Design and Development of a MUVE for a Distance Education Course in Philippine History[1]

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Abstract

T*he project explores the design and development of a Multi-User Virtual Environment (MUVE) for a distance education course in Philippine history. It seeks to find out what affordable learning actions and constraints MUVEs provide history teachers; and what design and development approaches are available to distance education teachers with scant resources.*

At the time of this project there was no available off the shelf game for teaching Philippine history. In addition there is little study on courses as MUVEs in distance education. The project hopes to address these concerns.

Open Simulator, a MUVE software was used to create a historical themed virtual world. Formative research methods were adopted in the design and development of the virtual world.

It has been found that the virtual world affords the adoption of a wide range of learning theories and methods. It has also been found that teachers may impose a minimal amount of instructional scaffolding through quests and placement of virtual objects.

In conclusion, series of steps and guidelines are suggested for developing virtual worlds. It is recommended that teachers exploit the tools of the MUVE for collaborative design and development as well as the production of reusable virtual world archives.

Sub-theme #4: *Future Directions, Spaces and Possibilities in OdeL*
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Introduction

Game-based learning (GBL) is an emerging technology "likely to have considerable impact on teaching, learning, and creative inquiry within higher education" in two to three years (*NMC horizon project preview, 2012 higher education edition*, n.d.).

Advocates promise GBL will develop teambuilding skills, allow the simulation of difficult situations, and can be used to teach cross-curricular concepts (*NMC horizon project preview, 2012 higher education edition*, n.d.). Furthermore it is claimed to motivate learning among students (Malone & Lepper, 1987). But some studies found that motivation by games is neither universal nor automatic. (Squire, 2004; Whitton, 2007)

Different game genres afford different learning actions for learners. This paper focuses on the genre Multi-User Virtual Environment (MUVE) and the concept of "affordable action" which I derived from affordance theory (see Gibson, 1986). Affordable actions are the *relations between patterns in*

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1 This paper is based on my special project for a master's degree entitled "*Exploratory approaches to the design and development of a game for a distance education course in Philippine history"* (2011), completed at the University of the Philippines Open University. I am indebted to my adviser, Prof. Patricia B. Arinto for her guidance.

the environment and patterns in the behaviour of agents (see Chemero, 2003). In MUVEs ***affordable learning actions are relations between features of the virtual world and the abilities of the learners as players***. With this perspective we can design an environment that affords learning and at the same time teaches the students ways to enhance their abilities to recognize and exploit the features of the environment for learning.

In 1999 Michelle Dickey did a study on the application of the MUVE Active Worlds in two DE courses. According to Dickey (1999), MUVEs afford educational opportunities that are difficult to achieve in real world classrooms and some forms of distance education such as web-based and one-way video. She highlights two ways by which learners can learn from MUVEs: experiential learning and collaborative learning.

Barriers to Adoption

MUVEs may be enticing to adopt but teachers and course designers generally lack the experience needed to integrate games in their courses (Klopfer, Osterweil, & Salen, 2009, p. 18). In addition the development cost of games is too high for educational institutions[2] (Becker, 2008, p. 94; Klopfer, Osterweil, & Salen, 2009, p. 19). Commercial off-the-shelf games (COTS) may be used but they are not always available for particular topics. For instance, there are commercial games for European history but there is none for Philippine history.

Therefore this project explores the design and development of a MUVE for a distance education course in Philippine history. It seeks to find out what affordable learning actions and constraints MUVEs provide history teachers; and what design and development approaches are available to distance education teachers with scant resources.

Design

This project adopted the formative research method. Reigeluth and Frick (1999) define formative research as "a kind of … action research that is intended to improve design theory for designing instructional practices or processes." The type of formative research applied is a "designed case" wherein the design theory is intentionally instantiated by the researcher. The assumption of formative research is that if there is a weakness in the instantiated case, then there is a weakness in the design theory. Furthermore, any improvement of the case is assumed to be an improvement of the theory. Development of the design theory is iterative.

I initially followed William Watson's *Games for Activating Thematic Engagement* (GATE) instructional design theory because he developed it on a shoestring budget with a single developer (2007).

The first method of GATE is to "develop a context, problem space, or world of experience and a supporting implementation structure" (Watson, 2007, p. 42). Thus design documents and a syllabus were written. Then themes were identified from the syllabus. The theme socio-economy of the sugar industry in the 19th century was designed into a quest.

By this time I abandoned GATE due to limited time and a lack of access to distance education

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2 Austin Grossman said that "In the year 2000, an average game published by a major game publisher cost $5–10 million to develop, required 1–3 years in development time and a team of 10–50 developers and artists..." (2003, p. x).

learners. The case was scaled down to a single lesson in one period in Philippine history.

The MUVE was divided into three areas. This includes an orientation area for briefing, debriefing and general class work (Fig. 1); a role-playing area (Fig. 2); and a sandbox area for student created content.

Figure 1: Orientation Area

Briefing and debriefing activities were designed to help students link experiences gained from the quest with information from history texts.

Figure 2: Role Playing Area

Development

Software. Free and opensource software was used. Open Simulator is the MUVE server and modified versions of the Second Life Viewer are the client. Development was done in an offline personal computer.

Additional software applications were installed when needed. An example is the Sloodle plug-in for the Moodle LMS which was able to provide learning tools like presenters, quiz, and student tracking.

Asset Development. Game assets include 3D objects, sound, animation, scripts, etc. When the game server was installed it had only an island and sea as shown in Figure 3 below. Based on historical photo references, a list of assets was drawn up for scenes. A *pueblo* scene for instance would have nipa huts and the Escolta scene would have shops.

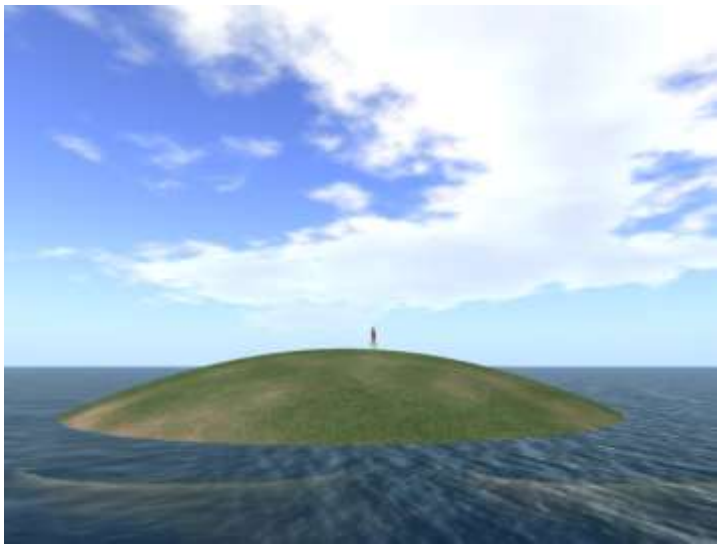

Figure 3: Default OpenSim World

Whenever possible, free and reusable assets available online were used.

Character Development. In a DE environment students may be in different time zones. Non-

Figure 4: Avatars

Player Characters (NPC) were created to provide quests and information while the teacher is offline.

Quest Development. The NPCs were programmed such that when they are clicked they would give an errand and point the player to the next NPC. The NPCs were strategically located in the virtual world to encourage students to explore the world.

Development of Briefing, Debriefing and Assessment Activities. Terrain was modified. For instance, a mountain was created to separate the orientation area from the first role playing area so

that players will not get ahead of themselves and avoid the briefing. The briefing and debriefing sessions could be conducted by the teacher on an avatar-to-avatar meeting or asynchronously with interaction tools provided. Assessment would be done on the output of the debriefing.

The prototype virtual world was then packaged as an archive called OAR to be uploaded to an online MUVE server for testing and evaluation.

Discussion

The affordable learning actions found in the designed case is compared to the educational affordances of MUVEs based on Hollins and Robbins (2008) and the broader concept of 3-D Virtual Learning Environments (includes non-multiuser 3D virtual simulations and games) from Dalgarno and Lee (2010) in the table below. I have reinterpreted the affordances from these papers into the ____+ **able** formulation (e.g. sitable) found in the examples given by Gibson (1986).

Table 1
Comparison of Affordable Learning Actions

MUVE (Hollins & Robbins, 2008)	**3-D VLE (Dalgarno & Lee, 2010)**	**Is it afforded in the designed case?**
Changeable virtual identities		Yes. Customisable avatars can be seen from the variety of NPCs that were created with the tools available to all players. It would afford the role playing of historical characters.
Creatable, changeable and explorable space	Able to interact with objects in virtual space.	Yes. Prims or primitive shapes like cubes and spheres were customised to form buildings, vehicles, furniture etc. that the avatars may touch, wear and modify. Terrain may be modified to form mountains, rivers, plains etc. But these abilities may be disabled by administrators.
	Able to model the real world. Contextualisable learning. Context is provided by unique avatars situated in a unique virtual “place”. Context is made richer by spatial and non-verbal cues.	Yes. In addition to the above the simulated physics allow avatars and objects to occupy a unique space. Simulated climate and lighting creates an illusion of a self contained world.
	Able to motivate and engage. Able to support games and narratives.	Motivation and engagement is unknown pending user testing. But the prototype shows that it is possible to create simple mini games like quests with a background story.
Changeable pedagogy.	Able to practise skills that are expensive or dangerous in the real world.	Yes. The affordable learning actions above allow the reconstruction of the past. It supports various pedagogies. As an example

MUVE (Hollins & Robbins, 2008)	**3-D VLE (Dalgarno & Lee, 2010)**	**Is it afforded in the designed case?**
	Reifiable abstract concepts.	social constructivism may be supported by collaborative manipulation of digital objects and communication tools. The virtual world may also be used for traditional lectures using voice and virtual presenters.
Able to use varied tools like scriptable objects, tradeable items, and communication tools.		Yes. Communication tools are available to learners through text-based and/or voice chat. But scripts and virtual currencies depends on the facilities enabled by the administrator. Specific learning tools like Sloodle are freely available that provide learners the use of Moodle modules such as quizzes, glossaries, and presentations. A built in browser allow learners to access any web based historical resource.
Able to collaborate and network socially.	In 3-D multiuser VLEs learners are able to collaborate through simultaneous manipulation of virtual artefacts and exploration of the virtual world.	Plausible. Virtual places and identities are persistent i.e. leaving the MUVE does not erase information about the avatar and delete changes made in the virtual world. Multiplayer facilities like groups and the communication tools above support communication among simultaneously logged learners.

Teachers may impose a minimal amount of constraint on the learning path through virtual objects that serve as obstacles. Items may be hidden from view (to delay use) or pointed out by NPCs. These constraints may help scaffold the game experience of novice players who are unfamiliar with the 3D environment and highlight the affordable actions. But the learner is also allowed to stray from this path and choose among various "next steps" (Becker, 2008, p.102).

This designed case was done by a single developer using scant personal funds. Therefore distance education institutions should be able to implement their own design cases and improve the design theory and development process described above.

This project produced a shareable and reusable virtual world for teachers and learners of history in a distance education setting. The OAR of the prototype may be shared online with other institutions. This affords the collaborative development of shared virtual worlds among DE institutions. It is also possible for institutions to hot swap virtual worlds using a single MUVE region. That is, unused worlds may be archived and stored when not needed and replaced by other worlds immediately needed in courses. In this way the institution will be able to maximise the use of the MUVE.

The prototype game is currently implemented on the MUVE grid Osgrid for testing and evaluation.

References

Becker, K. (2008, January). *The invention of good games: Understanding learning design in commercial video games.* Unpublished doctoral dissertation, University of Calgary, Alberta, Canada. Retrieved May 19, 2010, from http://www.minkhollow.ca/becker/papers/becker_thesis.pdf.

Cantada, R.P. (2011). *Exploratory approaches to the design and development of a game for a distance education course in Philippine history.* Unpublished master's special project. University of the Philippines Open University. Retrieved January 14, 2012, from http://www.mediafire.com/file/ei3fb2b9haja388/CantadaProjectReportEbook.pdf.

Chemero, A. (2003). An outline of a theory of affordances. *Ecological Psychology*, 15(2), 181- 195.

Dalgarno, B., & Lee, M.J.W. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, 41(1): 10-32.

Gibson, J.J. (1986). *The ecological approach to visual perception.* USA: Taylor & Francis.

Hollins, P., & Robbins, S. (2008). The educational affordances of multi user virtual environments (MUVE). In *ReLIVE 08, Researching learning in virtual environments*. The Open University: 172-180. Retrieved January 8, 2012, from http://www.open.ac.uk/relive08/documents/ReLIVE08_conference_proceedings_Lo.pdf.

Klopfer, E., Osterweil, S., & Salen, K. (2009). *Moving learning games forward. Obstacles, opportunities & openness.* The Education Arcade, Massachusetts Institute of Technology. Retrieved January 22, 2010, from http://education.mit.edu/papers/MovingLearningGamesForward_EdArcade.pdf.

Malone, T. W., & Lepper, M. R. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R. E. Snow & M. J. Farr (Eds.), *Aptitude, learning and instruction III: Cognitive and affective process analysis* (pp. 223-253). Hillsdale, NJ: Lawrence Erlbaum.

NMC horizon project preview, 2012 higher education edition. (n.d.). Retrieved January 7, 2012 from http://horizon.wiki.nmc.org/file/view/2012-Horizon.HE-Preview.pdf.

Reigeluth, C. M., & Frick, T. W. (1999). Formative research: A methodology for creating and improving design theories. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory* (pp. 633-651). Mahwah, New Jersey: Lawrence-Erlbaum Associates.

Squire, K.D. (2004). *Replaying history: Learning world history through playing Civilization III.* Unpublished doctoral dissertation, Indiana University. Retrieved January 22, 2010, from http://website.education.wisc.edu/kdsquire/dissertation.html.

Watson, W.R. (2007, August). *Formative research on an instructional design theory for educational video games.* Unpublished doctoral dissertation, Indiana University. Retrieved May, 25, 2010, from http://www.indiana.edu/~syschang/decatur/documents2/formative_resrch_isd-theory_edvideogames.pdf.

Whitton, N.J. (2007). *An investigation into the potential of collaborative computer game-based learning in Higher Education.* Unpublished doctoral thesis, Napier University. Retrieved November 7, 2011, from http://researchrepository.napier.ac.uk/4281/ .