The Application of VLE with 3D Google Earth and Interactive Technology

Wei-Kai Liou [1] and Chun-Yen Chung[1,2]
[1]*Science Education Center, National Taiwan Normal University, Taipei, Taiwan (ROC)*
[2]*Graduate Institute of Science Education and Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan (ROC)*

Keywords: VIRTUAL Learning Environments (VLE), Laser Driven Interactive System (LaDIS), KMC (Kinect Motion Capture), WCT (Wireless Control Technology), VR(virtual reality).

Abstract: The purpose of this research is to provide a viable, efficient and economical Virtual Learning Environments (VLE) educational system, which is easy to show VLE interactive system in any classroom. And most students and teachers are highly satisfied with, the system and willing to use. The effect of the proposed interactive system that incorporates 3D Google Earth into VLE may be summarized as the follows: 1) With a projector, screen, PC, LaDIS, KMC, WCT, 3D Google Earth and B&R 3D eyeglasses it is easy to show VLE interactive system in any classroom. 2) The proposed VLE system provides a viable, efficient and economical VLE educational system. 3) Most students and teachers are highly satisfied with, the system and willing to use, this form of VLE interactive system because of its naturally superior interactive performance in classes.

1 INTRODUCTION

VLE technology is currently developed for professional training in highly technical fields such as medical education, astronaut training and military training (Merril 1993; Merril 1995; Eckhouse 1993). The main problems of VLE educational systems include: high monetary costs, the complexity of software as well as the instillations of said software. Due to these stated limitations, VLE cannot be effectively implemented into every classroom worldwide. Most previous studies focus on how to the use of Google Earth /Google Map in teaching different subjects such as geography, earth science, history and eco-awareness (Mitchell, 2010; Demirci, 2009; Hwang, 2009; Patterson, 2007); however, there is a lack of investigational research into VLE application utilizing 3D Google Earth and interactive technology. It is hope of this research that the VLE tool, developed in this study, may enable teachers to use and apply VLE into any classroom. Student Satisfaction Index (SSI) are also utilized to explore the satisfaction ratings by our VLE interactive system.

2 INTEGRATED INTERACTIVE TECHNOLOGY AND 3D GOOGLE EARTH INTO VLE

The ultimate goals of VLE are to foster learners' problem-solving skills and to help students to become independent thinkers and learners (CTGV 1990). This research develops an innovative teaching tool which incorporates 3D Google Earth and interactive technology into VLE. Utilizing this system, teachers and students can better explore VLE problem-solving environments.

3D Google Earth: Google Earth is a virtual globe, map and geographical information program. It maps the Earth by superimposing images obtained from satellite imagery, aerial photography and GIS(Geographic Information System) 3D globe. Google Earth 5 includes a separate globe of the planet Mars that can be viewed and analyzed for research purposes. The maps of Google Earth 5 are of a much higher resolution than those on the browser version of Google Mars, and they also include 3D renderings of the Martian terrain. There are some extremely high-resolution images from the Mars Reconnaissance Orbiter's HiRISE camera that are of a similar resolution to those of the cities on Earth (Google, 2012).

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Laser Driven Interactive System (LaDIS): In order to combine laser driven and wireless control multi-technology, an innovation design was proposed. LaDIS provides a complete presentation function by utilizing a laser point (which comes from a laser diode pointer and emits a red spot on a screen). LaDIS cooperates with an optic camera and a laser point image tracing software. Utilizing image processes and software program operations, the movement of the laser point images can be transformed into a command signal to control the mouse's cursor on the screen. (Liou and Lee, 2011)

Kinect Motion Capture: FAAST(Flexible Action and Articulated Skeleton Toolkit) is middleware to facilitate the integration of full-body controls with games and Virtual Reality(VR) applications; to accomplish this, FASST utilized either OpenNI or the Microsoft Kinect for Windows skeleton tracking software. FAAST includes a custom VRPN (Virtual-Reality Peripheral Network) server to stream up to four user skeletons over a network, allowing VR applications to read the skeletal joints as trackers using any VRPN client. Additionally, the toolkit can also emulate keyboard input triggered by body posture and specific gestures (Evan et al., 2011).

Figure 1, illustrates users exploring the Earth and Mars. These two learner-centered activities, in a living science course, combine situated instruction and interactive system, using integrated LaDIS (Laser Driven Interactive System), KMC (Kinect Motion Capture), WCT (Wireless Control Technology) and 3D VR(virtual reality) environments, then incorporates 3D Google Earth into our work. Figure 2, shows an example of an interactive system that incorporates Google Earth into situated instruction.

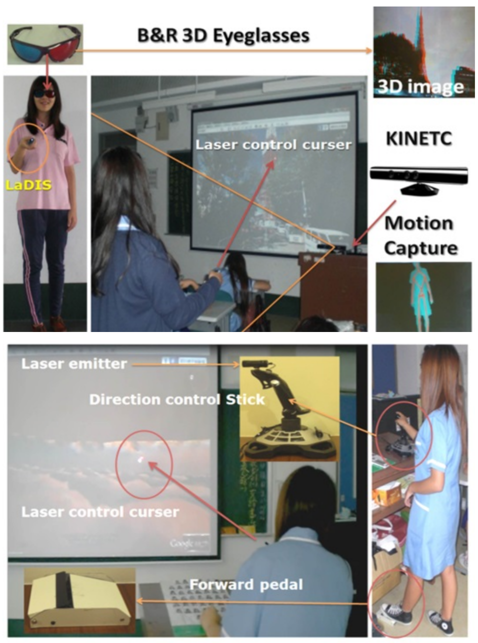

Figure 1: Travel around the world and Mars explorer activities using a projector, screen, PC, LaDIS, KMC, WCT and B&R 3D eyeglasses. These are incorporated with 3D Google Earth software to show how this VLE interactive system may be applied in classrooms.

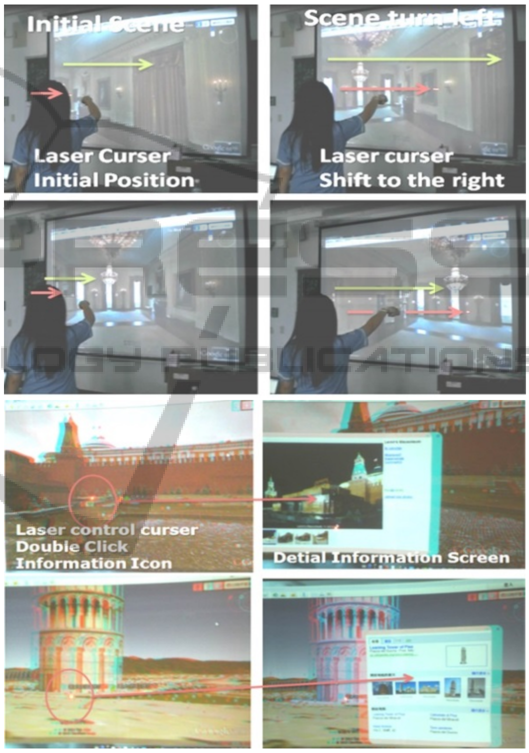

Figure 2: The student can control directions in 3D VR environments on the screen, via a handhold LaDIS device, to click information icons in Google Earth.

The students can control directions and click information icons in Google Earth on the screen. This is accomplished utilizing a handheld LaDIS device. In this way students may view different country scenarios in 3D VR environments. The VLE interactive system in this study provides a student with a way to: 1) induce movement forward commands via body gestures 2) surf in 3D VR environments as shown in Figure 3. Figure 4 shows how the VLE interactive system can immerse a student into 3D VR environments by wearing B&R (Blue & Red) 3D eyeglasses. Based on the theory of VLE, we designed an efficient and economic teaching tool, which incorporated 3D Google Earth and interactive technology into a "living science and technology" course.

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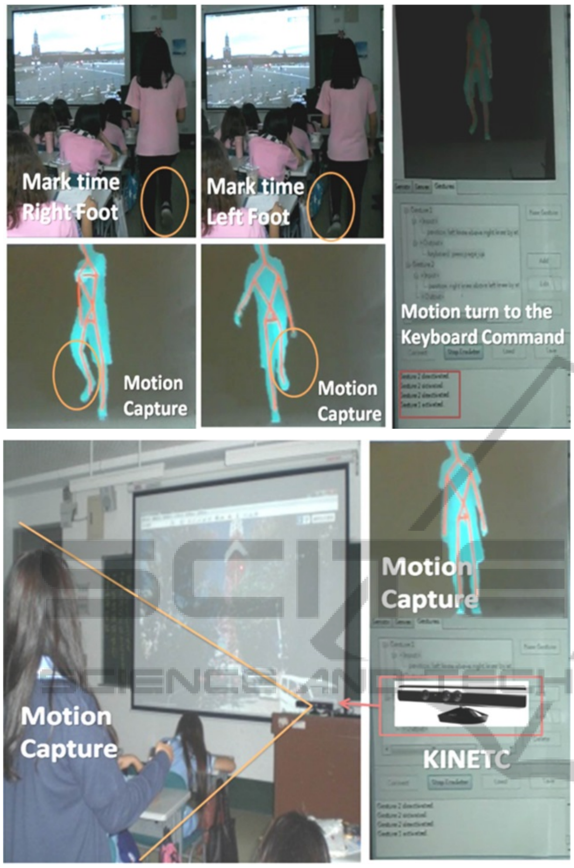

Figure 3: Student can surf Tokyo Tower and Red Square via body gestures.

We utilize laser curser with real-time control directions to click information icon on the screen as well as to mark time; forward pedals are used to induce forward commands, and to allow users to surf different countries in 3D VR environments. Student can use a handheld LaDIS device to navigate via body gestures or a forward pedal to control on screen movements; B&R 3D eyeglasses are utilized to immerse the user in 3D VR environments. Thus, students may feel free to walk around in different country scenarios, even on Mars by means of 3D VR environments.

Figure 5 shows that student also can drive the Mars exploration *"**Curiosity**"* vehicle while surfing different scenarios in Mars by LaDIS DSC (Direction Control Stick) and WCT (Wireless Control Technology) forward pedal. Student can control directions, on the screen, as well as interact with any information icon on the screen via the LaDIS DSC. In addition, users can also drive forward by way of the WCT forward pedal to immerse themselves into the Mars environment. This VLE interactive system integrates LaDIS, KMC, WCT, 3D Google Earth and 3D VR. The framework of this innovative teaching tool can enable teachers to use and apply VLE into any classroom as shown in Figure 6.

Figure 4: Students can walk around in Big Ben, Red Square, Piazza el Duomo and Tokyo Tower with 3D VR environments by utilizing B&R 3D eyeglasses.

3 STUDENT 'S SSI

As shown in Figure 7, Evaluation results for the Student Satisfaction Index (SSI), we use four dimensions including: satisfaction, willingness to use, interaction and learning to explore the relationship between student and satisfaction ratings on our VLE interactive system. Between each two dimensions are also included two sub-items such as between satisfaction and learning is "motive and effect", between satisfaction and willingness to use is "better than traditional and usability", between willingness to use and interaction is "perceptive and participation", between learning and interaction is "interaction with teacher or student and interaction between student and student or interaction with

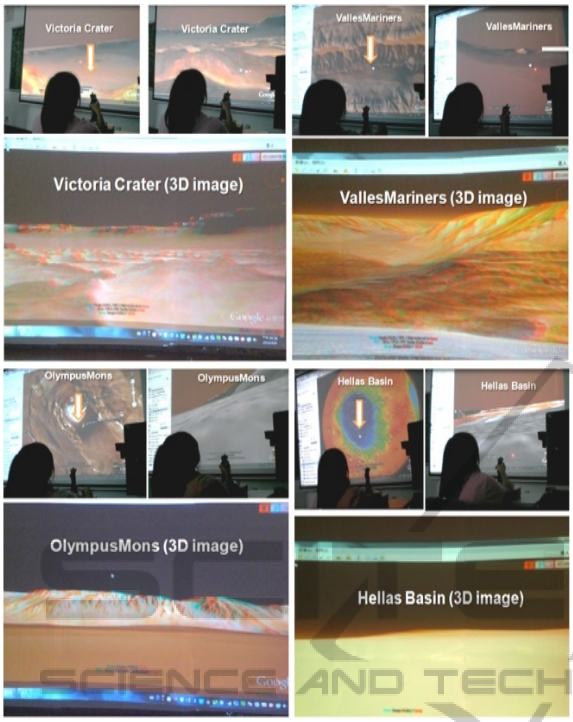

Figure 5: Student can drive the Mars Exploration "Curiosity" surfing Victoria Crater, Valles Mariners, Olympus Mons and Hellas Basin in Mars.

classmates". The results show each dimension such as satisfaction, willingness to use, interaction, learning and sub-items such as motive, effect, interaction with student and teacher, perceptive, participation, usability, better than tradition all obtain over 90% ratings satisfaction index. The results demonstrate that there was better interaction between student and teacher in the classroom due to the use of this form of VLE interactive system.

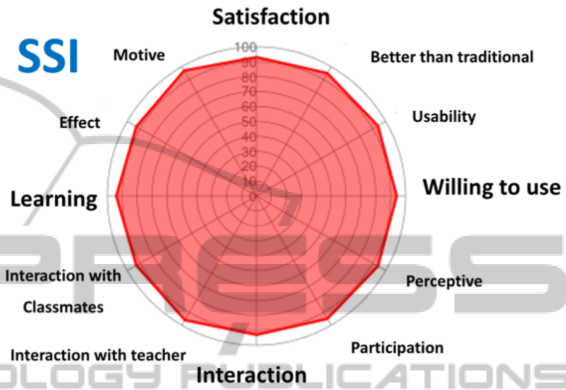

Figure 7: Evaluation results for the Student Satisfaction Index (SSI).

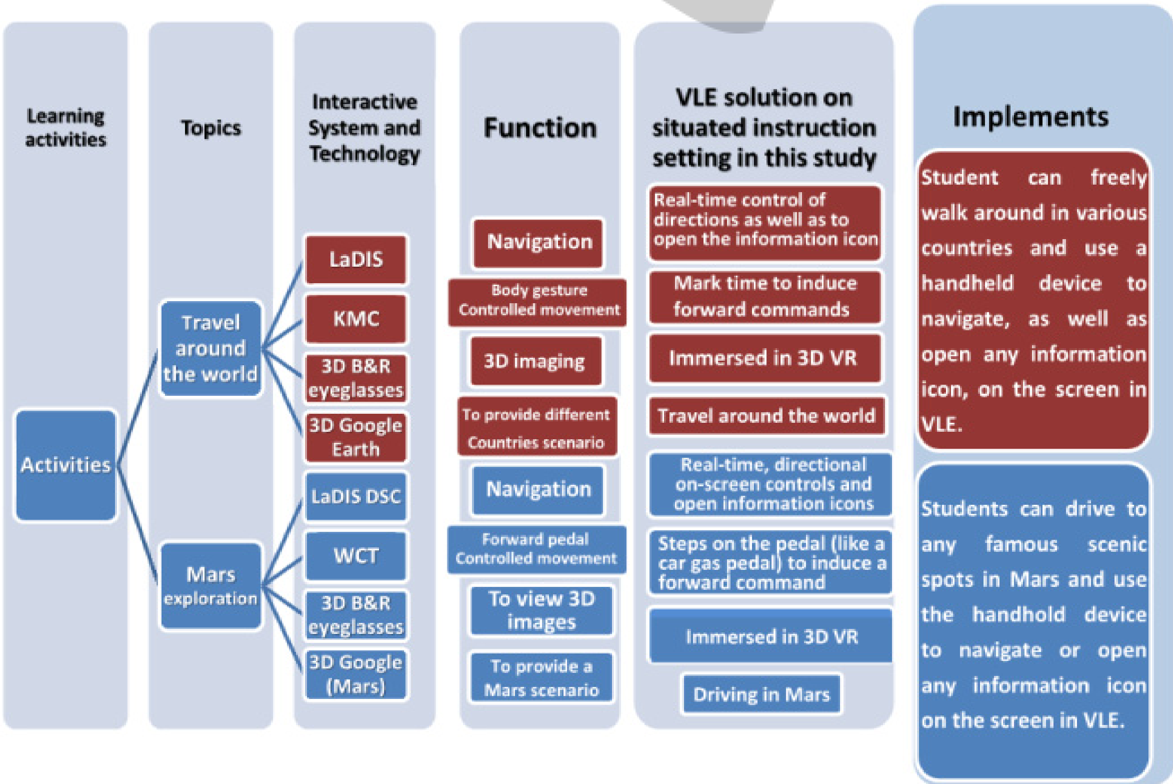

Figure 6: The framework of this innovative teaching tool can enable teachers to use and apply VLE into any classroom.

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4 CONCLUSIONS

The effect of the proposed interactive system that incorporates 3D Google Earth into VLE may be summarized as the follows: 1) With a projector, screen, PC, LaDIS, KMC, WCT, 3D Google Earth and B&R 3D eyeglasses it is easy to show VLE interactive system in any classroom. 2) The proposed VLE system provides a viable, efficient and economical VLE educational system. 3) Most students are highly satisfied with, the system and willing to use, this form of VLE interactive system because of its naturally superior interactive performance in classes. Further studies must be conducted to verify the advantage or disadvantage of innovative VLE interactive system in different perspectives. Moreover, research to explore what subjects are suitable to adopt the innovation of VLE interactive system is recommended.

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