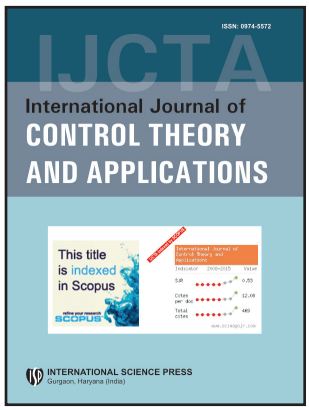

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Learning while Exploring with Virtual Reality

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Abstract: Software development and advancement have improved learners commitment towards learning environment. Within the learning environment realm, learners' sensory modalities lifted interactivity level and characteristics of effective learning increase learners' engagement. Therefore, in this study, virtual reality is adapted to incorporate both learning theory in a learning environment. A framework is drawn and a case study is developed based on the drawn framework. Two controlled group of learners who has little knowledge on subject of the case study are formed. For the First Group, learners are provided with text book of subject concerned and Second Group is provided with case study application with same subject concerned. As for the derived results, students from the Second Group have better knowledge of subject concerned compare to the First Group. Based on this study, researchers believe that learning while exploring with virtual reality environment could benefit learners as well as education system as a whole.

Keywords: Courseware, Virtual Reality, Learning Style.

1. INTRODUCTION

Reading is an important and most significant activity in a society. It is important for people to acquire knowledge and information. Information may appear in many different ways such as using digital, printed or virtual reality materials. An example of digital material is E-book that can be found in laptops, computer and handheld device. The usage widely accepted as a resource of information. With growing amount of digital information resource and the increasing amount of people reading behaviour is affected. Furthermore, the use of element multimedia such as text, graphics, video and audio for digital content has attracted many educators and student to use them at another level and this bring the idea of distance education [1, 2]. Traditional printed material is very common to society and they are still widely been use, which conveys planned course information. Examples of print resources like textbooks, workbooks, reference books, newspaper, journals and magazines. The usage of printed material has been decreased. In Malaysia for example, a few printing companies were closed due to their reducing in sales. This does not mean that people are not reaching. It just they switch the reading material from printed to digital [2]. Another substituted for printed material is Virtual reality (VR). Virtual Reality material gives readers the best aspect for real world experience. It improve online distance learning environment. Virtual Reality tools consist of video and sound, power point, group

and private messaging channel. These allow student have real life communication. The virtual setting even allows the student to visualize the subject that they are studying. This method is more engaging for the new generation.

This paper is organized as: Section 2: Learning Style; Section 3: Virtual Reality; Section 4: Methodology; Section 5: Case Study ; Section 6: Testing; Lastly Section 8: Concluding remarks.

2. LEARNING STYLE

In conjunction with traditional learning environment, varieties of learning method are actively promoted such as: tests, assessment devices, computer based learning (CBL) and online learning is introduced in order to help educators educate their students [3]. In addition, appropriate research on learning styles is conducted to accommodate these learning methods. Learning styles exist to accommodate diversity of learner's behaviour and psychometrics. This is due to the fact that different people perceive, interact and respond to learning environment differently [4].

Many researchers had been doing research on learning style. Among the famous learning style researcher is Neil Fleming [5] who had studied on learners' notions of sensory modalities. Learners' sensory modalities helps determine suitable learning style for appropriate learner. Four distinguish learner sensory modalities identified are: visual, auditory, read or write and kinaesthetic. First type of learner is visual learner who has a preference for having visual aids as a media for providing information. Second type of learner is auditory learner who prefer learn through listening. Third type of learner is tactile learner who prefer learn through experience like moving touching and moving. The last type of learner is read or write learners who prefer learning by reading or writing.

Additionally, appropriate effective learning characteristics helps trigger learners' fullest capability in order to grasp what they are learning. According to Tickell [6], there are three characteristics of effective learning which are: playing and exploring; active learning and creating and thinking critically. For playing and exploring: learners are expose with investigation and experience; active learning and creating: learners are involved with challenge and achievement while creating and thinking critically: learners are occupied with development of ideas and strategies.

Both characteristics of effective learning and sensory modalities are emphasized in this research to produce a better equipped support for learner development in courseware learning platform. Consequently, both characteristics and modalities are mapped together in Table 1.

Table 1
Mapping out characteristics of effective learning with Sensory Modalities

	Sensory modalities			
Characteristics of effective learning	*Visual*	*Auditory*	*Read/Write*	*Tactile*
Playing and exploring	✓	✓	✓	✓
Active learning	✓	✓	✓	✓
Creating and thinking critically	✓	✓	✓	✓

All three characteristics are closely relates with the sensory modalities. Each characteristic could incorporate all sensory modalities: visual, auditory, textual (read or write) and tactile attribute to nurture characteristic of effective learning. Meanwhile for the suitable learning environment, virtual reality is the best that support all of these attributes.

3. VIRTUAL REALITY

Virtual reality learning environment is one of learning style that using most advance type of learning in virtual environment [7]. Virtual reality can be described as 3D animation that runs on personal computers to networked simulators and it is associated with simulation [8]. According to [9], virtual reality can give great impact in students learning environment. Besides simulation, Virtual reality can also provide immersive, imaginative and interactive environment.

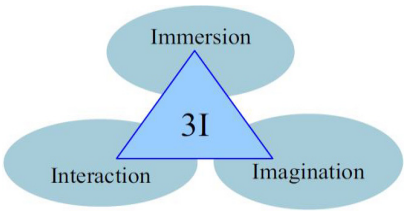

Figure 1: Environment of Virtual Reality System [10]

Immersion, interaction and imagination in Figure 1, will drenched students into the designated world, and they will feels like in that different world [10].

4. METHODOLOGY

Learning styles are analysed and studied for the important elements that need to be embedded in a learning environment. Characteristics of affective learning and sensory modalities are the major attributes that had been highlighted in this research. A framework drawn from this preliminary study is shown in Figure 2 below. This framework is used as guidance for the researcher in identifying the key elements for designing and implementing good educational coursewares that effectively educate students.

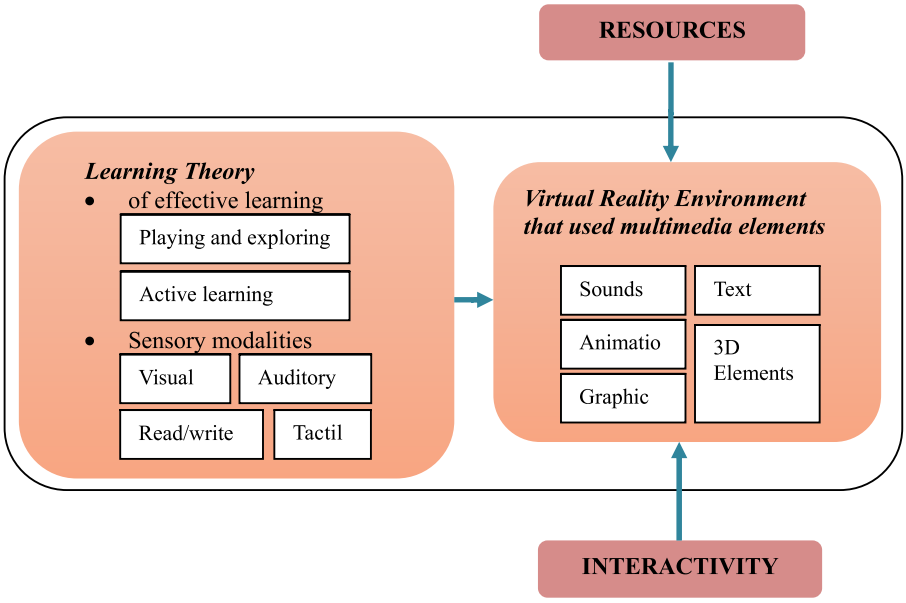

Figure 2: Framework Learning while Exploring with Virtual Reality

The best medium of adapting both effective learning characteristics and sensory modalities is using virtual reality environment which could adapt element sound, text, animation, graphic and XD elements all at the same time. A case study is conducted to adapt the drawn framework and this case study is discussed further in Section V.

5. CASE STUDY

A case study on learning while exploring with Virtual reality is build to organize and conduct research successfully. A case study is built after a careful analysis of the drawn framework. The case study is a virtual educational courseware that encompass about computer component. This educational courseware lets students explore system unit of a computer virtually and experience walkthrough inside a computer itself. Compare to other computer courseware, this educational courseware provides firsthand experience of visualizing fragile and small scale of computer component with realistic gigantic view. Each component are modelled individually so that it could be virtually rotated 360 degree by students. This courseware application upgrades traditional learning method to another level of virtual learning environment embedded with two of characteristic of affective learning which is playing and exploring and active learning. Figure 3 and Figure 4 show the screenshot of the educational software.

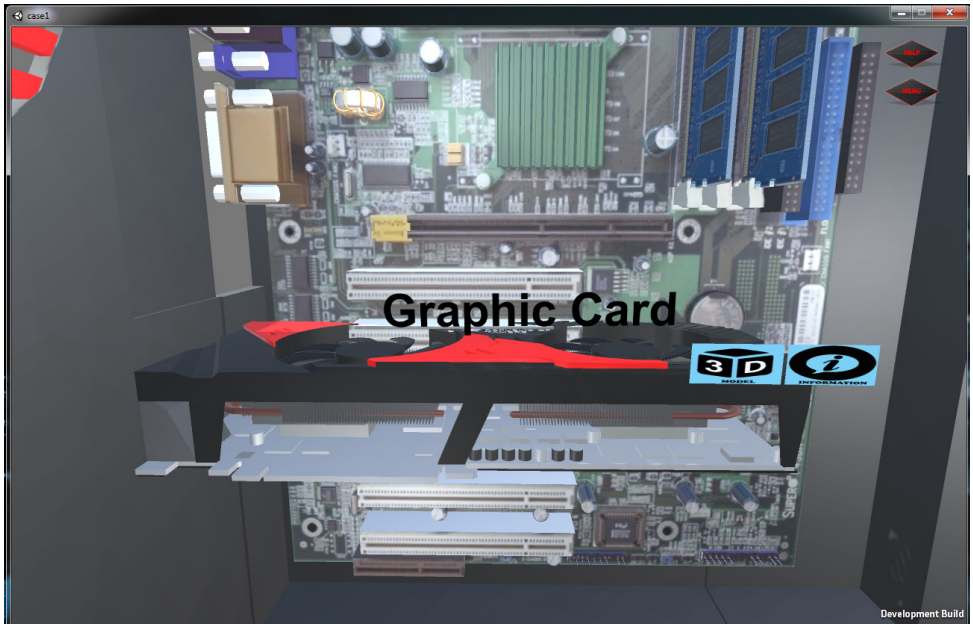

Figure 3: Screen shot I of case study

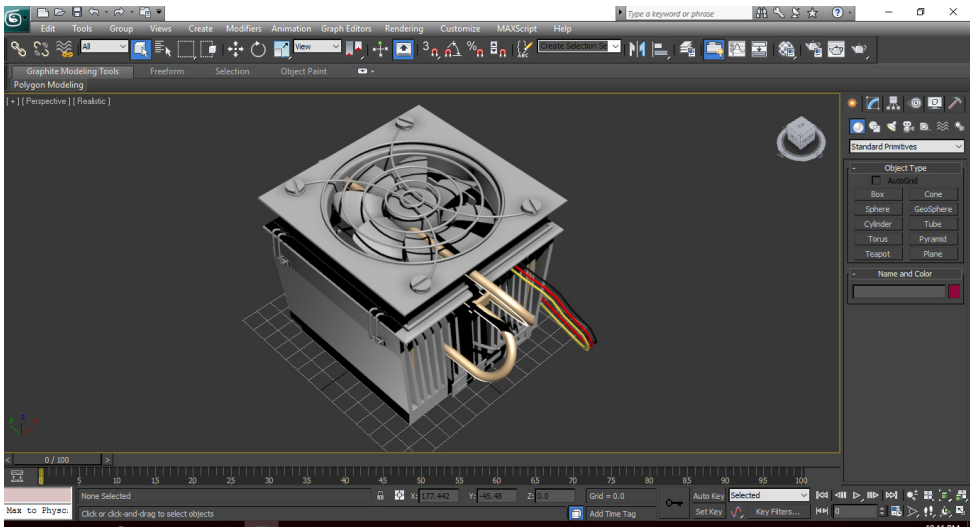

Figure 4: Screen shot II of case Study

As in Figure 3, users are also provided with further information about the object that is hovered by the user. Users are able to choose either 'model' or 'information'. For the button 'model', detailed exploration about the component are provided whilst for button 'information' textual information about the component together with its functions are given. Information is displayed in the form of textual and also recorded voice. For investigation, further testings are held.

6. TESTING

Usability testing is used for the testing purposes to ensure developed educational courseware which was based on proposed framework can carry out the intended tasks efficiently, effectively and satisfactorily. For this purpose, ten students' ages from 17 to 18 years old are gathered. All of them have zero knowledge about computer components nor computer hardware. These students are formed into two groups. The first group, students are provided with books about computer hardware specifically computer system unit. As for the other group, students are provided with the developed educational courseware. Both groups studied provided material for an hour. A set of quiz were given to all students in both groups. Results from both groups are shown in Figure 5 and Figure 6.

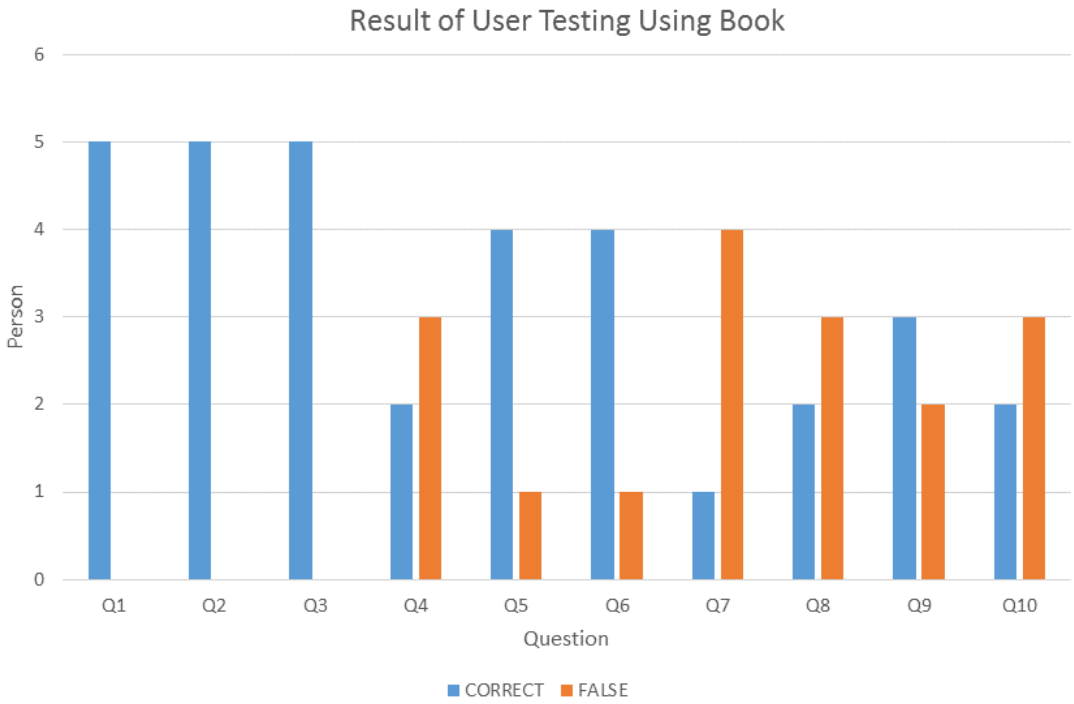

Figure 5: Test Result from First Control Group

Figure 5 is the tests results obtain form the first control group which used books as study material. Blue bars represent correct answers while red bars represent wrong answers. Question One, Two and Three are general questions where all students in the First group able to answer correctly. However question Four, Five, Six, Seven, Eight, Nine and Ten not all students in the First group successfully answer them correctly.

Figure 6 is the tests results obtain form the second control group which used developed educational courseware as study material. Similar to the Figure 5, Blue bars represents correct answers while red bars represent wrong answers. From this figure, it is clearly shown that all Question One until Question Nine are answered correctly by all students in the Second group. However for Question Ten, not all students in the Second group are able to answer it correctly, since the last question is a little bit tricky.

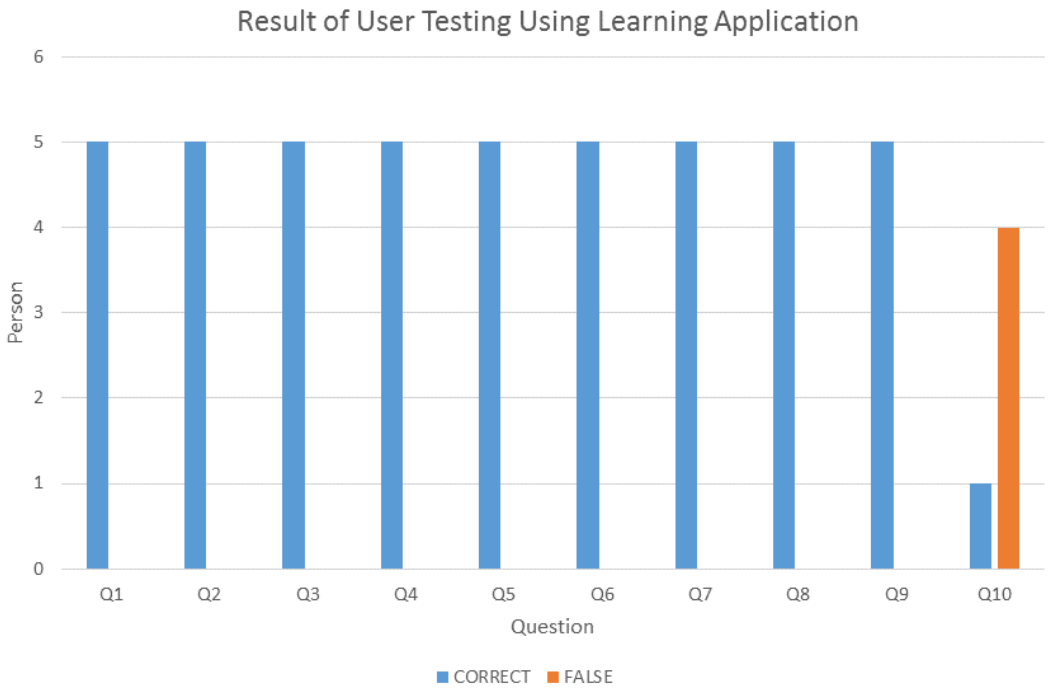

Figure 6: Test Result from Second Control Group

Based on this test, it is clearly shows that second group grasp knowledge more than the First group. In conclusion, educational courseware which comprise of sounds animation, graphic, text and 3D elements give more impact to learners compare to books which only contain text and graphic.

7. CONCLUSION

Virtual Reality material gives readers the best aspect for real world experience to allow learners visualize the learning aspect. Learners are engaged to learning environment when their sensory modalities: visual, auditory, read/write or tactile are activated. In addition to it, engagement can held longer when characteristic of affective learning such as playing and exploring; and active learning integrated in the learning environment. Researchers believe that learning while exploring with virtual reality technique could benefit learners as well as education system as a whole.

Acknowledgment

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