# Using Machinima Documentary and Virtual Environments to Reinvigorate Students' Learning in Systems Development

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## Abstract:

*Inspired by the success of the Students @ Work project (Reiners et al., 2008) run at Hamburg University, Curtin University (Perth, Western Australia) has recently concluded the running of a pilot course in Second Life with their Information Systems Project (ISP) management students. The need for a change was evident as student motivation and engagement in the Final Year Project Management course was strikingly low. Left with such a tall order for improvement, the ISP teaching staff looked to find suitable options for change. Staff combined a number of new and interesting tools in an effort to boost and maintain student interest: these tools include the Second Life virtual environment and a new filmmaking technique known as Machinima.*

## 1 Introduction

In recent years, along with the downturn in popularity of Information Systems courses, the authors have been experiencing a drop in student motivation in the final year systems development course. Students were unmotivated, lacking in commitment to engage in learning experiences and as a result, were not performing in their project tasks or demonstrating retention of new knowledge.

Adopting a constructivist approach, teaching staff have redesigned the third year Information Systems Project (ISP) to use a business case set up in a virtual world and have students engaged in analysing, designing, implementing, testing, and documenting business processes. Students use the features provided in the virtual world Second Life, including programming in Linden Scripting Language (LSL), and interoperating with other useful web based tools and environments.

In order to document their achievements students make a Machinima documentary that describes the business case and depicts the solution artefacts actually being used by in-world avatars.

A final stage of learning involves reflection upon coursework by presenting and reviewing the Machinima in a forum of peers and discussing the shortcomings and improvements that could be made.

# 2   A multi-faceted lack of learner motivation

The final year ISP course in the Bachelor of Commerce (Information Systems) programme is designed to allow students to demonstrate, in a real world situation and working on a real business case, their amalgamation of knowledge and skills gained in the area of Information Systems Design and Development during the previous two years of their Bachelor programme. Previously, student projects in this course were situated in real world business cases that students needed to find either via their own contacts, or were selected from a small set of pre-arranged business problems. The main objectives of the course were: to provide students with a real world systems development project with a business client, so that upon graduation they will have an understanding of the systems development process as practised in today's business and technical environment, and be able to point to a successful systems project in which they have been involved; to develop the ability to apply technical, managerial, and interpersonal and communication skills to a realistic, moderately complex system development project implemented on a team basis; and, to be able to synthesize and integrate information systems, systems analysis and systems design in the development of computer based information systems.

Despite expectations of enthusiastic engagement with these rich learning opportunities, students gradually lost intrinsic motivation to work on their projects. The lack of motivation was the result of several contributing factors that were both observed by teaching staff and articulated by students via course evaluation surveys.

## 2.1   Testimonial and observational understandings

The most pertinent of these factors included: the expectations of the business owner clients whom students were working with in their real business cases – the justifiably high expectations of business owners (naturally wanting the very best for their businesses) consistently surpassed students' developing abilities. This mismatch had an unavoidably frequent tendency to overwhelm students; a situation often resulting in a loss of intrinsic motivation, leading to low learner self-esteem, compounded by client dissatisfaction with final project outcomes. This was a situation, which frequently lead to a breakdown in communication between students and their clients – a disintegrating relationship that often meant students were unable to critically reflect upon learning outcomes via feedback from their clients, thus undermining the overall learning process and students' understanding of their achievements. Other contributing factors were the number of student group projects and the disparity between them, which made it virtually impossible for teaching staff to stay abreast of individual group progress and effectively guide students in order to assist in their construction and understanding of new knowledge. A final factor amplifying all others was that many students did not wish to engage with the unavoidable programming requirements of these projects; a significant number demonstrated the preference to adopt web-development projects as these were more "fun".

## 2.2   Inspirations from constructivism

From a surface perspective, these demotivating factors can be easily recognised. However, in order to properly understand the lack of motivation and develop an effective alternative method for course delivery, it is necessary to explore the underlying factors. ISP teaching staff, already proponents of the constructivist method of teaching, turned back to the theory in an effort to analyse the course's short comings and find some answers.

It is a necessary component of the ISP course that students are given the opportunity to amalgamate their three years of learning and apply this to a real business case, giving them a

taste of the real world of Business Systems Development. From a surface perspective this seems like a fantastic and motivational opportunity for students to branch out and get noticed in the business community – however, as we have seen, students are pressured by such a situation as they simply do not yet have the skills necessary to function (without guidance and support from senior workers) in a real world business environment and perform to high expectations. If we consider this from a constructivist perspective, it becomes apparent that students, in order to learn most effectively, need staged guidance from an instructor. Vygotsky described this as the learner's zone of proximal development, where it is necessary for learning tasks to be set at a level specific to the learner's abilities – if the task becomes too easy the learner will lose motivation due to boredom, and if the task is too difficult then motivation will be lost due to frustration – staged guidance is necessary in order to maintain motivation and allow for learning to take place (Kozulin, 2003, p. 41).

The range of different student group projects is another demotivating factor which can be understood by Vygotsky's zone of proximal development – if an instructor is unable to stay abreast with student work, then their ability to monitor students' relative zones of proximal development is greatly diminished. This perhaps speaks of the need for less variety between student group projects, an idea which could be met with criticism. However, if the variety were decreased and teacher support then increased as a direct result, arguably the learning benefits could outweigh any advantages that variety offers – especially if the variety of projects is not as a result of student choice but as a result simply of the availability of business clients and their particular needs.

ISP teaching staff were left with the complicated question of how to provide students with real business problems without the mismatch between ability and expectation; and to do this in such a way that would allow teaching staff to keep abreast of student projects progress in order to facilitate suitable guidance – thus positively affecting student motivation.

Above all else, constructivism asserts that learning, regardless of the topic, must be contextualised in such a way that is relevant to the world of the learners. Such teaching material will motive learners because it supports the way in which humans learn most effectively, by linking new information to existing concepts and understandings (Harper & Hedberg, 1997).

It is a given that "Motivation is a key component in learning. Not only is it the case that motivation helps learning, it is essential for learning." (Hein, 1991). Indeed, Oblinger and Oblinger (2005, p. 2.5) suggest that 'Net Generation' learners (aka. Gen Y) are motivated by learning which caters to their generational traits; learning which makes use of visual-spatial skills and allows for inductive discovery (discovery learning or active learning), attentional deployment (ability to shift attention rapidly between tasks) and fast response times (both capable of and expectant of). Therefore it is important to look at the current cohort of students and find clues as to what motivates them so that they might remain engaged with their learning and benefit from these learning experiences.

## 3   Reinvigorating learner motivation with Second Life

It was necessary to find an alternative method of delivery for the ISP unit, one which satisfied the course outcomes and also addressed the factors negatively impacting on student motivation – inspired by the success of the "Students at Work" project at Hamburg University, ISP teaching staff decided to examine Second Life as a viable platform for course delivery.

From theoretical examinations, it was fathomable that Second Life would provide students with all the necessary tools and options to undertake their course requirements and enjoy doing so. A virtual reality that is designed to mimic the real world as closely as possible, Second Life offers many of the same interactive opportunities that are available in the real world. Course delivery in Second Life allows ISP students to fulfil relevant course outcomes: goal-oriented group collaboration; implementing system development methodologies; using system development tools; designing, constructing, testing and implementing a computerised information system; production of a project plan; and, documentation to support implementation and continued use of the computerised information system.

The issue of fading learner self-esteem due to mismatched business owner expectations with students' developing abilities could be addressed through the use of Second Life; here staff have the ability to construct virtual world installations which place students inside simulated business problems that can be targeted to develop their specific skill levels and gaps in knowledge. Such background understanding of student projects will provide staff with a more comprehensive awareness of student progress and the expected outcomes. Coupled with the fact that staff are able to login to Second Life at any time (from on campus or other location) and observe and/or interact with students as they work on their projects (providing greater flexibility in meeting times), there is more opportunity for staff to stay abreast with student progress – thus increasing the effectiveness of guidance and feedback in accordance with a student's zone of proximal development.

Second Life is a dynamic environment rich in visual-spatial stimulation, which by its very nature promotes inductive discovery as it requires learners to explore the world, discovering how to best interact with it, and spend time working with object-oriented scripting blocks in order to construct tools for use in-world, or to interoperate programs and databases from outside the virtual world. In this environment, uniquely suited to the traits of Gen Y learners, scripting (previously a tedious task) becomes a visual-spatial experience where students receive instantaneous visual feedback for their efforts – students will be thinking more about how they can make their object do interesting, impressive and useful things (via programming) rather than the chore and boredom of programming per se.

The volume of raw programming necessary can be significantly reduced. This is largely due to the nature of the Linden Scripting Language (LSL), the programming language used in Second Life. This language is easy to learn and open-source – students are able to find existing applications in Second Life and reuse this code for their own purposes. Many Second Life developers sell (for nominal amounts) and share their code via in-world trading with Linden Dollars (a virtual currency which is exchangeable with real world currencies – roughly LD1000 to USD2.50). When a coded object is bought or shared for free, it comes with a certificate for use – thus representing permission to reuse that code. Restrictions for use (e.g. no modification) can be specified by the creator and applied to the object before it is sold.

## 4   Reinvigorating learner motivation with Machinima

### 4.1   What is Machinima?

Machinima (muh-sheen-eh-mah) is a relatively new, little-known and evolving filmmaking technique – it is an example of 'emergent gameplay', a term used to express the creative use of video game tools. The definition offered by the Academy of Machinima Arts & Science describes Machinima as, "the convergence of filmmaking, animation and game development. Machinima is real-world filmmaking techniques applied within an interactive virtual space

where characters and events can be either controlled by humans, scripts or artificial intelligence." (The Machinima FAQ, 2005). Traditionally the Machinima screen recording technique had been used to create non-narrative based animated game 'walkthroughs' (an alternative to the traditionally text-based forms) – increasingly Machinima is used to create narrative adaptations as well as original narrative scripts situated in unaltered as well as modified game world environments – the Academy of Machinima Arts and Sciences holds a yearly film festival for such creations. Virtual worlds such as Second Life, due to their adaptability and user-friendliness, provide ideal platforms for the production of Machinima.

### 4.2   Benefits of Machinima to ISP students

The major issue of limited student reflection in the IPS course can be creatively addressed via course delivery in Second Life. Through the use of the Machinima screen capturing technique, students document in detail all essential aspects of their projects, thus providing a critically rich, reflective learning experience that is reusable. In this approach to critical reflection, when compared with the more traditional real world setting, there is admittedly a lack of feedback from actual business owners for students to learn from. It is the opinion of this teaching team that the Machinima alternative offers an improved opportunity for critical reflection that caters to the motivational needs of Gen Y learners.

The creation of written system documentation is often seen as a necessary but nevertheless unwelcome task and carried out at the end of system development projects. This approach has two main drawbacks: firstly carrying out this documentation at the end of a project often results in an effort that is largely disconnected from the development stages. By the end of a project students may have forgotten many key decisions that lead to their final information system product. Substituting this written approach with a Machinima documentary sets the parameter that students will need to document footage at key intervals throughout their project creation, thus allowing for ongoing reflection. In their Machinima, ISP students needed to include evidence of: ongoing critical reflection upon information systems project development and decisions made; critical reflection upon final project outcomes; and, a working instructional demonstration of the final computerised information system. This process of using Machinima to encourage staged/continuous reflection provides attentional deployment where students can maintain their motivation by working on more than one task at a time, thus alleviating boredom.

This approach may appear to be an unreasonably time consuming alternative, however, it is in fact ideally suited to project creation within a virtual world environment. By the time of project completion, students have already set up their Machinima stage and characters as an inherent part of developing their information system – the task of capturing footage and editing the Machinima into a final product, if planned prior to undertaking, need not be any more time consuming than developing written documentation. Middleton and Mather (2008) have made similar observations in their study on innovative approaches to Machinima within virtual world curriculum; "If a set is already established the production of a visual response is within the grasp of both students and academics, and this can be useful in offering visual feedback, especially where digital media-enhanced pedagogies are already used."

As a format for visual feedback, Machinima has a two-pronged nature: firstly to elicit feedback from an open-forum presentation crowd; and secondly for students to repeatedly review in order to permit a deeper level of reflection upon what has been done, how to improve and what has been learned. It is the very nature of Machinima as an immersive, visual medium that makes it such an effective form of visual presentation and feedback. By providing a format which allows for instantaneous absorption of ideas, students are able to

receive valuable feedback from teaching staff and other key individuals present at the presentation, and also review their work many times over and instantaneously reflect upon their decisions. These opportunities are not nearly as accessible via the submission of written documentation, which takes time to be absorbed, reflected upon and responded to.

Machinima production for review and feedback has the added benefit of reusability. Machinima films can be easily archived where student Machinima is added to a library of examples for future use (Richter, Anderson-Inman & Mindy, 2007) – this is especially beneficial when considering the sheer volume of student projects undertaken over time and the expense this would lead to if an attempt were made to archive a live example of each within its original real or virtual world environment.

# 5   Machinima as an instructional device

The idea of using Machinima as a device for student reflection came upon the ISP teaching team whilst developing a Machinima of their own for use as an instructional device that would demonstrate to students what was expected of them in terms of project outcomes in Second Life. The ISP demonstration Machinima 'Australis 4 Learning' (2008) (named after the location island of the ISP project) depicted a scene demonstrating the customer's visualisation of their company once all information systems solutions had been finalised and implemented. The particular project given to students was to design one information system artefact of a lager integration of several systems, the result of which would function as a fully in-world student services virtual-campus system.

This method of instruction, rich in visual-spatial stimulation, served to provide students with a dynamic visualisation of expected outcomes and to begin orienting them with the Second Life environment in which they would be spending their semester. Middleton and Mather (2008) recorded similar observations; "...the academic believed machinima "interspersed in a lecture" would engage and interest students more than current methods and would be more "stimulating and exciting"." ISP students frequently referred back to the visualisation Machinima in order to gain inspiration.

Whilst not possible in the pilot stages of implementation, in future runs of the ISP course it will be practicable to use student generated Machinima as examples to set and improve expected standards. Truncations of student generated Machinima could also be used to provide introductions to tasks that students need to complete (Middleton & Mather, 2008).

# 6   Course re-design

To outline this newly refurbished course, weeks one to four provided an introduction to Second Life and the Linden Scripting Language. In the first lecture, students were introduced to Second Life and the business case study. After the first lecture and demonstration acquainting students with the Second Life environment, students were required to solve small tasks individually. The goal was to create a '6-pack of software artefacts', each of the six artefacts having the potential to make a useful contribution to the overall business case. Group work was deliberately avoided at this stage in order to provide the opportunity for every student to gain the same background knowledge. These weeks were taught with the assumption that most students were not familiar with Second Life and had to learn everything from scratch. Students who have had practice with online gaming or other virtual worlds might begin with an advantage, though in our experience most students achieve a comparable proficiency in programming with LSL.

6(9)

| Week | Activities | Notes |
|---|---|---|
| 1 | Basic object creation and avatar interaction | Development of one software artefact |
| 2 | LSL to create and control avatar animation | Development of one software artefact |
| 3 | Analyse the AAL business case for opportunities | Document analysis<br>Development of two software artefacts |
| 4 | Creation of a mechanism through which information can be communicated between SL and the real world | Development of two software artefacts |
| 5-10 | Software development and solution portfolio based on software artefacts developed during weeks 1 – 4. Extending ideas into realistic business solutions. | Project tasks were related to the main theme of the island – the Automated Assessment Lab (Dreher, Dreher & Reiners, 2008). |
| 11-12 | Project presentation and demo showing the implementation of software solutions. | Machinima format for presentation. |

# 7   Student responses

Concluding late May 2009, students of the ISP pilot course were asked to provide feedback on what was good, what was bad, and what needed to be changed right away. Generally, there has been a very positive result for students and as is evident from the feedback below, we have succeeded in capturing their attention, revitalising the course, and facilitating the students' achievement of course outcomes and objectives.

| Positives | Improvements |
|---|---|
| • Free from real world limitations, allowing for potential for innovation<br>• Many ways to approach the same problem therefore encouraging critical thinking and creative problem solving skills<br>• Fresh, fun and creative approach to project management<br>• Parallels real-life experience<br>• Learner-centred discovery learning | • Insufficient time and resources<br>• Restrictions inherent in Second Life environment, e.g. LSL, Avatar roles (landowner, officer, member)<br>• Focus on business principles of IS<br>• Communication skills development<br>• Protecting the investment in creating objects in Second Life e.g. backup, archiving |

However, there are things to improve, as can be seen in the right column of the table. Whilst one can be delighted with the positive responses, one also needs to adjust future course implementation and delivery so as to mitigate the negative.

# 8   Conclusion

We set out to reinvigorate interest, motivation and delight students with a pedagogically sound final semester that was relevant and fun.

There are rewarding opportunities to enhance IS Education for students through innovative use of emerging technologies such as Virtual Worlds. The use of Second Life and the AAL business case as modelled therein, has offered students the chance of immersion in a protected and privileged real world-like environment, with instant life-like feedback on their ideas, decisions, and constructions, without the usual penalty associated with making errors and yet with the benefit of intrinsic reward for success.

Students discovered a new and powerful means by which they could document information systems – the Machinima – which also served as an integral part of learning through doing and describing, followed by reflection.

As the use of ICT continues to evolve in the general community, educational institutions face the challenge of staying at the forefront of innovation and industry relevance – Virtual Worlds are one way of doing so that is both inexpensive and pedagogically beneficial.

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## Appendix – Machinima making basics

The Machinima making process is very similar to the filmmaking process in the sense that it is a three-phase course of action involving a pre-production or preparatory stage, a production stage where the desired footage is captured, and finally the post-production editing of captured footage into a presentable format. There are many different methods of Machinima making as well as tools available in order to make the process easier. We are by no means claiming to be experts in Machinima making, rather offering our experiences as guidance for other academics who would wish to experiment with Machinima as an instructional tool. These experiences are shared within the context that they occurred; teaching staff developing a rich media instructional tool in order to help students visualise the expected project outcomes.

### *Pre-production*

For the purposes of making Machinima it is the pre-production phase, which requires the most attention and time invested. (For students, if a course is delivered inside a virtual world, then much of the pre-production sage can be completed as a part of coursework.) Pre-production in Machinimatography consists of: world environment building; character creation; prop creation; scripting; and, camera movement experimentation. The initial build of the virtual world environment is by far the most time consuming of these tasks. The best advice one can receive at this stage is to take seriously the importance of planning ahead. Discoveries with regard to the specific mechanics of the virtual world will have an impact upon what is possible in filming later and can influence the direction of the script.

### *Production*

Before launching into the production phase, it is necessary to spend time selecting screen capturing and editing software. Media file formats and capture resolutions need consideration. We used Fraps (approx €25) and Adobe Premier (approx €950) encoding in raw AVI at 25fps. This approach resulted in one particularly inconvenient complication – the compressed AVI formats outputted by Fraps were not supported by Premier; thus making it necessary to capture everything in raw AVI. Working with such huge file sizes will slow down other processes later on such as file transfers and rendering. Several screen capture and edit software packages are available, for example Camtasia (approx €200).

Choice of capturing tools aside, the production phase is only as complicated as the requirements of the script – if there are plans for special lighting, intricate camera work and so on, then the production phase can become quite lengthy. Rehearsals of character interactions and camera movements are recommended in order to achieve the best outcome.

### *Post-production*

If all has been well prepared in the earlier stages, post-production can be a fairly straightforward process involving editing sound and footage together, and the possible capturing a few extra shots or sound clips if necessary. In order to avoid time wastage caused by the transferring of files, it is a good idea to make the editing machine the same one that captured the footage.

### *Essential Tools*

- Game Engine (online virtual reality world or computer game)
- Screen capturing software
- Video editing software
- Quality headsets (one for each avatar controller)
- Microphones (for ambient background noise and any dialogue not captured in-game)
- 3DX Mouse (great for smooth camera movements)
- Computers with specs for gaming