Kemp, J. and Livingstone, D. 2006. Putting A Second Life 'Metaverse' Skin On Learning Management Systems. In: Livingstone, D. and Kemp, J. eds. Proceedings of the Second Life Education Workshop at SLCC. San Francisco, pp. 13–18.

PUTTING A SECOND LIFE "METAVERSE" SKIN ON LEARNING MANAGEMENT SYSTEMS

Jeremy Kemp,
eCampus,
San Jose State University
jkemp@cemail.sjsu.edu
SL: Jeremy Kabumpo

Daniel Livingstone,
School of Computing
University of Paisley
daniel.livingstone@paisley.ac.uk
SL: Buddy Sprocket

Abstract

This paper outlines the advantages and weaknesses of Multi-User Virtual Environments for teaching and explores the possible benefits of integrating them closely with traditional Learning Management Systems. We present survey findings of teachers interested in using the Second Life MUVE for teaching. The teachers gave us their opinions about integrating SL and LMS in their classrooms. We finally propose technical methods for creating hybrid systems combining elements of both MUVE and traditional LMS systems for use in teaching. The hybrid system uses the Moodle open source system and Second Life's connectivity features to mirror web-based classrooms with in-world learning spaces and interactive objects. We suggest that further work may help suggest the most suitable educational applications for these hybrid systems.

Introduction

Faculty who offer web-based instruction and resources have become very familiar with the likes of WebCT, Blackboard, Moodle and other Learning Management Systems, or LMS. Rather than wasting time learning the technical craft of Web design, they rely on templates and simple forms to create interactive web-based class environments.

These environments offer affordances beyond simple document repositories, by featuring discussion forums, online chatrooms, gradebooks and the ability to give automatically marked tests such as multiple choice questionnaires.

LMS often include a variety of means for communication between staff and students, but they are perhaps most commonly used as document repositories (Livingstone and Kemp 2006). This enables flexible access to course materials – on and off campus with the security of password-controlled access. More adept faculty employ the fuller range of communication tools including discussion forums, synchronous chat, assignment file drop-boxes, self scoring quizzes and grade books.

For the most part, the educational content is stored in static documents – copies of Powerpoint slides and Word documents. Assessment and interactive features are used more sparingly. It is clear that the full potential for interactive learning support is not being reached in the main. There is relatively little use of multi-media – and indeed these VLE's do not readily support the creation of multi-media content. But richer multi-media presentations supporting learning of 'hard' topics has long been known to have value in student learning (Laurillard, 1997).

Second Life overview

Teachers and university administrators are experimenting with a new form of virtual learning environment with some basic similarities to LMS but offering radically different affordances. The Second Life, SL, system by Linden Lab is a persistent 3D world, or "metaverse". Users access the online system with a proprietary client and interact with content and other "residents." Unique features include simple tools for constructing 3D objects and scripting tools for interactive content - including connectivity with external web-pages and internet resources. SL improves on its predecessors in several key ways.

First, the SL platform is completely free of a publisher-imposed narrative. Unlike thematic MMORPG games such as *World of Warcraft*, SL has no plotline or setting. Teachers have freedom to weave their own metaphors and build domain-specific settings in 3D environments. Currently, education designers in SL create all manner of classrooms, lecture halls and campus landmarks. For example, New York Law School created a "Democracy Island" complete with a Supreme Court building and miniature models of urban neighbourhoods. These cityscapes were proposed as a way to meet public review requirements for city planning (Democracy Design Workshop 2006).

Secondly, SL offers very simple tools for modifying or "modding" content. Users build items with a limited palette of primitive objects "prims" including cubes, spheres, cones, etc. Simple menus allow users to adjust the size of the objects and to map images on their surface. For-profit designers do a brisk business in virtual furniture and pre-fabricated structures such as one-room school houses, office desks, decorative seats and interactive bookshelves.

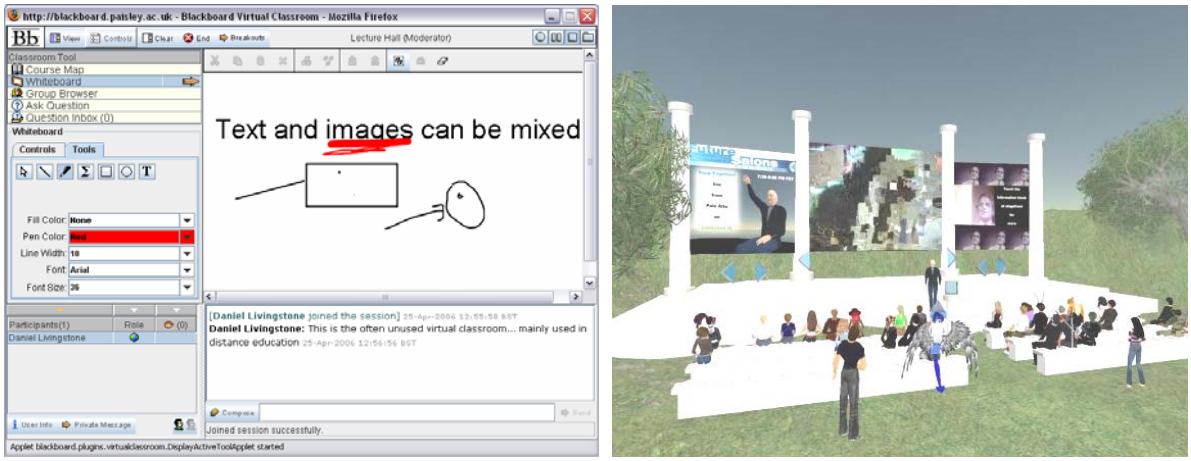

Figure 1. Interactive classroom settings in traditional LMS and Second Life.
Source: http://www.sluniverse.com/pics/pic.aspx?id=50270

Finally, amateur programmers create complex interactive applications in the proprietary Linden Scripting Language (LSL). They design objects that react intelligently to touch - making virtual "manipulatives" helpful for instruction (Resnick, 1998). For example, physics professor Anthony Crider at Elon University created a telescope trainer that teaches students the proper order for adjusting focus knobs on a real telescope (Crider, 2006). Objects respond in text chat to chatted commands allowing rudimentary teaching "agents" which answer questions and dispense domain content similarly to Harvard's River City MUVE project. (Dede, 2005). One object can even be programmed to move independently and control other items to create complex, multi-step building tools.

Objects can also send data to Web-based systems outside SL using the hyper-text transfer protocol (http). This data conduit is unique among all MUVE systems and opens immense opportunities for creating powerful connected learning applications.

While the features that already exist in LMS are not generally used to their fullest, they nicely fill in some of the current weaknesses of *SL* as a learning platform.

SL vs. LMS: Round 1

Many papers highlight benefits of learning within 3D worlds where students are embodied as avatars. For example, a review of two distance learning projects using Active Worlds is presented in Dickey (2005), concluding that the 3D immersive format has significant potential for "facilitating collaborations, community and experiential learning" and highlighting the situated embodied nature of the learning as a particular strength. A more speculative look at the future potential of 3D learning environments, albeit grounded in much prior practical experience, is presented in Dede (2004). Also see Antonacci & Modaress (2005).

As with the hypothetical example of Dede (2004), SL provides a sense of embodiment, yet one in which normal barriers between students and staff can be broken down as in Robbins (2006) concept of image slippage. Compared to other electronic tools for distance communication, there can be an improved sense of being 'there' in a classroom, rather than of being a disembodied observer, Figure 1.

Rich 3D demonstration models can be built in SL – leveraging the power of modern computers to allow students to *experience* phenomena of interest. The acknowledged power of multi-media to improve delivery of material over purely written means, (Laurillard, 1997), is worth exploiting – and SL makes this quite feasible, even for faculty with only modest scripting and modelling skills.

So, in terms of enhancing the experience of learning, it seems clear that SL should have some distinct advantages over traditional LMS. It also has some clear disadvantages.

SL vs. LMS: Round 2

If it is a weakness of LMS that they are often used only as document repositories, it is certainly the case that *MUVEs* including SL are very poor document repositories. The note cards used with SL are simple text documents which can support only very limited formatting. The documents which can be generated are essentially simple ASCII texts with embedded objects which require clicking on to view or open. Transferring documents between SL and desktop OS is also less straightforward than with LMS – generally requiring cut-and-paste.

SL developers have created PowerPoint-style presentations tools which require presenters to upload

each individual slide as a separate image – either to *Second Life* itself or to a web site such as *Flickr* (Metalab 2006).

Several other issues cause concern for the nascent community for educators. First, *SL* makes considerable hardware demands. The minimum technical requirements are beyond the capabilities of typical labs in most schools and colleges – particularly with regards to graphics cards. Some teachers must find secretly sympathetic technology administrators who accommodate their special needs (Delwiche 2003). This issue is exacerbated somewhat by a constant call for visual improvements from users with heightened expectations from the latest video game offerings. Linden Lab designers are tasked with serving an extremely heterogenous user base. Users range from game designers recreating traditional MMORPGs (Solvang 2006) to Barry Joseph's Global Kids (2006) youth program educating underserved communities.

Educators often raise the important topic of improving access for visually impaired students. Aside from the problems of navigating a 3D world, even the chat is inaccessible – the user-interface currently does not work with any screen-readers. For students with less severe visual-impairments, the ability to modify the user interface – to change colours and fonts to less stylish but more readable settings – would be a step in the right direction. Linden Lab promises to move toward a more flexible interface.

Disruptive players present another problem. For classes held in publicly accessible areas, these 'griefers' may interfere with classes and negatively impact the student experience such as paintballing the instructor (Kemp 2006). The virtual harm inflicted in many griefing incidents can cause very real distress (c.f. the well known incident reported in Dibbell, 1993).

Of these, only the issue of access for visually impaired students will concern users of LMS – and these students at least may rely on screen readers to some degree.

SL with LMS

Each platform offers complimantary affordances not available in the other. Connecting the two systems may allow instructional developers and teachers to explore exciting new opportunities for interaction on the Web and within the SL Multi-User Virtual Environment. It makes sense then to progress past the mindset of *SL* "vs." LMS, to the interconnection of the two - *SL* "with" LMS. We also want to avoid using *SL* as a weak rendition of LMS for document management or to continue using legacy Web learning systems by themselves with less interactivity and student engagement.

Survey Results

We recently completed a survey to better understand needs and desires for integrating both types of system for educators.

There are two distinct directions in which to progress this work. Moodle, or similar, can be modified to link or refer to SL. For example, using the Map API it might be possible to have links to SL locations, with maps, shown inside the LMS. LMS content generally allows HTML formatting, but not scripting, to be embedded in pages – thus a custom resource or similar would need to be developed.

Secondly, developers may put content, or links to LMS content, into *SL*.

We surveyed educators interested in using Second Life in their teaching to help determine whether these efforts would be worthwhile. To reach educators, a post was made to the Second Life Education mailing list and 27 educators responded. All respondents were able to exit the survey at any time or skip any question. A number of the questions were of general interest (showing, for example, that 80% of respondents had been active in SL for less than one year), while other questions were focused on questions relating to integrating SL and LMS. As it was possible to skip questions, for each of the findings we include details of the number of respondents that answered that particular question.

Asked which LMS they used, there was an equal split between Blackboard, WebCT, Moodle and 'Other', with 35% not using LMS at all (n=23).

Asked to compare aspects of SL and LMS environments, (n=16), 94% felt that SL was 'slightly better' or 'best' for synchronous chat, and 85% felt the same for live presentations or classes. Unsurprisingly, these opinions were reversed for features such as document storage, asynchronous discussion (e.g. forums) or grade-book support.

86% (n=22) thought integrating SL and LMS would be moderately, very or extremely useful. A final question asked what features of an integrated system would respondents find most useful, and allowed up to four choices to be selected (n=21). The most requested features, and number of times the feature was requested, were:

- Link to SL locations from inside LMS (e.g. SL Map API) (15)
- Broadcast LMS announcements in SL (13)

- Access assignment handouts from SL & LMS (13)
- Display text information from LMS in SL (13)
- Log of student time in SL sent to LMS (11)

Other requested features included linking live chat in SL and LMS, or allowing assignment submission in both, or accessing LMS forums from SL.

Sloodle

While the survey size was small, it was focussed very tightly on educators using – or planning to use – Second Life in their teaching. As such, we feel that the findings do illustrate genuine interest in SL/LMS integration, and provide motivation for designing and prototyping different integrated systems. The system we propose will integrate the Open Source Moodle LMS with SL, and which we call *Sloodle*.

Platform Layers

In thinking through the possible integration of these systems, it is helpful to consider them in the framework of "three tier" architecture (Wikipedia, 2006). Most modern Web-based teaching systems comprise three parts separated into the "layers" of data, logic and presentation.

The data layer includes passwords, pointers to assignment files, logs of interactions such as threaded messages and chat transcripts. It also includes guidelines for page designs and how static materials are arranged for viewing. LMS systems store this raw information in databases such as MySQL (Moodle) or Oracle (Blackboard Vista).

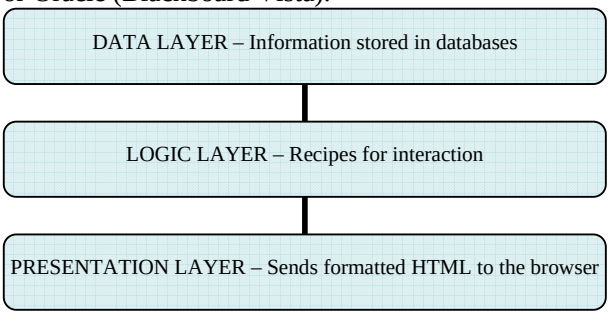

Figure 2. Typical three-tier architecture of an LMS

Logic is the second tier or layer in these systems. This layer implements interactive functions such as restricting access to materials, calculating grades, and multi-step operations such as quizzes and assignments. In the Moodle LMS system which we are currently working with, this layer is implemented using PHP. The final, presentation, layer delivers HTML code to the user combining images, static content and layout.

SL applications coded inside the environment may also be seen in this structure. Data is stored on notecards or chatted into the applications. For instance, museum owners set up "tour bot" agents that greet guests and take them on a pre-determined track with descriptions of the exhibits. The stopping points and text for the descriptions sit inside the "bots" as notcards. Logic is implemented using LSL, the presentation layer in 3D interactive objects.

Possibilities for interoperability

Now we take these three layers and see what areas lend themselves to interoperability. How will the two systems work together?

The logic layer for Moodle requires some minor adjustments to remove HTML formatting and to map the data onto the new interfaces offered in the SL environment. The SL logic layer mostly handles passthrough of data to the web-based database. Linden Lab limits access through this portal to a few times each minute so that real-time interaction is difficult. Thus, LSL scripting will be required to buffer data.

The presentation layer is the most interesting and holds the greatest potential for innovation. We think developers will be very active creating new ways to present previously web-delivered class information. Ubiquitous functions such as threaded messaging may be used in completely novel ways in this new setting where 3D metaphorical objects are generated automatically. Will artists create giant oak trees, each branch representing a thread of conversation? Or, as has often been the case, will fanciful interfaces be wittled down to bare-bones functionality, enabling students and their teachers to focus directly on the content being discussed?

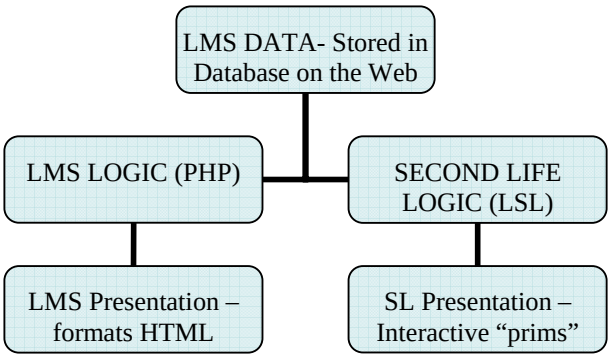

Figure 3. Three-tier architecture of a combined LMS-SL tool

Some features would only require changes to the LMS – such as adding resources which would allow the SL Map API (Second Life, 2006) to work inside Moodle. However, we would like to propose a set of tools to give access to Moodle resources from inside SL, and

to attempt to make effective and interesting use of the 3D space – otherwise why not simply open Moodle in a separate web-browser?

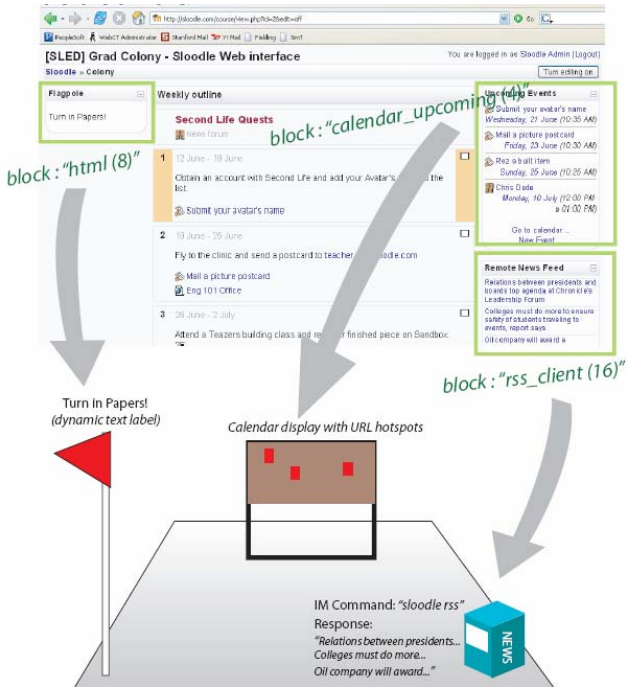

Figure 4. Sloodle will reflect the 2D page design in Moodle in a 3D 'office' space in SL

There are very many possible uses for this, but we propose a very simple example of this system at work. Our plan is that a standard-sized 512m^2 "office" in SL that reflects in 3D the Moodle page structure, Figure 4. This will be instantiated, or "rezzed", automatically based on blocks visible in the Moodle class. Each tool displayed in the Moodle class is re-created as interactive, metaphorical objects or "furnishings."

For example, notices in Moodle may be appear as flagpoles with text labels – providing clear visual cues to important new content. Calendar information may be rendered as a wall display, while real simple syndication "RSS" feeds appear in the form of radios or teletype machines. Interacting with any of these elements results in loading an appropriate URL or sending an IM text message to the user. Figure 5. shows three configurations of a Moodle class page along the top row and the corresponding SL office layouts below. The first column shows a calendar block on the left column and the flagpole on the opposite column announcing "Essays due now!" The reader board in SL shows the text included in the Moodle HTML block. The flagpole is down in the middle example, while the calendar and flagpole have shifted on the page and the RSS block is showing. The final column shows another flagpole announcement and the three blocks in their new positions.

Backend Functionality

The current prototype implementation uses "Sloodle distillers" loaded in PHP on the Moodle server. When the *Second Life* Sloodle objects are used, these use HTTP requests to PHP pages which then access the Moodle database. They output simplified, non HTML data that can be gathered by LSL scripts in-world.

It is hoped that as faculty re-arrange blocks in the Moodle shell, the office furnishings layout should change as well to mirror this. This repositioning might be either automatic or upon a "Sloodle reset" command chatted by the faculty member's avatar.

Conclusions

While previous work highlighted the distinct differences between SL and LMS, our subsequent investigations have identified a strong interest in

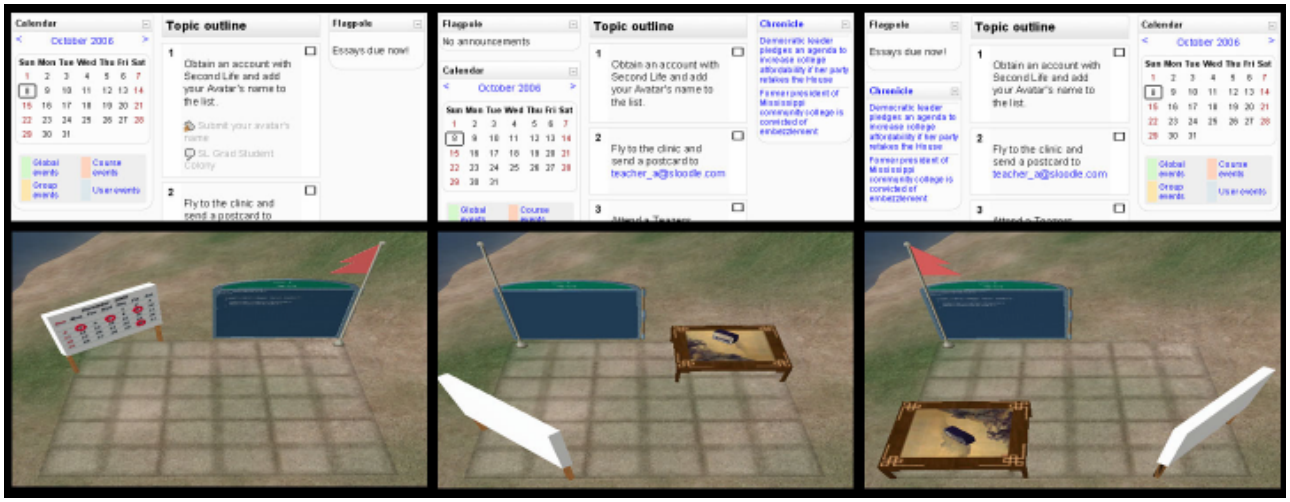

Figure 5. Moodle class page designs on the top row show calendar, flagpole (html) and RSS blocks. Corresponding layouts in SL show how 3D items reflect the Moodle design.

integrating these systems. We argue that any such integration should avoid merely presenting a weak LMS interface inside of SL, but should rather attempt to build something innovative that might lead to richer forms of interaction. Finally, we discussed how such integration may be achieved, and detailed our initial work in this area. While much remains to be done, we are confident that this will be a productive area of activity – and only time will tell what exciting shapes the flat worlds of LMS are transformed into when they become fully realised in three dimensions.

References

Antonacci, D., Modaress, N. (2005) Second Life: The Educational Possibilities of Massively Multiplayer Virtual Worlds (MMVW), EDUCAUSE Western Regional Conference, April 26, 2005, San Francisco, CA. http://www2.kumc.edu/netlearning/SLEDUCAUSESW2005/SLPresentationOutline.htm (accessed August 2006)

Crider, M. (2006). "Living and Learning in Second Life: A Firsthand Exploration and Tour of a User-Created Virtual World." Games, Learning, and Society Conference. Madison, WI, July 2006. http://homepage.mac.com/acrider/SL/SpaceportAlphaTalk-SV3.mov (October 2006)

Dede, C. (2004). "Enabling Distributed Learning Communities Via Emerging Technologies - Part One." T.H.E. Journal (September).

Dede, C., et al. (2005). "Fostering Motivation, Learning, and Transfer in Multi-User Virtual Environments." Paper presented at the American Education Research Association, Montreal. http://muve.gse.harvard.edu/muvees2003/documents/Dede_Games_Symposium_AERA_2005.pdf (last accessed October 2006)

Delwiche, A. (2003). MMORPG's in the College Classroom. *The State of Play: Law, Games and Virtual Worlds*. New York Law School, November 2003. http://www.nyls.edu/docs/delwiche.pdf (last accessed October 2006)

Dibbell, Julian. "A Rape in Cyberspace." The Village Voice 21 Dec 1993.

Dickey, M. D. (2005). "Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education." British Journal of Educational Technology **36**(3): 439-451.

Democracy Design Workshop (2006) http://dotank.nyls.edu/DemocracyIsland.html (accessed October 2006)

Global Kids. (2006) http://www.globalkids.org/olp/ (accessed October 2006)

Kemp, J. (2006) "There: Fading platform offers good chat tools." [Weblog entry.] From where I hover…. http://www.simteach.com/blog/?p=16/ (accessed October 2006)

Livingstone, D. and J. Kemp (2006). "Massively multi-learner: recent advances in 3D social environments." Computing and Information Systems Journal, School of Computing, University of Paisley 10(2).

Laurillard, Diana (1997) Learning Formal Representations through Multimedia, in The Experience of Learning, Marton, Hounsell & Entwistle (eds), 2nd Edition, Scottish Academic Press

Metalab (2006), http://metalab.blogspot.com/2006/06/communal-whiteboard.html (accessed October 2006)

Resnick M. et al. (1998) Digital manipulatives: New toys to think with. Proceeding of CHI 1998. http://llk.media.mit.edu/papers/dig-manip (accessed October 2006)

Robbins, S. (2006) "Image Slippage: Navigating the Dichotomies of an Academic Identity in a Non-Academic Virtual World." *Education Workshop at the Second Life Community Convention.* San Francisco, August 2006.

Second Life (2006), http://secondlife.com/developers/mapapi/ (accessed August 2006)

SimTeach (2006a) http://www.simteach.com/wiki/ (accessed August 2006)

SimTeach (2006b) http://simteach.com/moodle (accessed August 2006)

Solvang, J. (2006) Dark Life in Second Life. Way Out There Radio. http://www.wayoutthere.net/GameReports/DarkLife.html/

Wikipedia (2006), http://en.wikipedia.org/wiki/Three-tier_%28computing%29 (accessed October 2006)

Authors Note

Daniel Livingstone teaches computer game development at the University of Paisley. Research interests cover ALife, Game AI and teaching and learning with game technology.

Jeremy Kemp has coordinated online communities since 1998 and taught Web-based distance learning courses at the university level, starting in 1999. As a research assistant for Stanford University's medical school in 2001, he created Flash simulations for radiation therapy further education. Contact: jkemp@simteach.com.