Zaidatun and Baharuddin Aris (2007) which had done a simulation using a website called the World Wide Web-based Simulation (WWWS). In their study, they found that web-based simulation has a potential to improve students' understanding and motivation in Telecommunications and Networking. The results of their study show positive user acceptance of learning via the web simulations, namely on the design and content of education. Interactive websites with simulation and multimedia elements also has the potential in delivering and support of the constructivist learning theory which focuses on student centred learning. It is also suggested that by using web-based simulation as a teaching and learning strategy has the potential to increase individual learning experiences, particularly in the era of information technology.

The finding of this study is also supported by the study carried out by Toh (1993) which found that there are significant differences in the cognitive knowledge of students who used computer simulation methods and practical methods. By using computer simulations, students' individual knowledge is higher than students who did practical work. Retention scores of students in the computer simulation is also higher than the students in practical work. Alessi & Trolip (2001) suggested that simulation is a good way for users to perform certain activities. Les Pang & Hodson (1999) also agree that simulation has proven to be an effective way of learning, which enable students to be more innovative and creative.

**Implications of the study**

The impact of this study proved that the enhancement of virtual simulation strategies in multimedia-based teaching could improve student achievement and motivation. Multimedia skills and integrate a variety of effective teaching methods and techniques will help students learning process in the classroom. Shahrudin, Zaidatun, and Baharuddin (2007) found that simulation methods could help students understand the abstract image and can improve learning performance.

There are only few studies conducted in Malaysia that relates virtual simulation with the topic of Islamic Education subject in schools. Thus, based on the findings, there is an evident that the simulation method is one of effective teaching techniques as well as optimum use of multimedia. Therefore, it is recommended that virtual simulation methods should be given priority in the design process of teaching teachers. In addition, construction materials should also take into account the cognitive level of students to be accepted by all levels of students with high, medium and low.

This study gives impact on the need of alternative medium to help teachers and students overcome learning disabilities in the classroom, particularly for the Islamic Education subject. The optimum use of multimedia as well as good skills to adapt the methods or techniques appropriate teaching and learning is a productive pedagogical practice to enhance students' understanding of learning. Among the teaching techniques that can be used by teachers are simulation method, mind maps, mnemonic and others. The use of virtual simulation in Islamic Education is a new method for Malaysian Education system. Therefore, the researchers suggested that teachers who are teaching Islamic Education subject are provided with teaching materials that use virtual simulation mode (software or simulation software) especially for the topic of Worship in Islamic Education. Worship is a practical practice that need to be simulated in the classroom in order for the students to understand and are able to practice it in their real life.

**Limitation and Recommended Future Studies**

For future studies, it is recommended that larger samples are included in the study. By using larger populations such as by including secondary students from every state in Malaysia, the research result can be generalized across Malaysian Secondary Schools. As such, the application of web-based virtual simulation for the pilgrimage topic can be promoted if the findings of the future study are similar to this study. Future studies are also recommended to look at the selection of students by taking into account the differences extended beyond the expected, such as socioeconomic backgrounds that may influence this studies as the Quasi-experiment in this study had used existing class, assuming the two groups is similar. Location of schools such as rural schools and urban located school might contribute to different result for the study. Furthermore the study is limited only to the topic of pilgrimage in Educational Studies. Thus, it is suggested that the same study be expanded and applied to topics and other places of worship. As such, it can be known to what extent the effectiveness of web-based virtual simulation teaching methods to the achievement of students. It is also suggested that this study

should also be implemented on low-level students. It aims to identify the effectiveness of the impact of virtual simulation methods for different levels of students.

### CONCLUSION

This study found that the application of multimedia web simulation in teaching Pilgrimage topic has given positive impact on student achievements. The reason is the virtual simulation resembles the real world, which can attract students and help them to understand abstract images. The used of multimedia web virtual simulation in a lesson also support a learner-centred approach that related to Constructivist Learning Theory. Thus, in developing multimedia software, simulations should be considered as a suitable alternative for teachers in designing teaching materials. Therefore, teachers need to be more creative and innovative in order to attract students in constructing their knowledge by using different approaches that related to the topics in classroom.

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